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An Explorative Study into the Design and Use of Visual Reporting Systems in Project and Programme Management Environments

School of Industrial and Manufacturing Science

PhD

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Supervisor: Dr Fiona Lettice

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ABSTRACT

Project and programme management environments are extremely challenging, dynamic places to work. Understanding issues and correcting poor performance is crucial to the successful achievement of project/programme objectives, yet many organisations struggle to develop reporting systems that are efficient and still provide accurate insight.

In response to this problem, this thesis describes collaborative academic-industrial research into the use of a visually-based poster-size reporting system, referred to as the Dashboard. Given the exploratory nature of the research, a grounded theory, case study methodology was selected. Two case studies are presented: one at programme level involving a national utilities and roadside recovery organisation and one at project level, conducted with a support services company. The case studies were conducted over 20 and 9 month periods respectively. Data was collected from a number of sources including formal and informal interviews, workshops, company documentation, researcher diaries and for the second case study, through action research.

The Researcher found that a visual reporting system is an effective way of reporting status and performance, though is better suited to programme rather than project management environments. Specifically, it is effective as a communications and knowledge transfer mechanism to both internal and external stakeholders. Secondly, the visual approach can leverage mechanisms for developing trusting relationships between stakeholders, which could lead to more effective team working. These findings are important as they address common reasons for project failure.

Finally, the type of organisational culture has been shown to have a significant impact in the longer-term success of a visual reporting system. Where there is a culture of blame, of protecting information or where participative management practices are not embraced, the visual approach is unlikely to be successful beyond providing performance visibility and remedying actions in the short-term.

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AUTHOR PROFILE

After completing a degree in Business Administration and European Studies at Aston University in 2000, Martin's interest in the business practices of national and multinational organisations led him to study for a Master of Research degree in Enterprise Integration at Cranfield University, where he graduated in 2001. The course objective was to provide skills, methodologies and competencies to apply change initiatives and technologies for business integration and included two 3 month research projects where he worked with the NHS Executive and a South West NHS Trust. This interest in large scale organisations subsequently focused on the execution of strategy and paved the way for Martin to join the School of Industrial and Manufacturing Science at Cranfield. He worked there as a Research Assistant on an EPSRC sponsored research project, entitled PROJECT'ion, which was a feasibility study into the use of visually based tools in technical project environments. He has subsequently worked with a range of FTSE100 organisations developing and validating the outputs of PROJECT'ion. Martin currently works for KPMG as an Assistant Manager, specialising in the operationalisation and execution of corporate strategy.

SUMMARY OF PUBLICATIONS

Published Documents

Bryde, D., Wickes, M. & Lettice, F. (2004). PROJECT'ion – A Model For Programme & Project Performance. *PMA Conference*, 27-30 July, Edinburgh.

Lettice, F., Young, K., & Wickes, M. (2003). A Visual Approach to Transform Information into Knowledge. *eChallenges Conference*, 22-24 October, Italy.
Runner-Up in the award for Best Paper.

Wickes, M. Jukes, S. & Lettice, F. (2003). From Bust to Boom: Transforming a Programme through Performance Management. *British Academy of Management (BAM) Annual Conference.* September 2003. Harrogate.

Lettice, F., Wickes, M. & Feeney, A. (2003). *Avoiding Information Overload - Using a Visual Language Tool to Improve Knowledge Transfer.* 9th International Conference on Concurrent Enterprising (ICE): Enterprise Engineering in the Networked Economy, Espoo, 16-18 June.

Wickes, M., Leslie, A.,Lettice, F., Feeney, A. & Everson, P A. (2003). A Perspective on Nonaka's SECI Model from Programme Management: Combining Management Information, Performance Measurement and Information Design. *Organizational Knowledge, Learning and Capabilities (OKLC) Conference*, April 13-14. Barcelona.

Wickes, M. & Lettice, F. (2003). Don't Lose Your RAG! *Perspectives on Performance* (Trade Journal for the Performance Measurement Association). Vol. 2, Iss. 2. March.

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1 INTRODUCTION

This chapter introduces the research upon which this thesis reports. The background to the research and the research problem are described whilst the aims, objectives and research questions are also detailed. The scope of the report is outlined before a brief overview of the approach undertaken and the contribution to knowledge. As reader aids, an example of the investigated tool is provided as well as an overview of the structure of the thesis.

1.1 BACKGROUND TO THE RESEARCH

This thesis presents research findings about the application and utility of a reporting tool that has been used in project and programme environments. The tool is poster-sized and is highly graphical in its presentation. The tool is introduced in more detail in 1.7.

The researcher became involved in the study and development of the tool some time after its inception, so at this early stage in the thesis it seems appropriate to define the degree to which the tool was developed when the research began. A graphical approach was being used by the pilot case study organisation to represent what the organisation viewed as programme management information. However, the information presented was highly IT focussed and did not represent the key information areas defined by programme management methodologies. The researcher therefore worked in a collaborative fashion with the organisation to develop the content and design of the reporting tool. The findings were then applied into the other organisations participating in the research.

Thus, the design and use of the tool has been researched in the programme environments of two FTSE100 organisations as well as in several singular projects executed by another FTSE100 company.

1.2 THE RESEARCH PROBLEM

Change is a way of life for all organisations. New products and services may be developed, new IT systems may be implemented, acquisitions may be made and business units divested[1]. Change is constant; perhaps the only constant and is delivered through a series of processes and interactions known as Programme Management, which is defined as "the co-ordinated management of a portfolio of projects that change organisations to achieve benefits that are of strategic importance" (OGC, 1999). In fact, the variety and pace of change in today's business environment can cause an overload, not only of projects but of the volumes of data generated for each initiative.

[1] In fact Centrica divested the AA during the course of this research, causing a shift in IS strategy for the remaining business units, a full portfolio review and the transfer of multiple groups of staff between units.

"increasing numbers of executive directors of KPMG client companies express concern that the information they receive neither enables them to measure performance against their chosen strategy and objectives, nor helps them in their strategic decision-making process. The common complaints are of too much data and too little analysis." They go on to report that *"information used to monitor performance was rated poor or average by just under half of the companies contacted in terms of its relevance, accuracy, timeliness, completeness, cost-effectiveness and presentation. Dissatisfaction appeared to be most marked in the cost-effectiveness and presentation of information"*. (KPMG (1990) report (quoted in Neely et al, 1995)).

These environments are extremely challenging. Team members are often required to work in knowledge areas they are unfamiliar with, operating as transdisciplinarians, and need to be able to quickly understand new technologies, markets, people and organisations. They have to be able to respond to changing environments. Due to increasingly fast technological advancement and the forces of globalisation, the development of corporate strategy in many industries is more dynamic than ever (Mintzberg et al., 1998). Organisations will increasingly find their strategies are emergent with non-linear progression (Stacey, 2000) making the communication of that strategy to staff an ever-greater contest. Those working in a programme management capacity will increasingly find their role demands the development of more stringent Go/No-Go criteria, in order to best utilise resources. Average project cycle time is also likely to shrink to ensure that when a project delivers, it remains congruent with strategy. Further, project workers in most organisations face the trials of having to satisfy a myriad of stakeholders, each with a different perspective of what constitutes a successful project or programme. This is further compounded for those working in matrix organisations, who report to functional superiors as well as project superiors.

These factors result in an environment that is increasingly difficult to co-ordinate and control, though a degree of control is achieved through the implementation of formal project management methodologies, such as PRINCE2, (the *de facto* standard in the UK). This has led to an acceptance in the academic literature that organisations are never totally in control (Streatfield, 2001). The impact of this understanding is that the need for high quality information is vitally important if the organisation is to respond in a responsive and flexible manner to meet the challenges of portfolio [programme] management (Cooper et al., 2001). Effective knowledge transfer techniques are also imperative if the knowledge base of the organisation is to be leveraged to communicate issues such as strategic re-alignment, project status, best practice, departmental performance, and so on.

Hence, there appears to be a legitimate industry problem: given the complexity of the environment and the volume of data that is typically required to provide a holistic view in such environments, can a focused report with high quality data and analysis be developed that is suitably relevant to satisfy the differing information requirements of a multitude of stakeholders? The application of graphical techniques provided direction.

Information design is an emerging academic discipline, in response to the modern challenges of information overload. Though fast-breaking, information design has been gathering pace for over half a century and is robust in nature (Tufte, 1983). Visual Language (VL) is at the forefront of information design and is defined as the *"tight coupling of words, images and shapes into a unified communication unit"* (Horn, 1998). *"Tight coupling means that you cannot remove the words or the images or the shapes from a piece of visual language without*

destroying or radically diminishing the meaning the reader can obtain from it' (Horn, 1999). Research by Mayer (2001) found that by adding visuals to words, learning improved by 23%. In another group of studies, adding visuals to words improved transfer of learning by 89%. Maltz's (2000) study of Perceived Information Quality (PIQ), based on measures of information credibility, comprehensibility, relevance and timeliness, found that communication supported with tables and graphs improves PIQ. With support from developments in information technology, VL has the potential for increasing human 'bandwidth', the capacity to take in, comprehend, and more efficiently synthesize large amounts of new information. (Horn, 2001; Paivio, 1968). The number of applications are virtually unlimited but are likely to be most beneficial in environments where large amounts of information must be processed quickly, such as in interdisciplinary work (which is becoming increasingly common), or in day-to-day single discipline operations where large volumes of data must be processed in order to do the job (Horn, 2001). Project and programme environments fit both these criteria.

The integration of these VL techniques into project and programme reports would form the crux of the research.

1.3 RESEARCH AIMS, OBJECTIVES AND QUESTIONS

1.3.1 RESEARCH AIM

The overall aim of the research was to explore the design and use of visual reporting systems in Project and Programme Management environments as a reporting mechanism within project and programme environments.

1.3.2 RESEARCH OBJECTIVES

Having defined the aim of the research a number of lower-level objectives were developed to support the research aim:

- To critically review substantive literatures, useful theoretic literatures and other necessary secondary sources in relation to:
  - Areas of knowledge within the disciplines of Project and Programme Management, in order to provide robust contextualisation.
  - Performance Measurement Systems (PMS) and processes for their implementation.
  - VL and other communication media.
- To develop a typology of VL information components that can provide project / programme stakeholders with performance feedback and other mission critical information, which other companies may find useful.

- To develop and validate an implementation roadmap for a visual tool, for use by the business community.
- To identify key environmental factors that affect the implementation of a visual tool.

1.3.3 RESEARCH QUESTIONS

In addition to the aims and objectives, a number of research questions were generated. These provided guidance when developing the research activities and ensured that the research objectives were met. Thus, there was a clear relationship between the research questions and the objectives and, in turn, between the research objectives and the overall research aim.

RQ1a	What is Programme Management?
RQ1b	What is Visual Language?
RQ1c	What is Performance Measurement?
RQ2a	What are the information requirements of project / programme stakeholders?
RQ2b	What are the business requirements for such a reporting system?
RQ2c	What are the benefits and drawbacks of using such a system?
RQ3a	What lessons have been learned by academics and practitioners when implementing reporting systems?
RQ3b	What process should be followed when implementing this system?
RQ4a	What environmental factors affect the implementation of the tool?
RQ4b	To what degree do these factors inhibit the implementation?

Table 1.1 Research Questions.

1.3.4 RESEARCH DELIVERABLE

The research deliverable is a concept and guidelines to help projects and programmes to be better managed, controlled, communicated and delivered through the use of visually-based tools.

1.4 SCOPE OF THE STUDY

The scope of the research project reported in this thesis was relatively wide but well defined. As has been made clear, the intention of this study was to explore the concept of using VL as a reporting mechanism in project and programme environments. This formed a natural boundary, i.e. extraneous to the research were supporting reports, managing stakeholders, team selection, and numerous other elements of project and programme management. It should be noted that this scope is retrospective in nature. That is, it is

provided as a reader aid only; to employ scope management processes at such an early stage in a grounded study would be to invalidate the approach.

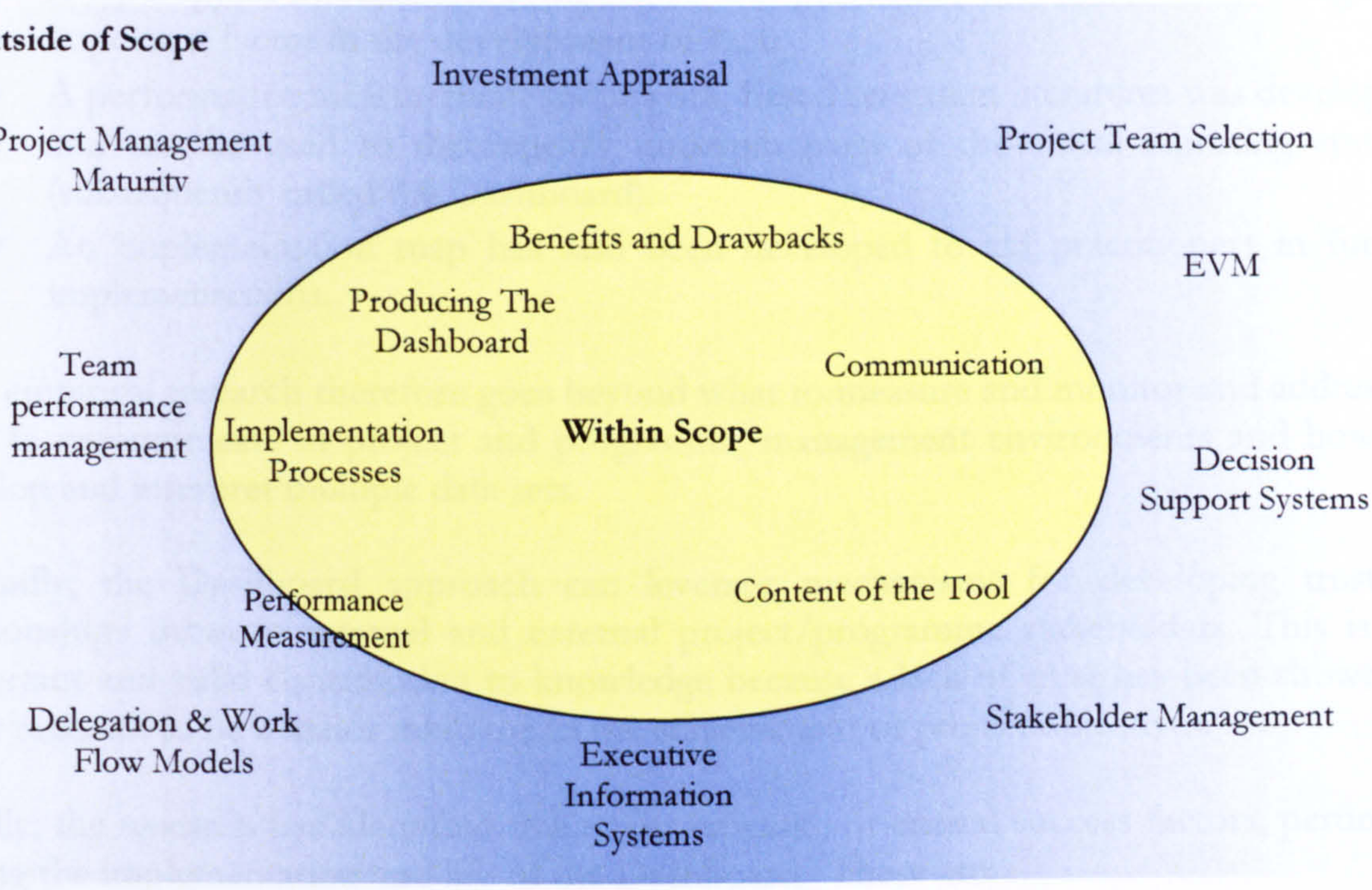


Figure 1.1 Scope of the Thesis.

1.5 RESEARCH APPROACH

A grounded theory approach has been employed to deliver the research objectives. The first stage in this process was to conduct a pilot study with very broad research questions. The approach is fairly standard in research such as this, where there have been little or no prior academic study conducted, as it allows the researcher to gain a general understanding of the phenomenon under study before posing more focused research questions at a later stage. Having completed the Pilot study, substantive literatures were reviewed in the areas that data were found to be concentrated in the Pilot. These were then used to generate a conceptual model, which was validated during latter cases, which were researched using an Action Research (AR) approach. This, in turn, developed and refined the model further.

1.6 CONTRIBUTION TO KNOWLEDGE

The academic contribution to knowledge made by this thesis has been to explore the utility of graphical reporting mechanisms in project and programme management environments. Three areas are of particular importance.

Firstly, this study makes a significant contribution to knowledge by identifying a tool which is effective as a communications and knowledge transfer mechanism in project and

programme management environments.

- A typology of information components was presented, with information design an important factor in the development of each.
- A performance measurement framework, based on extant literatures was developed and can be used to theoretically underpin parts of the visual reporting system (subsequently called the Dashboard).
- An implementation map has also been developed to aid practitioners in future implementations.

This empirical research therefore goes beyond what to measure and monitor and addresses how to communicate in project and programme management environments and how to develop and interpret multiple data sets.

Secondly, the Dashboard approach can leverage mechanisms for developing trusting relationships between internal and external project/programme stakeholders. This is an important and valid contribution to knowledge because a lack of trust has been shown in prior research to be a major inhibitor to the achievement of project objectives.

Finally, the research has identified five environmental, or critical success factors, pertinent during the implementation and life of the Dashboard. These are:

- Open communications
- "No blame" culture
- Participative solution development
- Securing long-term executive support
- Having appropriate IT integration

Having a no blame culture is considered to be the most important of these factors.

1.7 EXAMPLE OF THE TOOL

To provide further context to the research, an example of a visually-based tool is presented in Figure 1.2. This particular tool has been designed in Microsoft Visio and is A0 (poster) size. The content and utility of the tool will be described in much more detail in Chapter 3: Pilot Study but for now it is sufficient to note the graphical, colourful nature of the display.

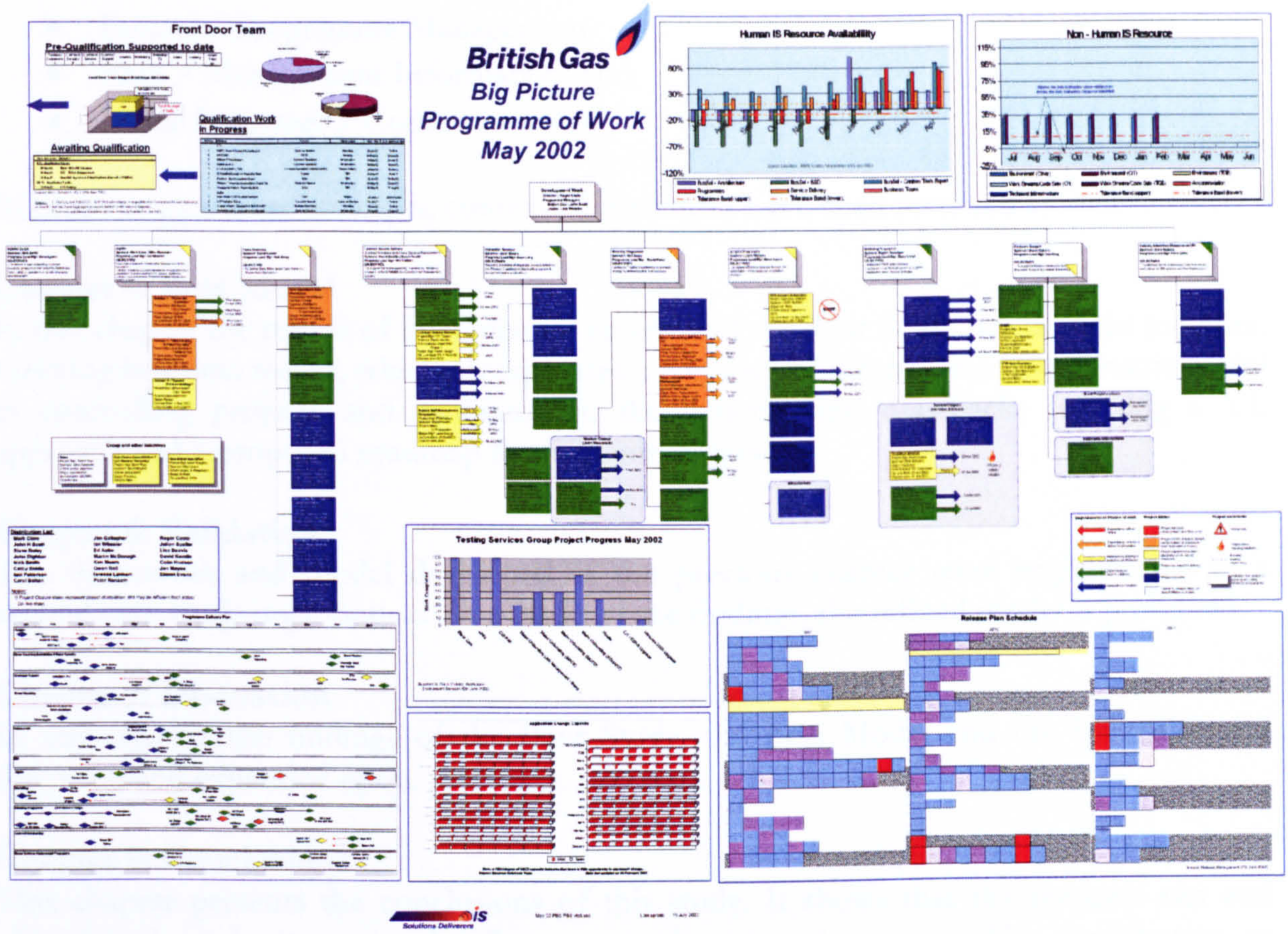


Figure 1.2 An example of the tool.

1.8 THESIS STRUCTURE

In order to present this thesis in a logical order, it has been necessary to divide it into a further seven chapters:

Chapter 2: Research Methodology
The aim of this chapter is to state the research design considerations, in order to give insight into the research process that has been followed and to demonstrate that appropriate methods have been selected and used to tackle the research problem central to this investigation.

Chapter 3: Pilot Study
This chapter reports on the findings of the Pilot Study. The aim of the Pilot Study is to gain a general insight into the tool before a more focused approach is adopted during the literature review and latter case studies. In this way, potentially important elements are not precluded from the study.

Chapter 4: Literature Review
This chapter aims to review substantive literatures so as to provide a state of the art view of three key domains:

- Project / Programme Management
- PMS / Management Information, and
- Visual Language / Communication.

In order to root these concepts, contextual literatures have been reviewed as well.

Chapter 5: Beta Model
In this chapter the results of the literature review and the Pilot Study, are brought together, resulting in a beta model, which incorporates a typology of information components useful in controlling projects and programmes, the benefits and drawbacks to using a VL approach and a proposed roadmap for implementation.

Chapter 6: Validation
The framework and model developed in the previous chapter were implemented in a second case study organisation. As a result of the findings, the refined model is presented.

Chapter 7: Discussion
In this chapter the findings of the Pilot Study, the Beta Model and the Validation are discussed and expanded upon.

Chapter 8: Conclusions
This chapter presents the conclusions of this study. It shows that the research aim and objectives have been met and reflects upon the research process. The contribution to knowledge made by this study is shown and, in light of this, areas for future research are identified.

Figure 1.3 provides a graphical overview of this structure.

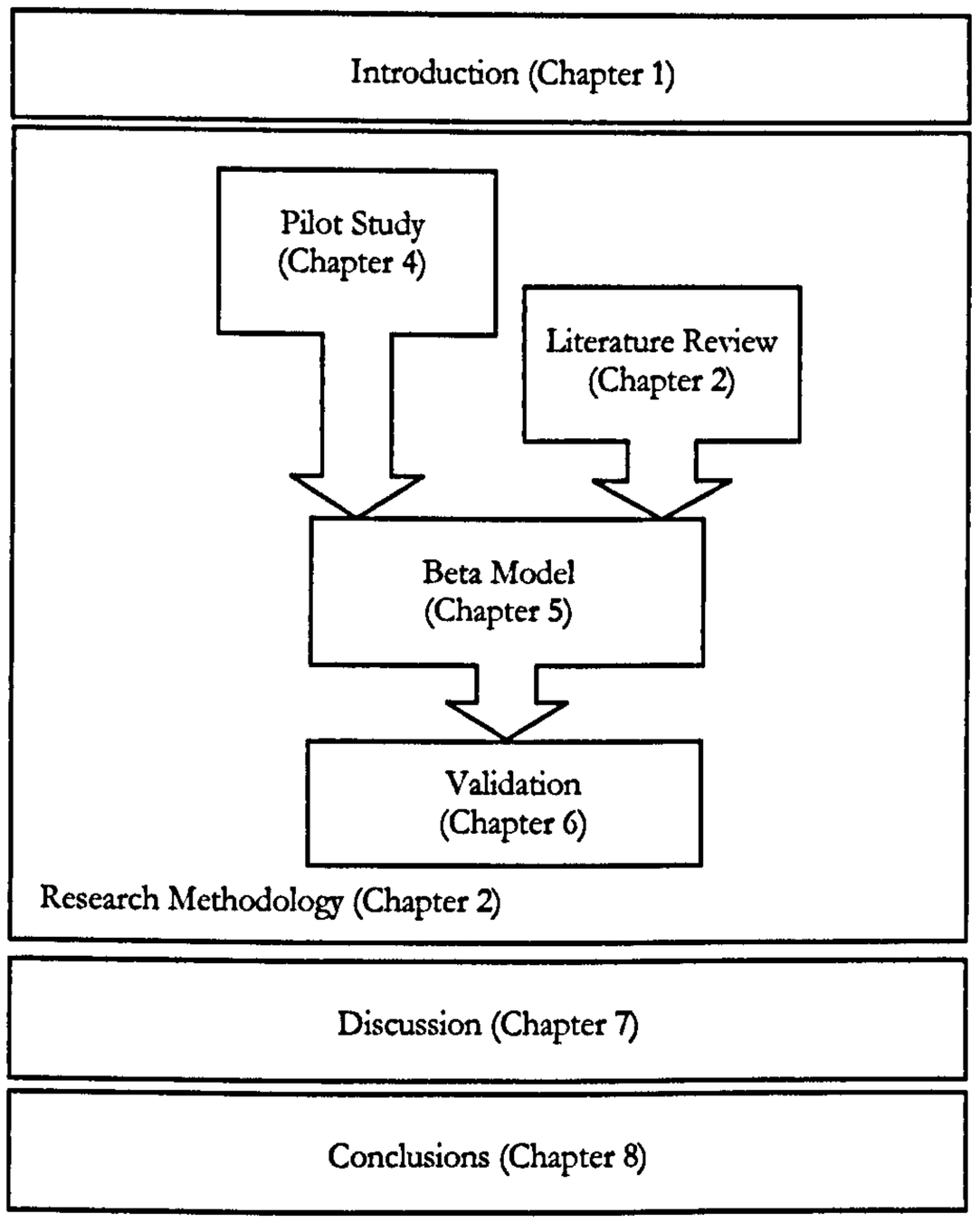


Figure 1.3 Graphical overview of the structure of the thesis.

2 RESEARCH METHODOLOGY

This Chapter outlines the methodological approach employed. The approach is contextualised and justified via an evaluation of other methodological practices available.

2.1 INTRODUCTION

Designing an appropriate research methodology for an enquiry is fundamental to the success of a research project. Methodology helps to ensure project aims are achieved and facilitates the process of answering the research questions and meeting the deliverables (Phillips and Pugh, 2000). As with all projects, there are a number of perspectives and levels of detail that need to be satisfied before the methodology can be considered robust.

In this process, there are no right answers. There may be several appropriate research paths and at the same time many inappropriate ones (Easterby-Smith et al, 1991). Choices must always be made and justified with reference to the research questions being addressed (Robson, 1993). It is also important that the researcher does not stray from the appropriate course of enquiry as a consequence of his/her own expertise, experiences and opportunities. One of the objectives of this chapter and the remainder of the thesis is to demonstrate how this linkage between research questions and the methodology undertaken has been established and maintained.

The research aims, objectives and questions were defined in Chapter 1. This chapter will guide the reader through the operationalisation of these facets of the research, starting with the high-level strategic considerations of research philosophy through to the more operational issues of techniques for data collection and analysis. This hierarchical process is depicted in Figure 2.1.

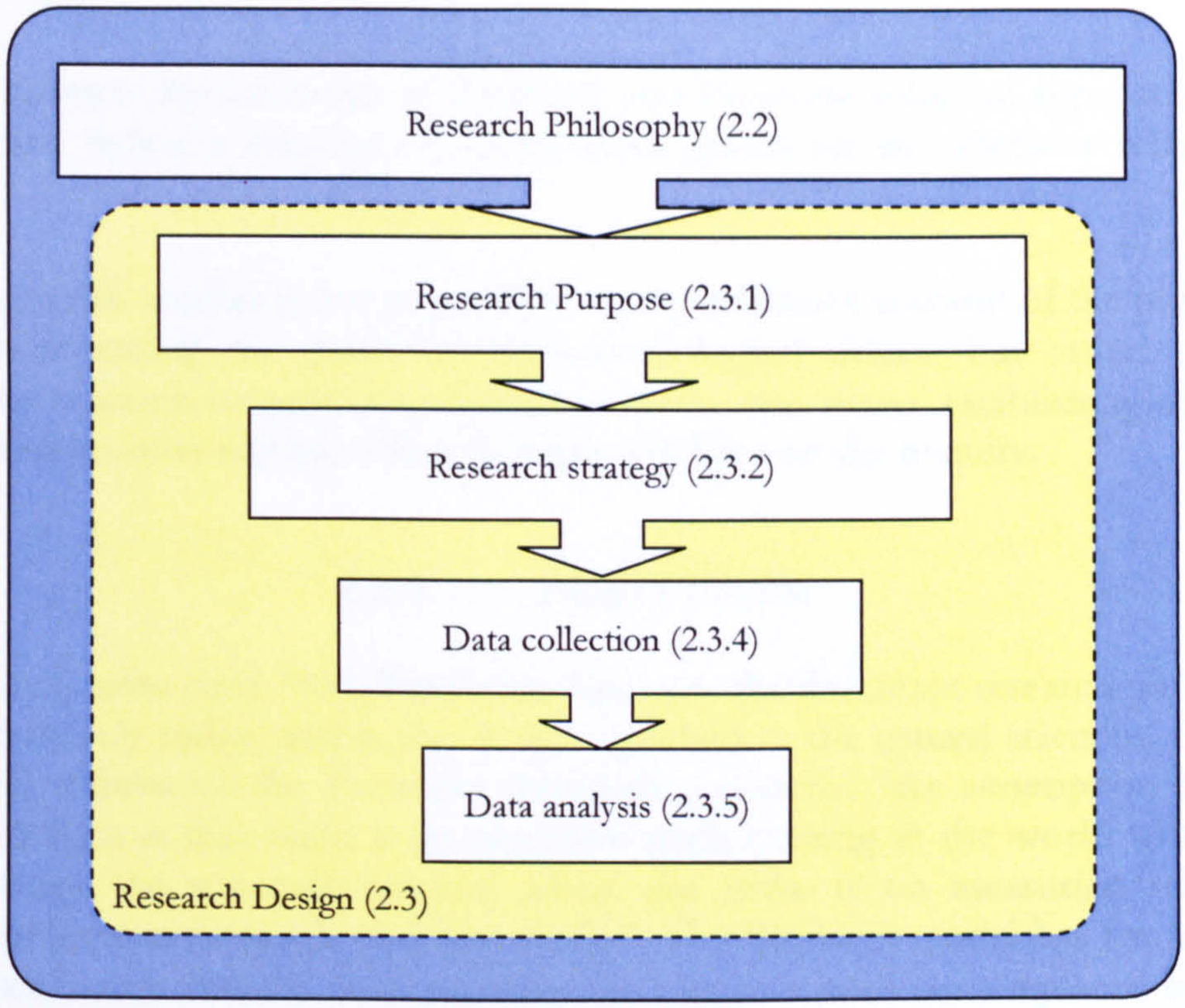


Figure 2.1 The Process of Developing a Research Methodology

Chapters 3-7 then describe the application of the selected methodology. Chapter 3 introduces contextual literatures, Chapter 4 describes a pilot study conducted to collect an initial wave of data, Chapter 5 presents a Beta Model based on analysis of the findings in the literature and Pilot Study, Chapter 6 reports on a second, more focused wave of data collection and analysis, and finally Chapter 7 presents a discussion on the findings.

2.2 RESEARCH EPISTEMOLOGY

"Epistemology refers to the claims or assumptions made about the way in which it is possible to gain knowledge of [a social reality]", (Blaikie, 1993, p. 6) and is important to the research enquiry because the selected epistemology will influence the way in which the research is conducted. It is therefore important to make clear to the reader this philosophical stance.

The debate is often polarised via a comparison of the more contemporary Phenomenological approach against the backdrop of the traditionalist model of Positivism. At the heart of this debate, is the question of whether the methods and procedures successfully developed in the natural sciences are appropriate for use in the social sciences.

In reality, and as will be made explicit, these two approaches are rarely utilised independently, as most studies contain elements of both (Easterby-Smith et al, 1991). Consequently, the approaches should be considered as being at opposing ends of a spectrum. This had led to a number of philosophies being defined that can be considered as 'middle ground' or '3rd way' approaches (such as Critical Theory, Realism, Contemporary Hermeneutics, Structuration Theory, Feminism, etc). In actual fact, these philosophies

incorporate distinct characteristics of Positivist and Phenomenological approaches and do little more than define a number of intermediate points on an otherwise relatively bare continuum.

The purpose of this section is not to provide a comprehensive account of the philosophical arguments surrounding the positivist/phenomenological debate but rather to set the context of the research by providing definition to the two terms, establishing the author's epistemological position and the effect that this will have on the enquiry.

2.2.1 POSITIVISM

Popularised by Comte circa 1830, Positivism has been the dominant research philosophy, is still used extensively today, and is the *de facto* standard in the natural sciences. Cassell and Symon (1994) summarise the Positivist approach succinctly: "the assumption behind the Positivist paradigm is that there is an objective truth existing in the world which can be revealed through the scientific method where the focus is on measuring relationships between variables systematically and statistically". The Positivist model has for many, been 'dumbed-down', such that the term positivist has come to have been replaced by the term quantitative. Yet this does not do the approach justice. Positivism is a complex philosophical argument with many strands. The core tenets on which it is based are, (Easterby et al, 1991):

- The observer must maintain his or her independence from the subject being researched to ensure the objectivity of enquiry,
- Value-freedom is maintained in the choice of research subject, which must be determined by objective criteria rather than according to the researcher's interests or beliefs.
- The establishment of causality should be the goal of scientific enquiry, together with the discovery of fundamental laws and regularities.
- The hypothetico-deductive approach should be taken to develop hypothetical propositions, and deduce tests of falsification or support for the theory upon which they are based.
- Operationalisation of concepts allows facts to be measured quantitatively.
- Reductionism allows whole problems to be better understood through the study of their constituent components.
- Generalisation allows the formation of universal laws if large enough samples are selected. Cross-sectional analyses of the variation across these samples facilitates the identification of universal regularities.

Robson (1993, p. 19) lays out a framework for this approach, which consists of five stages:

1. Deduce a hypothesis (a testable proposition about the relationship between two or more events or concepts) from the theory.
2. Expressing the hypothesis in operational terms (i.e. ones indicating exactly how the variables are to be measured) which propose a relationship between two specific variables.
3. Testing this operational hypothesis. This will involve an experiment or some other form of empirical inquiry.
4. Examining the specific outcome of the inquiry. It will either tend to confirm

the theory or indicate the need for its modification.

5. If necessary, modifying the theory in the light of the findings. An attempt is then made to verify the revised theory by going back to the first step and repeating the whole cycle.

This approach is 'deductive' because a hypothesis is generated at the start of the process and data is collected to provide either support, negate or provide no conclusions for the hypothesis.

Although traditionally considered to be a robust philosophy, it is not without criticism. One of the problems of the Positivist approach is "where the propositions that form the basis of a deductive theory comes from. The issue of how the theory is tested is the scientific element of deductive research, but the process by which the idea is conceived contains a creative element. There are arguments that it actually involves the use of inductive reasoning" (Payne 2001). Olander (1993) suggests that the philosophy tends to result in existing theory becoming the start point of research rather than a phenomenon of interest, and the exclusion of such phenomena if they are not objectively measurable. Finally, Positivism has been described as idealised since most 'scientific' research that purports to encompass and adhere to its ideals does not actually follow a Positivist process and is often merely reported as if it has (Woolgar, 1996). This may then impact the credibility of the research in other ways.

These factors have resulted in a shift away from the Positivist philosophy for some, in favour of a new paradigm, termed Phenomenology.

2.2.2 PHENOMENOLOGY

Developed by Husserl (see Bauman, 1978) and based on the philosophy of hermeneutics, Phenomenology aims to achieve pure understanding, liberated from the relativism of historical and social entanglements (Blaikie, 1993). Researchers following a phenomenological paradigm are "characteristically concerned in their research with attempting to accurately describe, decode and interpret the precise meanings to persons of phenomena occurring in their normal social contexts and are typically pre-occupied with complexity, authenticity, contextualization, shared subjectivity of researcher and researched and minimization of illusion." (Fryer, 1991). Note that this definition does not preclude, nor even discourage the use of quantitative data; nor should it. There is however a focus on collecting data from social interactions in the natural world using a naturalistic set of methodological procedures i.e. case studies, ethnography, observation and interviews (Denzin & Lincoln, 1994), with the goal being to understand the diversity of people's experiences rather than to explain regularities and explain causality, (Easterby-Smith et al, 1991).

Whilst positivism is characterised by its deductive approach to testing theory, phenomenology tends not to take existing theory as the start point. Instead, data tends to be collected and then theory is drawn from the data (Glaser and Strauss, 1967; Strauss and Corbin, 1998). A further distinction is that while positivists believe that the investigated phenomenon can be better understood by breaking it down into its constituent elements, phenomenologists believe that such reductionist thinking oversimplifies the world and that a more holistic viewpoint is necessary to produce a more accurate comprehension. In

order to achieve this, proponents of phenomenology advocate the use of multiple methods of data collection in order to triangulate view points. In comparison, positivist approaches typically advocate a single method of data collection. A consequence of this Phenomenological, holistic thinking is that it is difficult to establish generality because the phenomena under study are context-specific. Positivist approaches however, seek to identify universal truths which can be applied across a number of different situations. Finally, while Positivists believe reality is tangible, external and objective, Phenomenologists believe that the researcher is inextricably entwined with the research, meaning that subjectivity is inevitable. "The interplay between research and researcher means that the researcher is an instrument of analysis in qualitative studies." (Strauss and Corbin, 1998, p.53). For purposes of transparency, it is important to explicitly document potential biases.

2.2.3 SELECTING A PHILOSOPHICAL APPROACH

The key concerns for both approaches should be that the most appropriate methods and most pertinent data be used, regardless of the philosophical stance of the researcher (Hammersly, 1996). Thus, the most important principles underlying the research should be that conclusions are based on valid and reliable information whether that is quantitative or qualitative, arising out of positivism or phenomenology. To ensure that the appropriate approach is employed, it is important to reconsider the objectives of the research. They are:

- To critically review substantive literatures, useful theoretic literatures and other necessary secondary sources in relation to:
  - Areas of knowledge within the disciplines of Project and Programme Management, in order to provide robust contextualisation.
  - Performance Measurement Systems (PMS) and processes for their implementation.
  - VL and other communication media.
- To develop a typology of VL information components that can provide project / programme stakeholders with performance feedback and other mission critical information, which other companies may find useful.
- To develop and validate an implementation roadmap for a visual tool, for use by the business community.
- To identify key environmental factors that affect the implementation of a visual tool.

It is important to remind the reader that this research is exploratory in nature. To the author's knowledge there has not been a study in this area before. As such, there are no directly applicable theories to test. Given that most positivist approaches start with existing theory, it would initially seem that the positivist approach is not appropriate (although it would be possible to develop conjectures). As an exploratory study, it also seems reasonable that the initial scope of the research should be relatively wide, to ensure that no potentially important areas are precluded from the study. This should also direct the reader

towards phenomenology, which is an impression that is compounded when methods of data collection are considered. Although this topic will be discussed in more detail later in the chapter, suffice to say that while quantitative methods could be used, in order to gain a richness of understanding in an environment which is not well understood, qualitative approaches are considered to have greater synergy with the research objectives. For example, a survey could be used as a data collection technique to sample a high number of project workers about specific elements of communication and control systems on their projects and the use of visual language. However, with little research having been conducted in this area, it is difficult to be certain of the correct questions. This qualitative approach is also characteristic of phenomenology.

Having selected the Phenomenology approach, the next stage in developing the methodology is to start to design the processes and vehicles for collecting and analysing data.

2.3 RESEARCH DESIGN

The research design is "the logical sequence that connects the empirical data to a study's initial research questions and, ultimately to its conclusions" (Yin, 1994, p. 19). Stated more fully, the research design is a plan that "guides the investigator in the process of collecting analysing, and interpreting observations. It is a logical model of proof that allows the researcher to draw inferences concerning causal relationships among the variables under investigation. The research design also defines the domain of generality, that is, whether the obtained interpretations can be generalised to a larger population or to different situations" (Nachmias & Nachmias, 1992, pp. 77-78).

The purpose of the research design in an academic environment is to document a logical case for the approach taken, such that if the research were to be repeated by another person, it could be conducted in exactly the same manner. That is not to say that the outcome would be exactly the same – different data may lead the researcher to different conclusions – but the methodology used should be tantamount to a clone. The first stage in developing the research design is to define the purpose of the research.

2.3.1 THE MATURITY OF THE RESEARCH DOMAIN AS A DRIVER FOR RESEARCH PURPOSE

Having selected the most appropriate research philosophy to achieve the research objectives, an appropriate research methodology must now be designed to answer the research questions. The reader is reminded that they are:

RQ1a	What is Programme Management?
RQ1b	What is Visual Language?
RQ1c	What is Performance Measurement?
RQ2a	What are the information requirements of project / programme stakeholders?
RQ2b	What are the business requirements for such a reporting system?
RQ2c	What are the benefits and drawbacks of using such a system?
RQ3a	What lessons have been learned by academics and practitioners when implementing reporting systems?
RQ3b	What process should be followed when implementing this system?
RQ4a	What environmental factors affect the implementation of the tool?
RQ4b	To what degree do these factors inhibit the implementation?

Table 2.1. Research Questions

As previously discussed, phenomenological approaches imply that the theory will be generated from the data, rather than data being used to test existing theory. The research questions support this implication.

Understanding the purpose of the research is important as it will have an impact on the scope of the inquiry and will partially determine the methods of data collection and therefore analysis that are used. Robson (1993, p. 42) suggests that all real world research can be classified according to three purposes:

Exploratory
- To find out what is happening
- To seek new insights
- To ask questions
- To assess phenomena in a new light
- Usually Qualitative

Descriptive
- To portray an accurate profile of events
- Requires extensive knowledge of the situation to guide data collection
- May be Quantitative and/or Qualitative

Explanatory
- Seeks causal explanation of a situation
- May be Quantitative or Qualitative

"However, implicit in this categorisation is the status of research progress in the area being investigated. This suggests a different role must be played by theory in research enquiries serving each purpose. Typically, Exploratory research would be conducted when existing theoretical explanations of a situation or phenomenon are lacking or inadequate. The theory that results might then become the driver of Descriptive research, guiding the collection of the most appropriate data for the accurate modelling of the situation

being investigated. Explanatory research could then be conducted to test the theories generated by the Exploratory and Descriptive research" (Burns, 2003, p. 64).

Research has been conducted into many facets of project / programme management and performance measurement and management (see CCTA, 1999; OGC, 1999; Reiss, 1996; Kaplan and Norton, 1996 and 2000; Neely 1998 for introductory texts). Visual language however is an emerging discipline (see Tufte, 1983, 1990, 1997; Horn, 1998, 1999, 2001 for an induction to this domain), and there has been limited application into business contexts (for examples see Johnson, 2000; Buchheim, 2000; So & Smith, 2002). Given the interdisciplinary nature of this research, the direct application of theory from these contextual domains is not appropriate. This research aims therefore, to explore the design and utility of visual language as a reporting mechanism in project management and programme management environments. Due to the immaturity of the research domain, this research will not progress into Descriptive or Explanatory research. It will however, present a tentative theory developed from the data, which is intended to progress the sub-discipline. The process of theoretical induction from the data will be described in Chapter 5, and follows the general process of 'Grounded Theory' generation as originally proposed by Glaser and Strauss (1967).

2.3.2 RESEARCH STRATEGY

Traditionally there has been a notion that the purpose of the enquiry will dictate the research strategy, Robson, (1993) i.e.:

- Case studies are appropriate for exploratory work;
- Surveys are appropriate for descriptive studies; and
- Experiments are appropriate for explanatory studies.

Whilst this notion may hold true for the majority of research conducted, it is not an absolute truth. For example, there can be, and have been, exploratory, descriptive and explanatory case studies (Yin, 1981). It is therefore still necessary to consider the appropriateness of experiments, surveys and case studies as research strategies.

Experiments are defined as "measuring the effects of manipulating one variable on another variable", (Robson, 1993, p.40). Experiments are typically associated with the natural sciences but can be used in social science research where it is possible to prove or disprove a theory. Experiments are rejected due to a lack of research in this area. Any 'hypothesis' generated by the author would be little more than conjecture and would significantly weaken the research methodology.

Surveys are defined as the "collection of information in standardised form from groups of people", (Robson, 1993, p.40). As a research strategy, surveys are commonly associated with descriptive research because the research and survey questions posed are more focused than in exploratory research but do not typically seek to establish causality, as in explanatory research. Surveys, as a research strategy, are rejected because the standardisation of data collected would make it difficult to theoretically sample for further data (an important principle of Grounded Theory, Glaser and Strauss, (1967)).

For the purposes of this research, it would appear that the case study is the most

appropriate method given the requirements of the other strategies. Case studies are a popular research strategy in exploratory research. Yin (1994, p. 13) has developed a two-part definition. It states that a case study is an empirical inquiry that:

- Investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident

and, the case study inquiry:

- Copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result
- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
- benefits from the prior development of theoretical propositions to guide data collection and analysis.

2.3.3 CASE STUDIES

This section is intended to demonstrate that the case study approach has been fully considered and that potential weaknesses in the approach have been rendered.

2.3.3.1 Traditional Prejudices against the Case Study Strategy

Case studies have traditionally been regarded as the weaker sibling of the other research techniques. Yet as case study methodologies solidify over time, this view is being challenged. It must be acknowledged however, that in the past, many case studies have not been conducted with the highest degree of integrity and as such have been criticised. The following section summarises the criticisms levelled at case studies and provides a rebuttal, discounting the arguments, whilst the next section identifies a series of methods aimed at strengthening case study integrity.

- Lack of rigour in the process – biased views or equivocal evidence are allowed to influence direction of the findings and conclusions. To combat this, it is necessary to conduct initial research before a full plan is designed (Yin, 1995). It is one of the aims of this chapter to make evident that this research has been well planned. The following sections detailing the design of the cases in this research and the documentation of the execution of that design establishes that view. Effective triangulation of data also guards against the introduction of equivocal evidence. (Denzin and Lincoln, 1994). This topic will be discussed in more detail in section 2.3.5 and its application demonstrated in Chapters 4 and 6.
- The scope of the case is often too broad resulting in data overload and a lack of comparable data. (Miles and Huberman, 1984; Denzin and Lincoln, 1994). Whilst the initial scope of this inquiry will be broad (in line with the principles associated with exploratory research and grounded theory development), it will become focused around concepts abstracted from the data in the first case study.
- Case studies provide little basis for scientific generalisation. Case studies, like experiments are generalisable to theoretical propositions and not to populations and universes. In this sense, the case study, like the experiment, does not represent a 'sample' and the investigator's goal is to expand and generalise theories (analytic

generalisation) and not to enumerate frequencies (statistical generalisation). (Yin, 1995). This research presents a series of propositions based on theoretical induction.

- Case studies take too long and result in massive incomprehensible documents. (Yin, 1995). This may be true of some case study research, however due to the confines of a PhD thesis, the case study chapters have been written in a concise, economic manner.

2.3.3.2 The 5 Star Case Study

Yin (1994, pp. 20-26) defines five components as being especially important for strong case study design. They are:

1. A study's questions. The questions for this research have already been discussed, as part of the process for determining the most appropriate research methodology.

2. Its propositions, if any. The study propositions provide additional direction to that made available in the raw question and should direct attention to an issue to be examined within the scope of the study. Due to the lack of research in this area, the propositions for this research will be generated following the Pilot Study and Literature Review phases. This approach is consistent with the Grounded Theory methodology proposed by Glaser and Strauss (1967).

3. Its unit(s) of analysis. Two organisations are researched: a parent company comprising a national utilities and roadside recovery organisations, and support services company. It was considered important to document the experiences of two organisations for a range of reasons. Firstly, the researcher was only able to research the first case study organisation after the system had been established. The experiences documented by interviewees were retrospective and as such subject to the deficiencies of human recollection. The researcher worked with staff at the support services organisation throughout the entire process. Secondly, the process used to implement the tool was ad hoc. It seemed appropriate therefore to assist another organisation in the process from start to finish in order to capture the method in its entirety and to capture people's opinions as issues arose – it will be demonstrated in later chapters that a key proposition relates to a structured implementation process. This was also necessary as an important aspect of the research objective was to develop and validate an implementation roadmap, for use by the wider business community. Thirdly, the tool set was implemented at a programme-level in the national utilities and roadside recovery organisation. The combined value of these programmes was over £1 billion. As another facet of the research objective was to understand the applicability of visual language tools in project environments, it was necessary to document the experiences of a project team in a second case study. The support services organisation represented the second case study, with the unit of analysis being a £1 million project, which aimed to develop ICT skills in north-east labour markets. Finally, it was felt that studying two organisations would create some contextualisation of the findings, "We cannot understand this case without knowing about other cases" (Denzin and Lincoln, 1994).

4. The logic linking the data to the propositions, and
5. The criteria for interpreting the findings

It seems appropriate at this juncture to introduce the notion of Grounded Theory, as the concepts by which it is defined play a key role throughout the thesis. Grounded Theory is an approach to theory development that was originally developed by Glaser and Strauss, (1967) though the most recent offering by Strauss and Corbin (1998) is generally referenced in this thesis. The following excerpt succinctly summarises the characteristics of Grounded Theory:

> "What do Strauss and Corbin mean when they use the term "grounded theory"? They mean theory that was derived from data, systematically gathered and analyzed through the research process. In this method, data collection, analysis and eventual theory stand in close relationship to one another. A researcher does not begin a project with a preconceived theory in mind (unless his or her purpose is to elaborate and extend existing theory). Rather, the researcher begins with an area of study and allows the theory to emerge from the data. Theory derived from data is more likely to resemble the "reality" than is theory derived by putting together a series of concepts based on experience or solely through speculation (how one thinks things ought to work). Grounded theories, because they are drawn from data, are likely to offer insight, enhance understanding, and provide meaningful guide to action."
>
> (Strauss and Corbin, 1998, p. 12)

This approach embodies the philosophy of phenomenology and the principle of inductive research previously outlined, and acts as a cornerstone to the methods employed throughout this research. Various aspects of the grounded theory process will be introduced at appropriate sections in the thesis.

Given the differing nature of the two cases in terms of research style, the scope of the study and the unit of analysis, the purpose of conducting a second case was to facilitate cross-case comparison. Those comparisons that are made will not focus on differences between the cases; only commonalities will be highlighted. "Seldom is there interest in how a case without the phenomenon is different because there are too many ways to be different. Generalizations from differences between two cases are much less to be trusted than generalizations from one" (Denzin and Lincoln, 1994). Further comparison will be made at the conceptual level (Strauss and Corbin, 1998), rather than at the data level.

Finally, the author proposes that any commonalities established can only be considered trends and not laws because laws in social science cannot exist; they will be ultimately be disproved by cultural or social morphing or through free will (for further discussion on this issue, see Popper, 1961). Grounded theory is consistent with this principle because theories are developed at the conceptual or abstract level and not at the data level. Further, given the exploratory nature of the research, it would be inappropriate to move into theorizing given the limited data available and the novelty of the domain. However, where appropriate, grounded theory methods will be employed to provide insight into the data.

2.3.4 DATA COLLECTION

Having decided to analyse the phenomena through a case study approach, it is necessary to consider issues of data collection. There are two main ways in which the researcher can interact with the case study organisation; by visiting periodically or by basing themselves 'on site'. The latter technique is known as Action Research (AR) and results in the researcher becoming very closely involved with the organisation in an attempt to get as close to the phenomena of interest as possible. This has both benefits and disadvantages, which will be explored in the next section. Both methods have been used in this research.

Visiting the case study organisation periodically is the more traditional and well established method of conducting case studies. The period over which visits will be made and the frequency of visits are normally defined at the onset. Degree of access, methods of data collection, and issues of confidentiality will all be defined. Since most readers will be familiar with the concept and implications of visiting the case study organisation periodically, the following section will serve as an introduction to the arguably more contentious practice of AR.

2.3.4.1 Action Research

AR is a generic term, covering many forms of action-oriented research (Reason and Bradbury, 2001). The term AR was first coined in 1945 by John Collier (1945), though Kurt Lewin is often regarded as one of the 'founding fathers' (Foster, 1973). Collier argued that "since action is by nature not only specialised but also integrative to more than the specialities, our needed research must be of the integrative kind. Again, since the findings of the research must be carried into effect by the administrator and the layman, and must be criticised by them through their shared experience, the administrator and the layman must themselves participate creatively to the research, impelled as it is from their own area of need" (Collier, 1945, p. 275).

Modern definitions of AR have not changed greatly and are summarised succinctly by Coughlan and Coghlan (2002), who, quoting a wide range of authors, identify the following characteristics to action research. Firstly, AR is research *in* action rather than research *about* action. In this case, the researcher was an active agent in the creation and implementation of the solution, moving far beyond the traditional notion of the researcher being external to the environment being studied. Secondly, the research should be participative. In this case, the solution was developed collaboratively, principally by the researcher and project manager but also by the project team and senior project management. Thirdly, AR is research concurrent with action. "The goal is to make that action more effective while simultaneously building up a body of scientific knowledge" (Coughlan and Coghlan, 2002, p. 223). This has certainly been the goal of this research as one of the deliverables is a contribution to knowledge for a PhD and a second is an implementation guide for businesses interested in applying the principles and processes researched. Finally, AR is a sequence of events and an approach to problem solving. In this instance, the sequence of events has been highly iterative; as the research domain has been understood, further data sets have been collected and analysed. The approach has required co-operation between researchers and members of the organisation under study. These characteristics are representative of AR. Again, this is consistent with Grounded Theory.

Regarding the practicalities of executing an AR approach, Hopkins (1993) argues that

periods of reflection are critical. Such reflexivity ensures rigour as it allows the researcher to determine the impact of previous actions. This was achieved by maintaining a research diary, which enabled "consciousness in the midst of action" (Torbert, 1991). It also provides an opportunity to improve the approach. Schon (1983) suggests that good AR rests on the assumption that effective relationships can be built between the researcher and the phenomenon, which is often a difficult hurdle for academics to overcome. In addition, without a clear plan, accurate data recording and a period of data reflection, the researcher can be criticised for simply conducting a piece of consultancy or producing heavily biased research. Integrating more traditional data collection activities in to the AR can improve the perceived rigour of the research.

Proponents of the approach argue that "If the propositions are generated exclusively by a researcher who is not involved in the experience being researched, and are imposed without consultation on the practical and experiential knowledge of the subjects, we have findings that directly reflect neither the experience of the researcher nor that of the subjects." (Heron, 1981). And in considering traditional research mechanisms, "Conventional laboratory-derived research seeks to minimize the degree of involvement between the researcher and the researched in the interests of objectivity. This falls foul of much that is known about the change process, and of conditions facilitating change. The discrepancy is not surprising as the task of conventional pure scientific research is to describe, understand and explain – not to promote change. Coming to terms with the dual 'understanding' and 'promoting change' roles calls for a different view of research..." (Robson, 1993 p.438). AR is often criticised because the researcher becomes too closely involved with the investigated phenomena, yet it would appear that this bias is acceptable providing it is made explicit, "Critical subjectivity means that we do not suppress our primary subjective experience, that we accept that our knowing is from a perspective; it also means that we are aware of that perspective and of its bias, and we articulate it in our communications." (Reason, 1994, p.327)

A range of processes for effecting action research have been proposed (see Hopkins, 1985; Robson, 1993) though these appear to be somewhat simplified versions of actual practice, though all are broadly based on Lewin's 1946 model of planning, acting, observing and reflecting. The model presented here is developed by Elliot (1982) and whilst it has been criticised for being too complex (Hopkins, 1985; Adelam, 1989; Winter, 1989), will hopefully provide the reader with a more accurate insight into the researcher's activities:

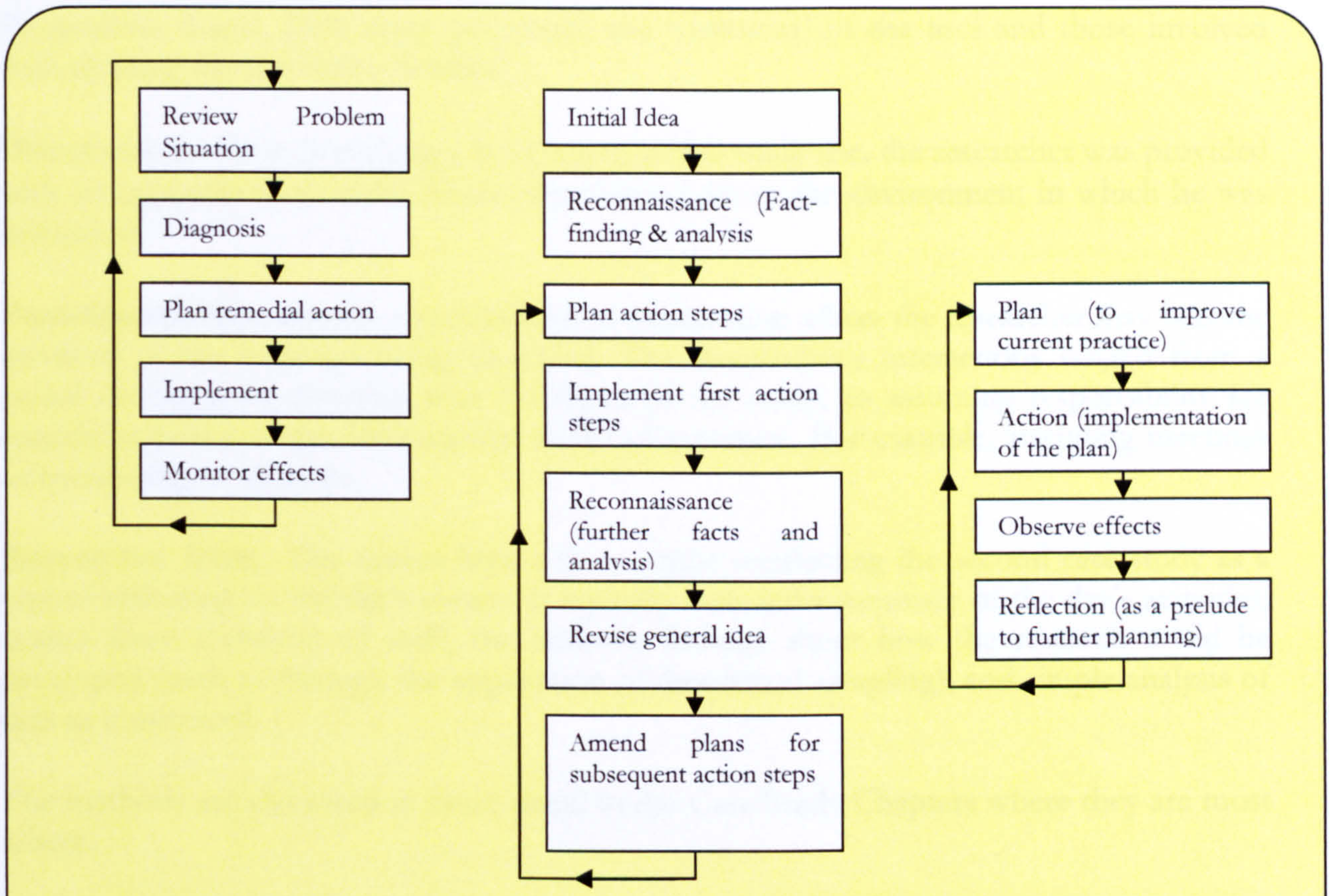


Figure 2.2. The Action Research Cycle, (Elliot, 1982).

2.3.4.2 Data Collection Methods

In the two main case studies, the following data collection methods were used:

Documents. For example:

- Letters, memoranda, e-mail and documents from other modes of communication.
- Agendas, minutes of meetings and other written reports of events.
- Administrative documents – project mandates, project plans, progress reports, and other internal documents.
- Formal studies or evaluations, such as the documented business case, prior to acceptance from the Programme Board.
- Newspaper clippings and other articles appearing in the mass media.
- Information from case study organisation's internet and/or intranet site.

Archival records, which include:

- Service records, such as those showing the number of clients served over a number of years.
- Organisational records, such as organisational charts and budgets over a period of time.
- Organisational process documents, such as Project Management process maps.

Interviews, which were either semi-structured or totally unstructured, taking into account facts (as perceived by the interviewee) and possibly conjecture. Personnel interviewed included all stakeholders of the tool, e.g. Project Managers, Programme Managers,

Programme Board, Data entry personnel, the 'customer' of the tool and those involved with defining the metrics to be used.

Direct observation. In making a field trip to a case study site, the researcher was provided with an opportunity to make direct observations about the environment in which he was immersed.

Participant observation is a special kind of observation where the researcher may become involved in the situation being observed. The Researcher's interactions ranged from a casual exchange of thoughts with a subject of the study, to assuming responsibility for specific activities in the environment under observation. For example, attending meetings or conducting workshops.

Researcher Diary. The author kept a diary whilst conducting the second case study as a way of reflecting on the day's events. It typically included a summary of the day's activities, quotes from members of staff, the author's feelings about how the research could be developed (such as through the application of theoretical sampling), and simple analysis of data as it occurred.

The methods are discussed in more detail in the Case Study Chapters where they are most salient.

2.3.5 DATA ANALYSIS

A range of analytic techniques have been used during this research. More detail will be provided regarding the combination and order of techniques employed for each case study in the appropriate chapters. The purpose of this section is to provide a summary of those analytic techniques, which will be referenced in the case study chapters.

The first stage in the analytic process is to conduct microanalysis, which is defined as "the detailed line-by-line analysis necessary at the beginning of a study to generate initial categories (with their properties and dimensions) and to suggest relationships among categories; a combination of open and axial coding". As suggested, within the process of microanalysis, a number of other analytic techniques are employed. These include (Strauss and Corbin, 1998):

- Assigning properties and dimensions to categories of data
- Various comparative techniques (such as Flip-Flop, Systematic and Red Flag)
- Open, Axial and Selective Coding
- Memoing, to document Code Notes, Technical Notes and Operational Notes
- Diagramming
- Identifying conditions and consequences
- Identifying macro and micro conditions
- Identifying actions and reactions to conditions
- Identifying processes and sub-processes
- Organising categories and sub-categories around the central research theme

As some of these analytic techniques are fairly complex, they will be discussed in more

detail as they are used. In this way, examples using real data can be made. In addition, the principle of triangulation will be used.

2.3.5.1 Triangulation

One important benefit of using multiple methods is in the reduction of 'inappropriate uncertainty' (Robson, 1993). That is, using a single method of data collection and assuming that it has yielded the 'correct' answer. Assuming that there are multiple perceptions of the same phenomenon and attempting to understand as many of them as is feasibly possible is consistent with the phenomenological approach. It also helps to address one of the criticisms of the case study approach, that of equivocal evidence. Triangulation is typically established via four key means (Denzin, 1978):

Triangulation of data requires two or more data points. If they are complimentary, then they can be said to cross-validate each other. If they do not, it may be appropriate for the researcher to interpret the inconsistency. This has been achieved by interviewing a range of people on the same issues and in the second case study, the same people over a period of time.
Methodological triangulation occurs where more than one method of data collection has been utilised. This was achieved by using the range of data sources outlined above.
Triangulation by investigator is achieved by using more than one investigator to collect the data. In so doing, the subjectivity of one researcher's interpretations can be reduced. This is difficult to achieve as part of the PhD process however and triangulation efforts therefore focused on the other three means.
Theoretical triangulation is realised when multiple perspectives are used to interpret a single data set. This was achieved during the data analysis phase by considering the data from a range of viewpoints to ensure multiple translations were achieved.

A fifth method of triangulation is proposed by Janesick (1994), termed **interdisciplinary triangulation** and is achieved by drawing on the erudition of a number of academic disciplines for the purpose of one piece of research. This has been achieved by contextualising the research and answering the research objectives by drawing on a wide range of academic disciplines:

- Project management and Programme management
- Performance measurement and management
- Information Design / Visual Language
- A number of other disciplines, as demanded by the data.

All methods of triangulation enhance the credibility of the research.

2.3.6 OTHER SOURCES OF DATA

In addition to the data collected through the use of case studies, a series of parallel activities were conducted. These are:

Literature Review: An initial review of literature was conducted prior to commencing the first case study. The purpose of this was to provide grounding for the researcher in the major domains of literature, which are:

- Project and Programme Management
- Performance Measurement and Management
- Visual Language and Information Design

This initial wave was cemented by an ongoing review of literatures throughout the research. The output of this phase of the research is presented in Chapter 3, Literature Review.

The second major phase of the literature review process was to augment the findings in the primary data collection activities, with research that has been previously conducted. For example, one of the major concepts to emerge from the first case study was that the tool acted as a vehicle for knowledge transfer. Once this concept had been identified, other research in this area was appraised.

Expert Interviews: A two expert interviews were also conducted in order to gain feedback as the tool was developed. The interviewees were:

- Dick Eve, Technical Director at Mantix, a programme management consultancy.
- Geoff Reiss, Chairman Of 'The Programme Management Specific Interest Group' and Director of Product strategy at PMG

2.4 CRITERIA FOR JUDGING THE QUALITY OF THE RESEARCH DESIGN

Having documented the research design, it is necessary to ensure its quality. A design may be considered robust if it is defensible against four key criteria, summarised in Kidder & Judd (1986).

Construct validity: establishing correct operational measures for the concepts being studied.
Internal validity (for explanatory or causal studies only, and not for descriptive or exploratory studies): establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships.
External validity: establishing the domain to which a study's findings can be generalised
Reliability: demonstrating that the operations of a study – such as the data collection procedures can be repeated, with the same results.

As previously stated, this research is exploratory. As such, the research need only be defensible against three criteria (construct validity, external validity and reliability) Yin (1994) identifies the following tactics as being effective in strengthening research design.

Tests	Case study tactic	Phase of research in which tactic occurs
Construct validity	Use multiple sources of evidence Establish chain of evidence Have key informants review draft case study report	Data collection Data collection Composition
External validity	Do pattern matching Do explanation-building Do time-series analysis	Data analysis Data analysis Data analysis
Reliability	Use case study protocol Develop case study database	Data collection Data collection

Table 2.2. Case Study Tactics (Yin, 1994).

These tactics will be demonstrated, where appropriate, throughout the remainder of the thesis.

2.5 CONCLUSION

A series of important methodological decisions have been explained and justified in this chapter. Firstly, the Positivist epistemology was rejected in favour of a Phenomenological approach. Secondly, a number of key decisions were made with regard to the research design. In summary, they are:

- This research is exploratory in nature
- A case study approach will be used as the principle research strategy
- 2 major cases will be conducted
- The sources of data identified as potentially salient include:
    - Corporate documents
    - Archival records
    - Interviews
    - Direct observation
    - Participant observation
    - Researcher Diary
- This data will then be analysed using a series of analytic tools as recommended in Strauss and Corbin's (1998) guide to developing grounded theory.
- Two expert interviews will be performed to gain feedback on the development of the tool set and the concepts that are abstracted from the data.

Finally, a set of criteria were presented which can be used to judge the quality of the research design. The major processes in the identified methodology for this research are summarised using visual language in Figure 2.3.

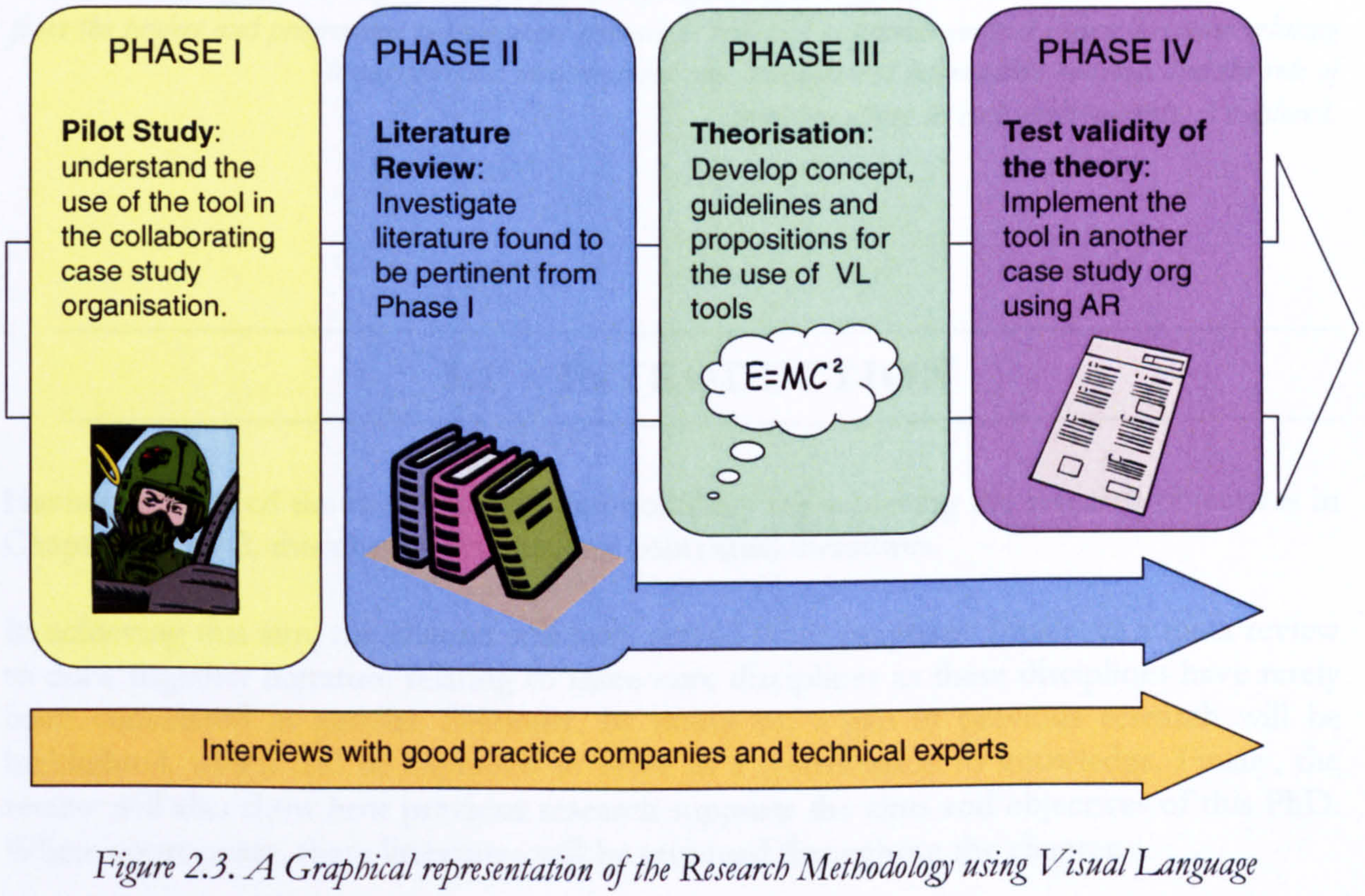


Figure 2.3. A Graphical representation of the Research Methodology using Visual Language

The following Chapter, Literature Review will present contextual literatures for the three core domains of academic research, within which this research is positioned.

3 LITERATURE REVIEW

The aim of this chapter is to review extant literatures to provide a state of the art view of communication and monitoring systems employed in project and programme management environments. Salient literature from the project and programme management domain is reviewed to provide context before literature relating to performance measurement and management information systems, and the role of communications in such environments, is explored.

3.1 INTRODUCTION

Having introduced the thesis and the methodology for achieving the research objectives in Chapters 1 and 2, this chapter will present contextual literatures.

In achieving this aim, the chapter will have served three purposes: Firstly, as a meta review to draw together literature relating to three core disciplines as these disciplines have rarely been considered in parallel. Secondly, by doing so, a gap in previous research will be highlighted, which will be exploited to serve as a contribution to knowledge. Finally, the review will also show how previous research supports the aims and objectives of this PhD. Where appropriate, these literatures will be critiqued throughout the chapter.

The reader should not expect the review of each domain to be as comprehensive as it would be for a research study conducted within the natural boundaries of one academic field. Further, and as will become apparent during the latter chapters of the thesis, a range of emergent concepts will be contextualised using appropriate literatures. These literatures are not included in this chapter but will be presented as they become relevant.

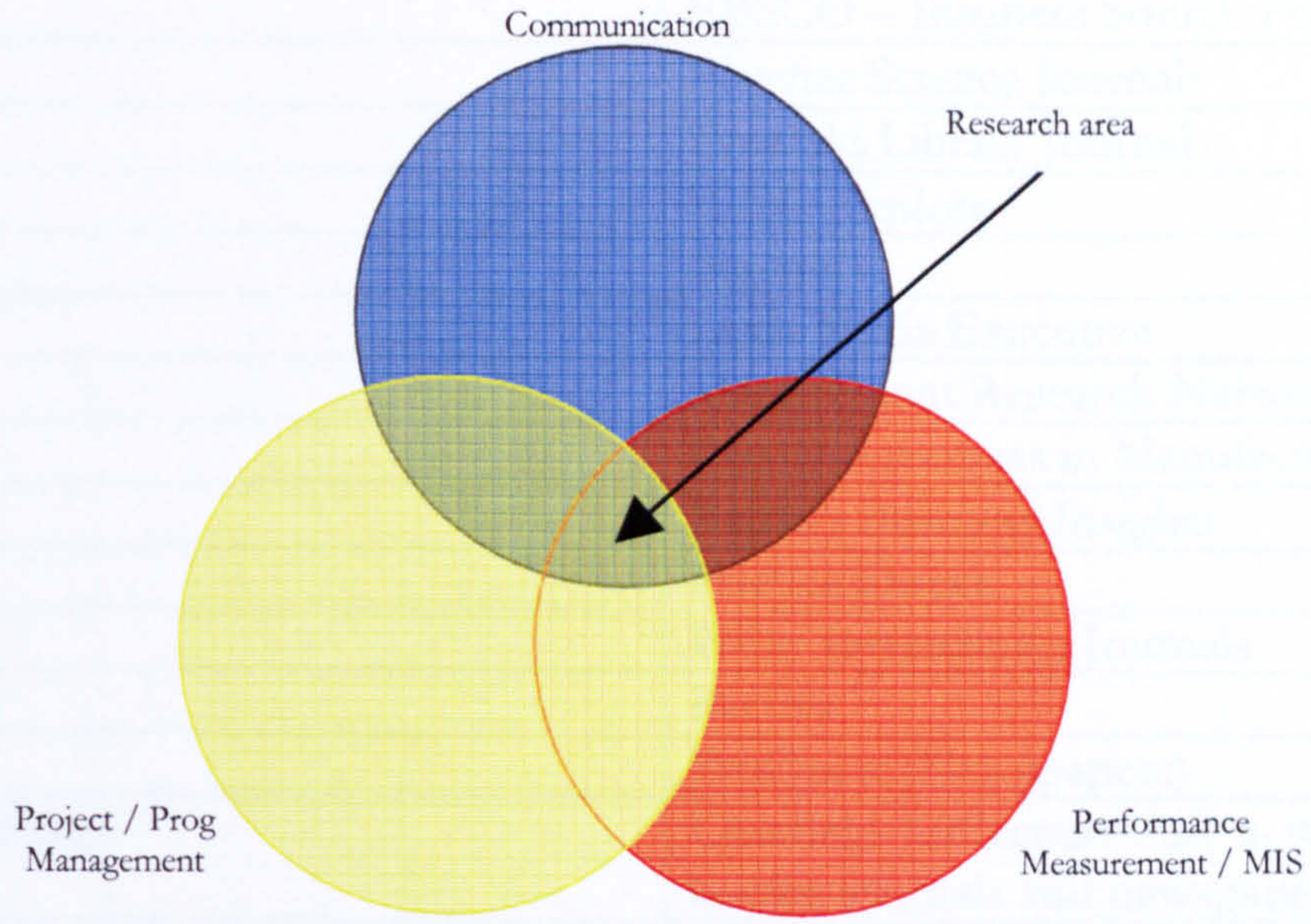


Figure 3.1. Academic Disciplines Investigated for Literature Review.

3.2 METHODOLOGY FOR LITERATURE REVIEW

This sections aims to provide a summary of the literature review process so that another person could replicate the process. If the researcher were to do so, they would probably discover a slightly different set of literatures as it is unlikely that they would have access to the same databases of academic journals and indeed it is likely that they would focus on more contemporary research. However, it is important to present a transparent account of the research process.

An initial review of the three domains of literature was conducted at the beginning of the study, in Autumn 2001. Since that time, the researcher has continued to scan data sources for new developments in the field. In addition, to ensure that the review is as comprehensive as possible, a final intensive review has been conducted during the final stages of the study, in summer 2004.

A range of data sources have been used to search for literature. They are presented in Table 3.1.

Type of Media	Sources of Information
Academic Databases	(ProQuest) ABI
	(ProQuest) ASTI
	EBSCO – Business Source Premier
	Elsevier Science Journals
	Emerald Library Journals
	IEEE Explore
	Ingenta
	Lexis-Nexis Executive
	Management Research Network
	Recent Advances in Manufacturing (RAM)
	Reuters Business Insights
	Science Direct
	Wiley Interscience Journals
Newspapers	Factiva
	ProQuest (Newspapers)
University Library	Cranfield University has a wide range of books, journals and newspaper cuttings
British Library	Any books or academic journal papers that are not available via the databases or physical holdings can be ordered from the British Library
Conferences and Trade Journals	The author has been fortunate to present at a wide range of Conferences, Special Interest Groups and publish in Trade Journals. This invariably resulted in excellent and useful feedback, particularly with regard to extant literatures.

Table 3.1 List of Data Sources used in Literature Review

When using databases, the search terms listed in Table 3.2 were used both singularly and in conjunction with their sub-terms and with each other. The list is not exhaustive as much literature was found by following references through a number of articles, however it should serve as a useful start point. Finally, it should be noted that the search terms varied slightly if the databases had a pre-defined categorisation scheme.

Term	Sub-Terms
Project Management / Programme Management	Benefits management
	Change control
	Communication
	Configuration management
	Control systems
	Costing
	Critical Success Factors (CSF)
	Information
	Information systems

	Management reports
	Planning
	Post-project reviews
	Project control
	Project evaluation
	Project selection
	Quality management
	Risk management
	Value management
Performance Measurement / Performance Management	Critical Success Factors (CSF)
	Implementation process
	Performance Measurement Systems (PMS)
	Performance Measurement Framework (PMF)
	Project success criteria
	Project evaluation criteria
	System design
Information Design	Data representation
	Information design
	Information graphics
	Information representation
	Information visualisation
	Scientific visualisation
	Visual communication
	Visualisation design
	Visual information design
	Visual language
	Visual-verbal language

Table 3.2. List of search terms.

3.3 CALLS TO ARMS

This section presents a series of quotes from Chief Executives, Managing Directors and leading academics from fields as diverse as design to healthcare. These statements solidify the arguments previously proposed: that senior officials need better mechanisms for interpreting the volumes of data available in order to better understand the performance and development of their organisation.

KPMG (1990) state that "increasing numbers of executive directors of KPMG client companies express concern that the information they receive neither enables them to measure performance against their chosen strategy and objectives, nor helps them in their strategic decision making process. The common complaints are of too much data and too little analysis". They go on to report that "information used to monitor performance was

rated poor or average by just under half of the companies contacted in terms of its relevance, accuracy, timeliness, completeness, cost-effectiveness and presentation of information" .

"We Measure Everything!" US Business Improvement District Manager (Hogg & Medway, 2002, p.1).

"Immediately before every board meeting I receive 1 to 2. inches of material to prepare me for the meeting. The information is different every time. ... I know the insight I need to be effective is in there somewhere, but I have a tough time extracting it and tracking it over time." (Felton et al, 2004, p.35).

"The increased affordability, power and connectivity of information technology are providing many institutions with an opportunity to revise the format and delivery of medical records, directories of local services, drug formularies and other sources of clinical knowledge. However, before we redesign records for electronic access we must first fully understand how to format such information to make it easy to find and clear to interpret. Otherwise, we risk propagating information in formats which, by ignoring subtle design principles will mislead on a large scale." (Wyatt, 1999, p.1501).

"Quite soon, an unimaginable volume of digital data will be available. The challenge is to transform it into information and that information into knowledge. We need to accelerate the transfer of business information to provoke ideas, broader patterns of thought and deeper levels of comprehension." (Schneck, 1999, p.38).

3.4 PROJECT & PROGRAMME MANAGEMENT

As discussed in Chapter 1, many organisations now pursue increasing dynamic and complicated strategies, delivering change via the structures, systems and processes established through effective Project and Programme Management. This section reviews salient literature in the field of Project and Programme management as it provides the context for this research. As will be summarily demonstrated, 'Project Management' and 'Programme Management' are distinct terms which address conceptually different issues and have different actions, structural arrangements and approaches associated with them.

Before the different elements of Project and Programme are presented in relation to the research, the terms will be defined. Project Management is a commonly used term in many organisations. Associated tools and processes have been significantly developed since their inception in the construction and aerospace industries, (Archibald, 1976). Defined as the management of "a temporary organisation that is needed to produce a unique and pre-defined outcome or result at a pre-specified time using predetermined resources" (CCTA, 1998, p.7), project management, as a discipline, is insular, focusing on the definition, planning and execution of a specific objective. As the popularity of project management grew as a vehicle for delivering these unique objectives, organisations began, almost by default, to use it to deliver strategic or complex change (Grundy, 1992), perhaps in response to the notion that "implementation is frequently the graveyard of strategy" (Grundy, 1993, p.43). Very often, this resulted in organisations executing a

number of projects in parallel, which prompted the development of a series of organising process, tools and structures. Whilst these were initially termed programme management processes (Ferns, 1991; Turner, 1993), it is a somewhat blinkered view of the role that programme management can play as it focuses on the management of resource constraints and of project interdependencies. In fact, what these early commentators were referring to is what has become known as multi-project management. "In a multi-project organisation, all the project leaders make use of several pools of (limited) resources, e.g. departments or expertise. The simultaneous management of the throughput times, resource allocations and costs of the projects is a complex process of balancing the (often conflicting) interests of multiple participants." (Platje and Siedel, 1993, p.209). "Programme management is not the same as multi-project management. The nature and practice of programme management are far more wide reaching than common resource management. The management of scarce resources, or the establishment of appropriate information systems are clearly core elements of programme management, but focus attention to the technical and planning aspects rather than the generative and organising aspects." (Pellegrinelli, 1997, p.141). Thus, recent definitions are more inclusive. Programme Management is "the co-ordinated organisation, direction and implementation of a portfolio of projects and activities that together achieve outcomes and realise benefits that are of strategic importance" (OGC, 2003, p.11). This definition assumes that the starting point is not to organise an existing set of projects but to realise a strategic vision, or set of high-level strategic objectives. So programmes can be defined from strategic objectives, which are then broken down into projects. To further differentiate programme management from project management, the following table is reproduced from the OGC's seminal guide, Managing Successful Programmes.

Project Management	Programme Management
Is an intense and focused activity that is driven by the outputs that are to be delivered	Is a broadly spread activity and is concerned with more broadly defined change objectives
Includes change control mechanisms but is best suited to objectives that are closely bound and relatively certain	Is suited to managing large numbers of projects and activities with complex and changing inter-relationships, in an uncertain environment (that is, a larger and more dynamic environment)
Is about managing the delivery of a product, service or specific outcome	Produces, through synergy, a wider set of benefits than the total of individual project benefits
Aims to deliver benefits at the end of the project	Is suited to managing the impact of, and the benefits from, the deliverables from a number of component projects and ensuring that there is a smooth and risk-reduced transition into a new business operation

	Delivers benefits both during and after conclusion of the work, having put in place the measurement mechanisms required to demonstrate delivery of the target benefits over time
	Continues until the organisation has achieved its Blueprint, which generally coincides with completion of all constituent projects. (A programme may of course be stopped earlier if no longer viable or relevant)

Table 3.3. Some typical differences between Project Management and Programme Management. (OGC, 2003, p.149).

The OGC go even further to state that there are not just differences between programme and project management but that in some circumstances they will be at loggerheads. "There are inherent tensions between the pressures on projects to complete on time and the need to achieve the wider goals of the programme. Compromises will inevitably be required as the programme is implemented. The compromises, if they are left to individual project teams, may seriously prejudice attainment of the wider goals and benefits." (OGC, 1999). The relationship between projects, programmes and their wider contexts can be represented thus.

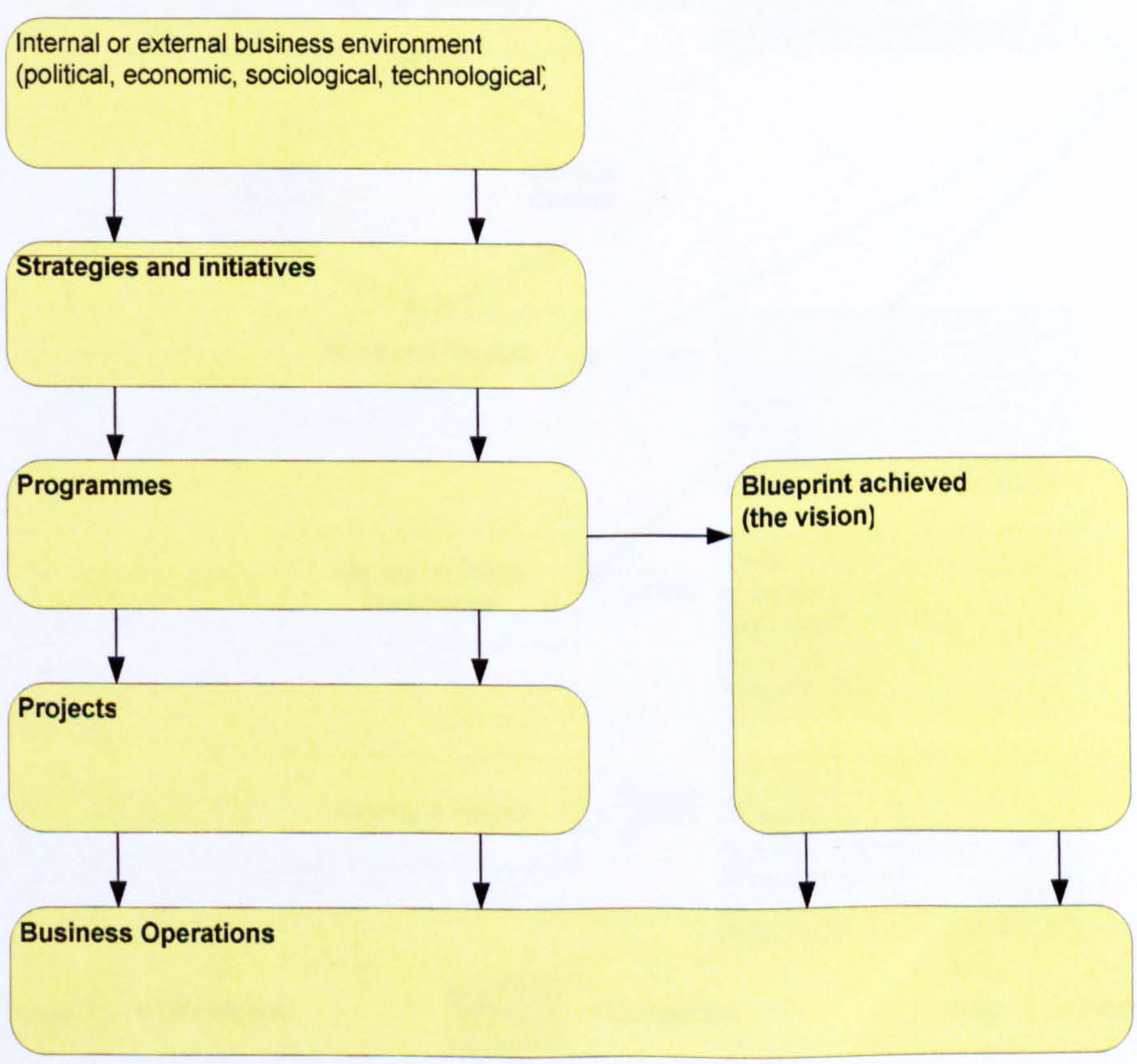


Figure 3.2. The Programme Management Environment. Adapted from OGC, (2003, p.12).

3.4.1 PROJECT AND PROGRAMME MANAGEMENT METHODOLOGIES

One of the more popular project management methodologies in the UK, particularly in the public sector, is known as PRINCE2 (**PR**ojects **IN** **C**ontrolled **E**nvironments). PRINCE2 is a comprehensive approach originally developed by the Central Computer and Telecommunications Agency (CCTA); now known as the Office of Government Commerce (OGC). A wide range of certifications are available in PRINCE2, with many organisations requiring qualification in the standard for their Project Managers. PRINCE2 adopts a process-based approach to project management. The processes define the management activities to be carried out during the project. In addition, PRINCE2 describes a number of components that are applied within the appropriate activities. Figure 3.3 shows the use of PRINCE2 components and techniques in the processes.

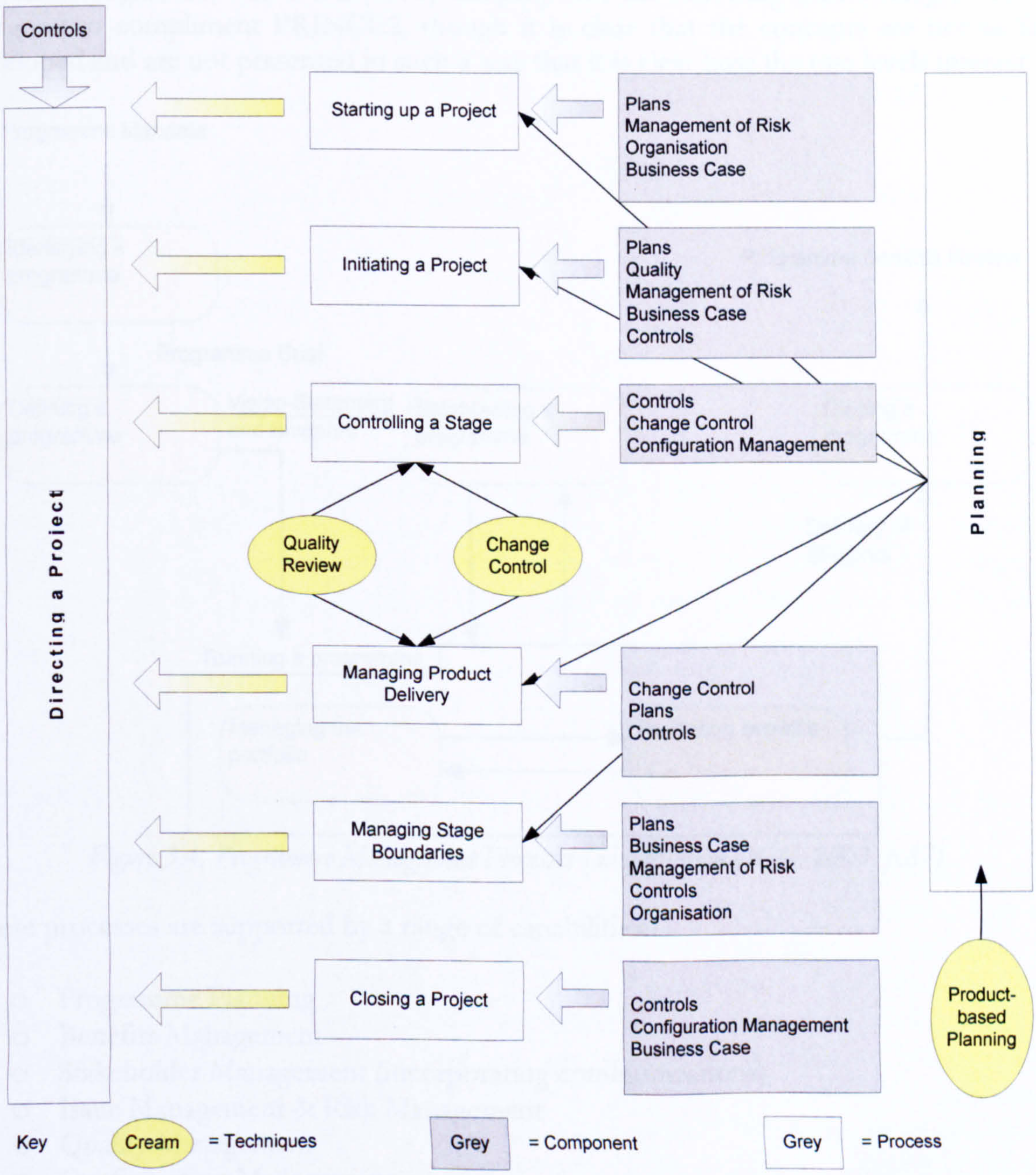


Figure 3.3 PRINCE2 components and techniques (adapted from OGC, 2002, p. 19).

One of the criticisms of PRINCE2 is that change control processes are over bureaucratic, so can be inefficient where large numbers of people are required to authorise changes (e.g. local government) or where a high volume of changes occur (e.g. software development projects). In defence of the methodology, it is heavily emphasised that it should be adapted to the requirements of each organisation. Perhaps what is more true is that a consequence of the highly structured approach may not be consistent with the demands of a dynamic environment. Reimann (1973) found that one of the limitations of a bureaucratic mechanistic structure is that it tends to be slow to change and tends to encourage rigid adherence to policy and rules in the face of new requirements. There also appears to be a lack of integration with other relevant academic disciplines, such as change management and strategic planning / corporate development.

Programme management methodologies are relatively thin on the ground compared to project management. The OGC (1999) has proposed the following methodology, which is designed to compliment PRINCE2, though it is clear that the concepts are not as fully developed and are not presented in such a way that it is clear how the two levels interact.

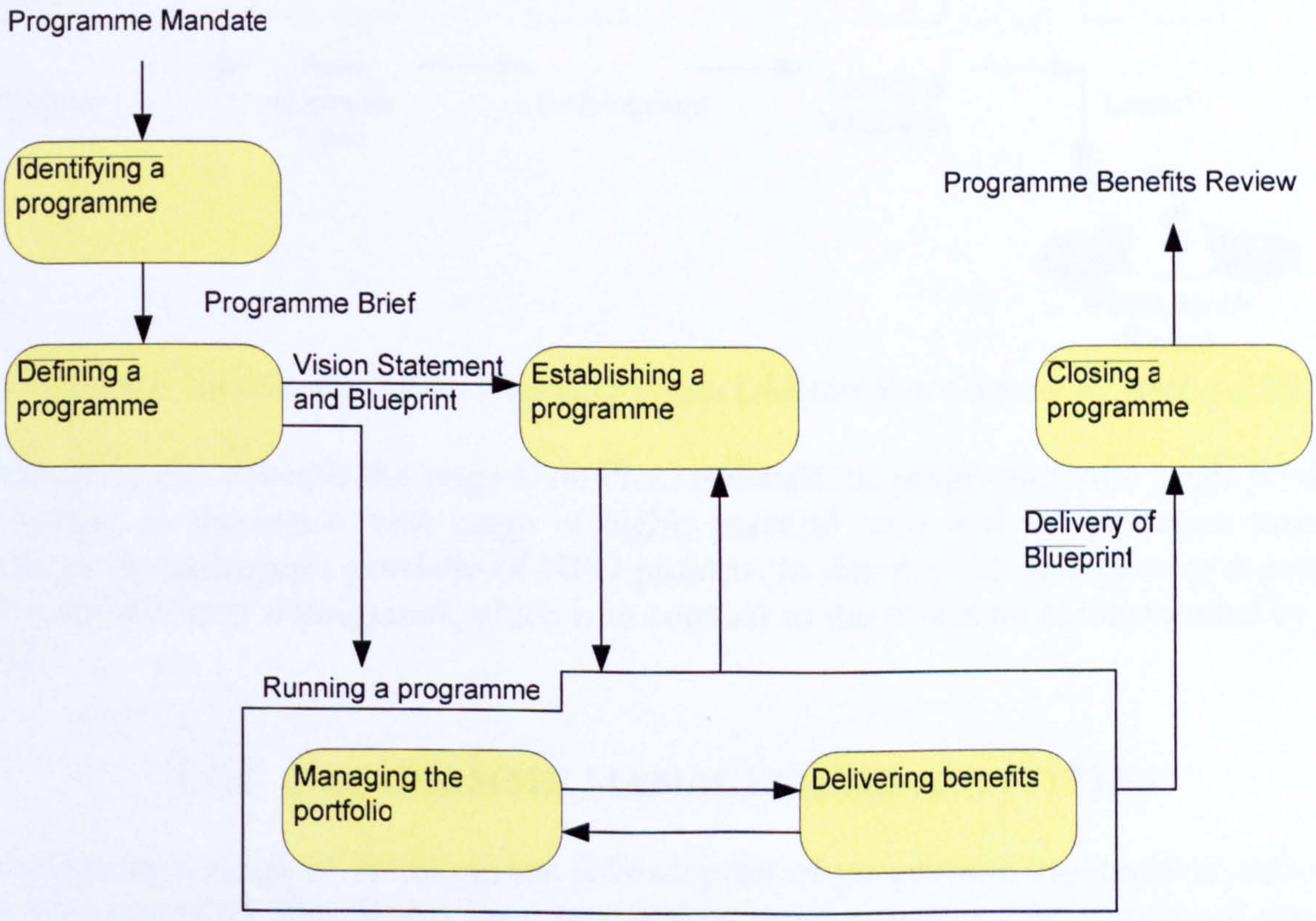


Figure 3.4. Programme Management Processes (adapted from OGC, 2003, p.87).

These processes are supported by a range of capabilities:

- Programme Planning
- Benefits Management
- Stakeholder Management (incorporating communications)
- Issue Management & Risk Management
- Quality Management
- Configuration Management
- Audits

Thiry (2002), has developed a high level programme management methodology which integrates value management into the process and acknowledges the need for programme management to incorporate a learning perspective. In America, there has been little research into programme management, however there have been a significant amount of studies into the New Product Development (NPD) process and into mechanisms for managing multiple NPD projects. One of the most popularised methodologies for managing such projects is called the Stage-Gate Process (Cooper et al, 2001). The process has multiple stages, together with gates or decision points, as per Figure 3.5.

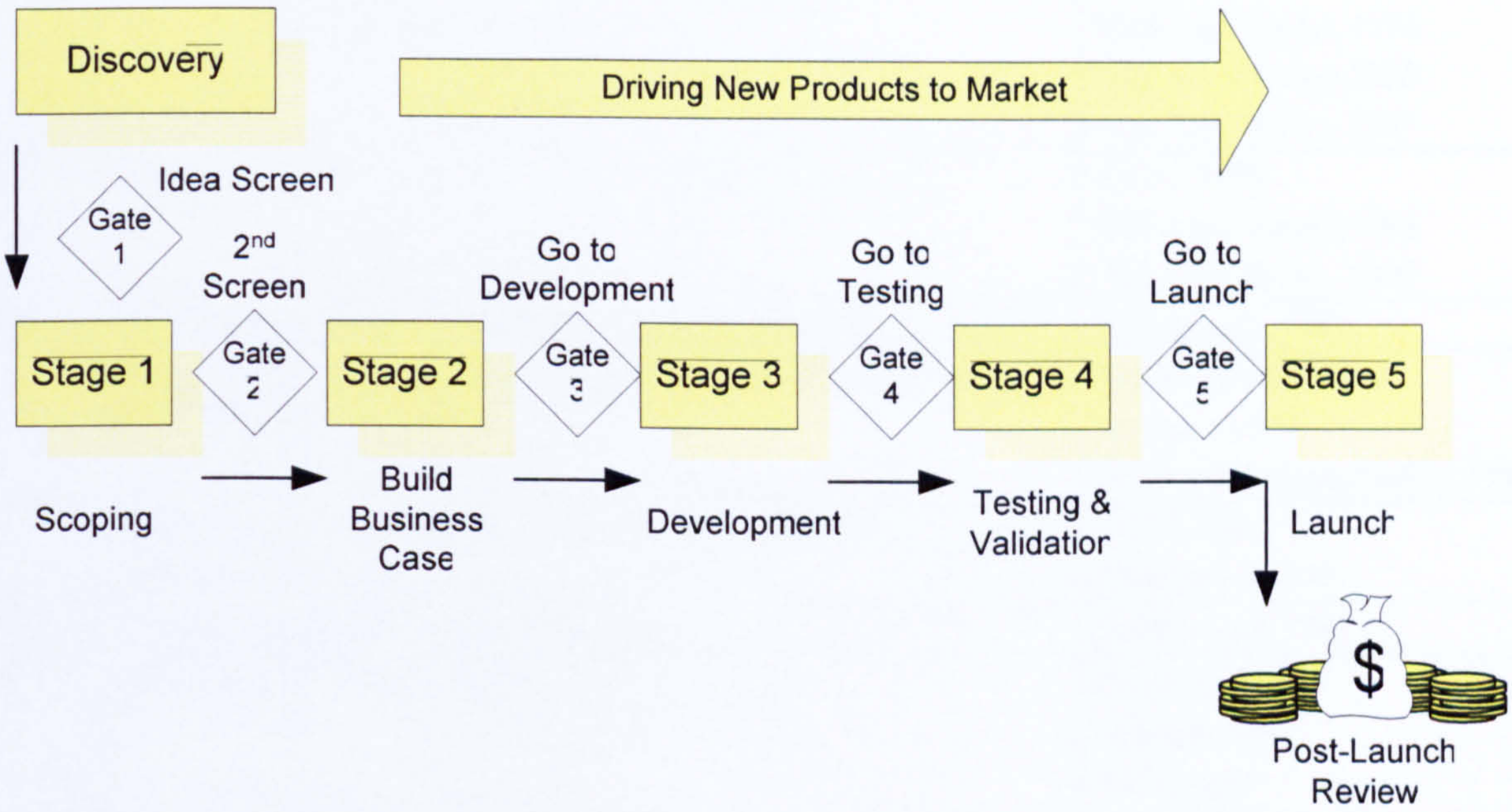


Figure 3.5. Overview of a Typical Stage-Gate Process (Adapted from Cooper et al, 2001, p.272).

Although in this example the Stage-Gate Process details the progression of a single product to market, in the text a wide range of highly practical tools and sub-processes provide guidance on managing a portfolio of NPD projects. In this way the management at project and portfolio-level is integrated, which is in contrast to the processes recommended by the OGC.

3.4.2 PROGRAMME MANAGEMENT ACTIVITIES

By reviewing a range of literature, the following list of programme management activities has been compiled. This list has been rendered by programme management critical success factors and reasons cited for programme failure. The list has been drawn from literature discussing programmes of work, multi-project management or strategic projects. Although differences between these terms were identified earlier in the literature review, references from each sub-domain have been compiled due to the lack of programme-specific literature and in order to create a significant body of evidence. In any case, within the literature the terms are frequently, if erroneously, used interchangeably. This list will, in part, form the academic contribution to the development of a range of information components that can be compiled to generate a programme management reporting tool. The list will be supported by primary data from the field and will be referenced once the tool has been introduced to demonstrate that the key programme management bases are satisfied by the tool.

No.	Activity	Reference
1	Managing resources	Cooke-Davies, 2002 Levene & Braganza, 1996 OGC, 1999 Pellegrinelli, 1997 Platje and Siedel, 1993 Van Der Merwe, 1997
2	Managing throughput times	OGC, 1999 Platje and Siedel, 1993 Van Der Merwe, 2002 Van Der Merwe, 1997
3	Managing costs	OGC, 1999 Platje and Siedel, 1993 Van Der Merwe, 1997
4	Generating projects (Depending on programme type)	Pellegrinelli, 1997
5	Assessing potential projects and selecting the most valuable ones, aligned to strategy	Cooke-Davies, 2002 Grundy, 1997 Archer & Ghasemzadeh, 1999
6	Responding to changes in the internal and external environment[1]	OGC, 1999; Pellegrinelli, 1997
7	Organising projects and their activities	Pellegrinelli, 1997
8	On-going benefits management	Bartlett, 1998 Grundy, 1997 OGC, 1999 Pellegrinelli, 1997 Reiss, 1998
9	Using value management techniques	Pellegrinelli, 1997 Thiry, 2002
10	Addressing strategic performance	OGC, 1999 Pellegrinelli, 1997 Thiry, 2002
11	Ring-fencing resources	Pellegrinelli, 1997
12	Ensuring that projects are driven by business need (strategic imperative)	Cleland, 1994 Cooke-Davies, 2002 Lord, 1993 OGC, 1999 Pellegrinelli, 1997 Turner, 1992
13	Recognising and understanding dependencies	OGC, 1999 Pellegrinelli, 1997 Duck, 1993
14	Identifying, evaluating and appraising risks	OGC, 1999 Pellegrinelli, 1997
15	Aligning and consolidating information for reporting and	Cooke-Davies, 2002

[1] There appears to be some debate regarding the position of scanning and futurizing the internal and external business environment. Scholars in the field of strategic management may argue that it falls under their remit (see for example Wheelen and Hunger, 1998), however the more experienced programme managers interviewed as part of this research felt that is was an area of information they would like a degree of involvement in generating.

	communication purposes	Pellegrinelli, 1997
16	Managing conflicting goals	Pellegrinelli, 1997
17	Prioritising Projects	Pellegrinelli, 1997 Levene & Braganza, 1996
18	Monitoring performance against programme objectives and against the competition to facilitate renewal / dissolution decisions	Pellegrinelli, 1997 Pinto & Kharbanda, 1996
19	Minimising disbenefits through common / conflicting projects or the introduction of standardised processes / technologies	OGC, 1999 Pellegrinelli, 1997
20	Enabling effective delegation (i.e. preventing staff over-load)	OGC, 1999 Kelly & Maynard-Moody, 1993
21	Ensuring all issues are recognised and managed	OGC, 1999
22	Ensuring the smooth delivery and integration of change	OGC, 1999
23	Lobbying	Pellegrinelli, 1997 Grundy, 2000;
24	Ensuring processes are in place to provide accurate estimates	OGC, 1999
25	Communicating with all stakeholders	Grundy, 1997 OGC, 1999 Van Der Merwe, 2002 Duck, 1993
26	Defining PMO structure	OGC, 1999 Van Der Merwe, 1997
27	Liaising with the Programme Board	Duck, 1993 Kelly & Maynard-Moody, 1993 OGC, 1999
28	Conducting programme appraisals / portfolio reviews	Cooke-Davies, 2002 Cooper et al, 2001; Murray-Webster & Thiry, 2000 Partington, 2000
29	Ensuring employee participation at all stages	Kelly & Maynard-Moody, 1993
30	Not breaching the organisation's capacity to change	Duck, 1993
31	Accurately assess and reward project management performance	Pinto & Slevin, 1988

Table 3.4. Programme Management Activities

3.4.3 PROJECT MANAGEMENT CRITICAL SUCCESS FACTORS (CSFS)

A significant body of research has been conducted into project critical success factors. This domain of research is considered pertinent to the research objectives because the areas of project management that are considered to be project critical could be incorporated into the graphical reporting system. Appendix I comprises a combination of theoretical and empirical studies, organised by success / failure factor. In order that the list is of a manageable size, critical factors have been combined where appropriate. To prevent confusion, a distinction should be made between 'success criteria', which are the measures by which success or failure will be judged and 'success factors', the inputs into the management system that lead directly or indirectly to the success of the project (Cooke-Davies, 2002).

There are a wide range of critical success factors and reasons for failure, for example

having clearly defined and communicated project objectives, having inadequate resources and poor planning. Alarmingly, there does not appear to have been progression in the reasons cited for success / failure. For example, one might not be surprised that earlier studies highlight fairly basic practice - the need for clear lines of responsibility to be defined or for executive commitment to be established and maintained. One might also expect that over time these factors would become integrated into project management so that more recent research could focus on the subtler nuances of project management, such as the importance of politicking. This does not seem to be the case. Authors have been pointing out the importance of having executive support since 1969 (Avots) and continue to do so until this day. This would suggest a lack of integration between academia and industry, which is slightly surprising given the practical nature of the topic. Similarly, making the project objectives clear and communicating them to stakeholders, also seems to be as much of a problem now as it was when it was first recognised by Martin in 1976. The ability to monitor and control the project and to communicate effectively with stakeholders is also cited by a wide range of authors yet project managers must be careful not to develop systems that become unnecessarily bureaucratic (Baker, Murphy & Fisher, 1983; Youker, 1999).

To summarise, these wide range of factors, Belassi and Tukel (1996) present a useful framework which organises most factors into one of four categories:

- Factors related to the project
- Factors related to the project manager and the team members
- Factor related to the organisation, and
- Factors related to the external environment

Similarly, Cooke-Davies, (2002) identifies 12 critical factors organised around the responses to three questions: "What factors lead to project management success?", "What factors lead to a successful project?" and "What factors lead to consistently successful projects?". Interestingly, he is the only author to cite benefits management as critical. He also cites the importance of both portfolio and programme management practices and a "suite of project, programme and portfolio metrics that provides direct 'line of sight' feedback... so that portfolio and corporate decisions can be aligned."

Of the more recent studies, Nikander & Eloranta (2001), present an interesting piece of research detailing a typology of early warnings that indicate when a project is likely to deviate from schedule. However, most of the factors are perfectly intangible, such as 'gut feeling', 'the mood of the team', or the 'tone of verbal communication'. As such, their inclusion into formal project management processes is extremely difficult. This problem is accentuated by the diversity of factors recorded. However, the typology should certainly be noted by all Project Managers. If there is a criticism/area for further research, the paper does not present how long these factors lead a deviation from plan. Factors relating to communication and monitoring & control dominate the typology, indeed, 'communication with management' was identified as the one of the critical responses to the identification of an early warning sign.

3.4.4 PROJECT & PROGRAMME MANAGEMENT SOFTWARE

Finally, it is important to consider the availability of existing graphical tools and

their strengths and weaknesses. Due to constraints of time and money, this section will generically review available software.

A range of different software are available to aid managers in the planning and monitoring of projects. The most popular of these is Microsoft Project. Whilst this software is easy to implement (it can be installed on just one machine and requires only minimal training), it is severely restricted in terms of scalability, the delegation models available, reporting and integration of projects across the programme. At the more sophisticated end of the market, a range of programme management software is available, from companies such as The Programme Management Group, Primavera and Artemis. Shomberg (2004, p.8), vice president of Global Marketing at Primavera Systems, Inc, argues that "The real challenge lies in establishing and maintaining the efficient communication and sharing of vital project information with other executives and business units easily and on a timely basis." Such software is implemented at the Programme Department level; if the client organisation operates a matrix structure then implementation of the software will impact at the enterprise level. Software at this level requires significant investment in terms of cost and company time. As the software are developed based on industry recognised best practice, the client organisation will typically have to develop their programme management processes to a level of maturity that is consistent with the software (similar to implementing ERP software). Proponents of this type of software would argue that they are based on industry recognised best practice and that organisational development to this level is positive. Others would argue that the software should be suitably flexible to adapt each organisations unique requirements and that little or no development activity should be required before implementation. Thus, the client organisation may have to undergo significant change, wide spread training and serious financial investment to implement such software. Even though the Programme Management Group argue that payback can be achieved in as little as 25 weeks (Reiss, 2003), some organisations will inevitably look for a solution that can be implemented much more quickly. After all, organisations that find they are in a fire-fighting situation and require quick visibility over the status of their programme will not have time to go through a process of software selection, organisational development, staff training and roll-out before the benefit of such software impact. Further, whilst a scientific review of these software has not been conducted, the author has yet to see a software package that presents a holistic view of key programme management activity in a well designed report.

3.4.5 SECTION CONCLUSIONS

To combat the problems of data oversupply the team must identify areas where focused information can help them to make good decisions. A range of different research areas has been reviewed in order to present different perspectives on the types of factors that could be included in a project reporting system.

To understand about defining measures and processes for data generation, literature in the field of Management Information and Performance Measurement and Management has been reviewed.

3.5 GENERATING INFORMATION IN PROJECT & PROGRAMME MANAGEMENT ENVIRONMENTS

The purpose of this section is to present relevant contextual literatures from the field of performance measurement. To achieve this, two popular Performance Measurement Systems (PMS) are presented, which the reader may have some awareness of already. They are the Balanced Scorecard and the Performance Prism; reasons for their inappropriateness in project environments are briefly discussed. Then, the debate surrounding performance measurement in project management environments is presented, tracking it from its roots in the 1960s to the modern day. The opinions of a wide range of authors regarding which measures should be used to identify project success are then compiled into a table along with the functional requirements of a PMS. Finally, processes for implementing a PMS are considered as these will become salient in the latter stages of the research. The challenge of developing a project PMS is summarised by Thiry, (2002, p.222). "...in the current organisational context and culture, of e-business and accelerated change, managers are required to process a large flow of often-contradictory information in a short time. Programme managers, in particular, are caught between the ambiguous, soft, 'fuzzy' realm of strategic management and the concrete, hard place of implementation. They have to deal with high ambiguity and high uncertainty at the same time."

3.5.1 POPULAR PERFORMANCE MEASUREMENT SYSTEMS

For the purposes of this brief review, The Balanced Scorecard and Performance Prism are presented to provide the reader with an insight into the structure of such PMFs. But first, some definitions:

- Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of an action. (Neely et al, 1995, p80).
- A performance measure can be defined as a metric used to quantify the efficiency and/or effectiveness of an action. (Neely et al, 1995, p.80).
- A performance measurement framework (PMF) can be defined as the grouping of performance measures so as to structure them around various dimensions of performance.
- A performance measurement system (PMS) can be defined as the totality of constructs required to deploy and maintain a PMF, including but not limited to the PMF, operationalisation and implementation of the PMF, tactics with which to manage the PMF, training and development plan for users of the PMF, communication strategies to be used in conjunction with the output of the PMF and measures to assess the value of investing in the PMF.

3.5.1.1 Balanced Scorecard

Developed by Kaplan & Norton (1996, 2001), The Balanced Scorecard is touted as being used in approximately 55% of great U.S. companies and 45% of the major European companies (Rigby, 1999) and is presented for that reason. The measurement system is driven by the organisation's strategy and is organised around four drivers, as depicted in Figure 3.6.

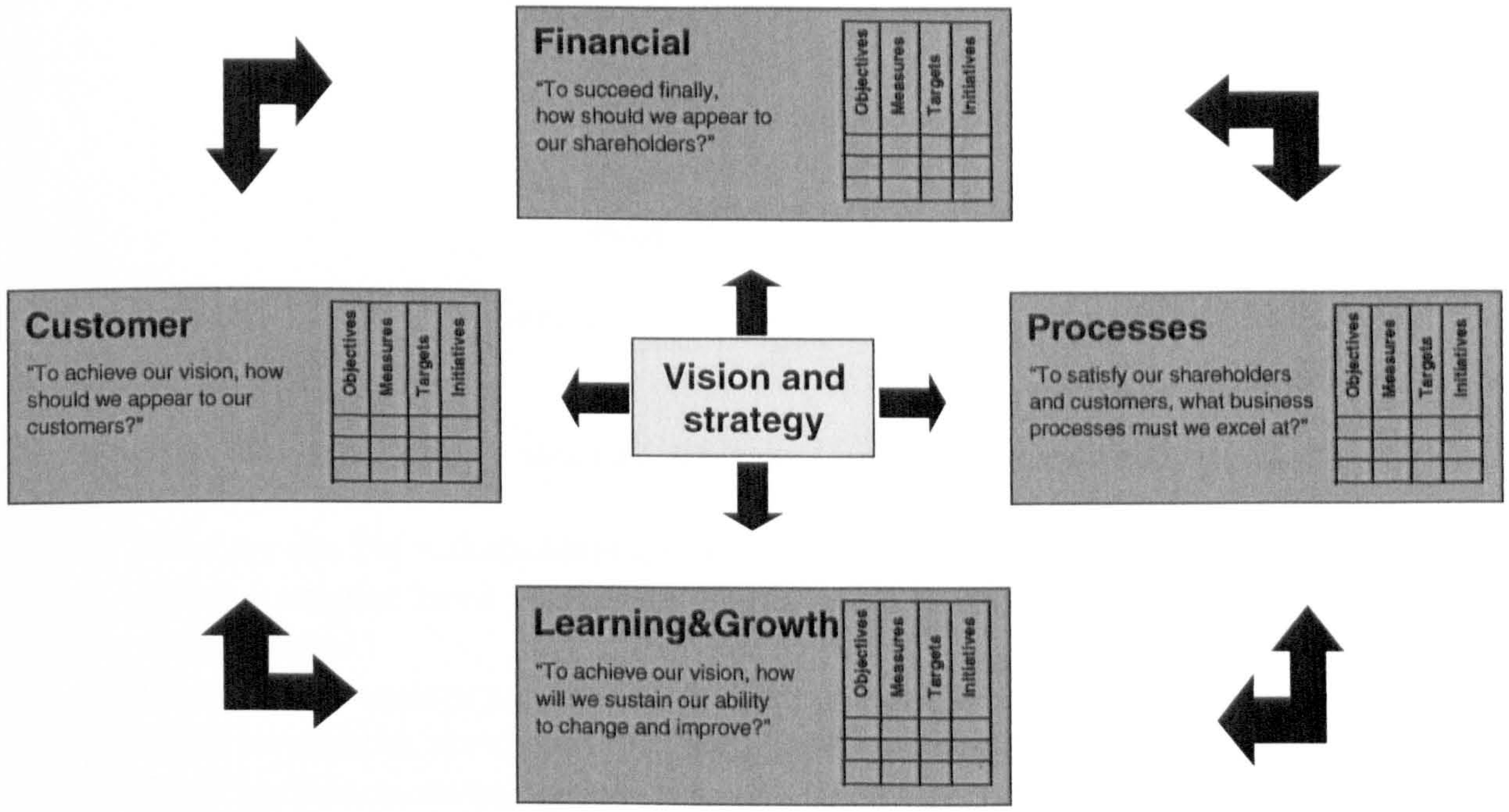


Figure 3.6. The 4 Perspectives of the Balanced Scorecard (Kaplan & Norton, 1996).

Businesses are required to construct a strategy map, cascading financial objectives into customer objectives, then customer objectives into process objectives. Finally, organisations should address how they will develop and improve as a result of this effort.

Stewart (2001) presents an application of the BSC in a project portfolio environment, however, the approach took a narrow view of the term 'customer' and dimensions of success were not awarded a stronger position on the card as the project matured along its lifecycle. Further, Stewart (2001, p.40) argues that "one or more of the BSC perspectives can be the focal point for the project's existence, but should not take precedence over the remaining three perspectives." In order to achieve this grouping of projects the framework must have been implemented at a corporate level, or the system will seem forced; inconsistent with higher-order objectives. Finally, such frameworks are designed for continuous, operational environments and do not account for the differing characteristics and information requirements in projects and programmes (Bryde, et al 2004).

3.5.1.2 Performance Prism

The Performance Prism was developed at Cranfield University by Neely (2000). The system represents state of the art thinking within the discipline and addresses some of the weaknesses of the Balanced Scorecard, such as the limited importance of stakeholders, represented only via the Customer perspective.

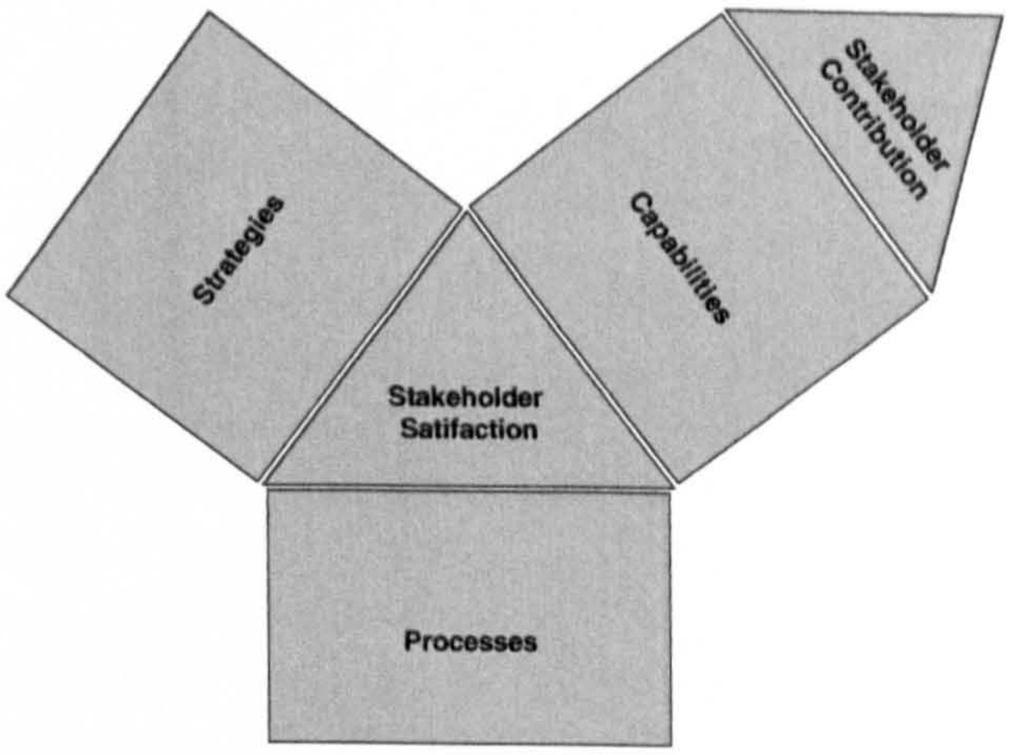


Figure 3.7. The Five Facets of the Performance Prism (Neely and Adams, 2000a).

In designing the organisation's strategy, the following questions should be asked:

- Who are the key stakeholders and what are their wants and needs?
- What strategies have to be put in place to satisfy the wants and needs of key stakeholders?
- What core processes are needed to execute these strategies?
- What capabilities are critical to operate and enhance these processes?
- What contributions are required from stakeholders to maintain and develop those capabilities?

There have not been any documented applications of the Performance Prism in project or programme environments.

3.5.2 MEASURING PROJECT PERFORMANCE

Since project management emerged as a discipline in the 1960s, there has been continued debate regarding the definition of a successful project. The problem is that success means different things to different people (Pinto & Slevin, 1989). An architect may consider success in terms of aesthetic appearance, an engineer in terms of technical competence, an accountant in terms of spend under budge, a human resources manager in terms of employee satisfaction, a chief executive in terms of stock market value. Consequently the debate continues to develop. This section of the literature review documents the development of the debate from its inception to the current day. There are two other reasons for this ambiguity: as discussed by, different project stakeholders will have different perceptions of success. Firstly, many of the lists of success criteria differ - there is no consistency - they are often project specific and/or taken individually they do not impact the project, (Belassi & Tukel, 1996). Secondly, some authors seem to confuse critical success factors and critical success criteria (as discussed earlier).

Attention is now turned to the development of these success criteria. Traditionally, PMS were financially orientated, focusing on profit, Return on Investment (ROI) and other

accounting formulae. More recently, and principally as a result of Kaplan & Norton's (1996) work, which developed The Balanced Scorecard (BSC), organisations have aimed to develop PMS which consider a number of stakeholder perspectives. In the case of the BSC, this meant viewing the performance of the organisation from four perspectives: financial, customer, internal (process) and learning and growth.

A review of the literature reveals a similar evolution of PMS within the field of project management. The debate surrounding the performance of projects informs the debate at a programme level because many of the measures are appropriate for aggregation. In addition, there has been limited research into performance measurement in programme management environments. In the 1960s, project success was measured entirely in technical terms: either the product worked or it did not (Kerzner, 1998). In the 1980s, project success was defined by compliance with the iron triangle (Atkinson, 1999), also known as the 'golden triangle' (Gardiner and Stewart, 2000). That is, whether or not the project had been delivered to cost, time and quality (specification). "These dimensions may be used because they are the easiest to measure and they remain within the realm of the project organization [sic]." (Pinto & Slevin, 1988, p.67). Further, there had previously been an implicit assumption that if the iron triangle was met, then the customer *must* be satisfied. Whilst they resulted in an objective appraisal of the project, such narrowly focused measures were also criticised for being retrospective in nature, (Bryde, 2002).

de Witt's research (1988) has resulted in a recognition in the difference between a successfully delivered project and a well managed one. For example, the Project Manager may have established excellent relations with a client, and sold further contract work, but for internal or external reasons beyond the Project Manager's control (e.g. organisational politics or economic disruption) the project delivered over time and budget. Using the traditional parameters of success, such a project would have been considered a failure even though the costs associated with delivering over budget and time may be outweighed by the profits generated by the subsequent contract. Morris & Hugh (1987) cite the Thames Barrier project, which took twice as long to build and four times the proposed cost but provided a profit for most customers, so was considered a success. Thus there is a distinction between project success (measured against the overall objectives of the project) and project management (measured against the traditional parameters of time, cost and quality). Project success is arguably harder to achieve as it involves 'second order control' (both goals and methods are liable to change) whereas project management success involves only 'first order control' (goals are held constant but practices are likely to change to meet these predetermined goals), (Cooke-Davies, 2002). Pinto & Slevin, (1988), further differentiate between whether the project achieved its purpose and whether it delivered value. Wateridge (1998, p.59/69) provides the example of an electronic stock control system. "A computerised stock control system can be delivered on time, on budget and to user requirements. It can be user friendly and meet all the requirements at the outset of the project (and any changes throughout the project – how ever many there have been!). However, if it does not reduce the amount of stock held in the warehouse, has it achieved its purpose?"

More recently, the number of perspectives of success has been broadened beyond that of the project manager and customer to incorporate members of the project team. This psycho-social orientation was originally proposed by Pinto and Pinto (1991) and whilst paying attention to different facets of performance, has now broadened to potentially

incorporate a wide range of stakeholders, including: sponsors, users, customer, team, suppliers and project organisation (Freeman & Beale, 1992). This is highlighted in the British Standard definition of project management, which states it as the "planning, monitoring and control of all aspects of a project and the *motivation of all those involved* in it...." (BS6079, 1996. Emphasis added).

Finally, the more strategic concerns of a programme manager are yet to be expressly documented in the literature. However, certain measures can be drawn from research that has investigated the management of strategic projects and indeed from the field of strategy deployment. For example, such measures could include:

- Development of the technological base of the firm (Shenhar et al, 1997)
- Creating new marketing opportunities (Shenhar et al, 1997)
- Leveraging existing knowledge base (Roth, 2002)
- Dissemination speed of new practices across project teams (Roth, 2002)
- Attainment of corporate objectives (such as market share, cost base, brand leader, etc) (Johnson & Scholes, 2002)

Pinto & Slevin, (1998) and Morris and Hough (1987) suggest that the relative importance of project success dimensions change with time. The important factors in the early stages of a project are internal – meeting budget, schedule and technical performance. In the latter phases, external factors such as customer needs and satisfaction become increasingly important. Similarly, Baker, et al (1988) advise that the iron triangle ceases to be important after the project is completed but that customer satisfaction and the impact of the project on the project organisation continue to be important after the conclusion of the project. Pinto & Covin (1989) propose both a morphing of the CSFs and PMS in line with project progress. Tukel & Rom (2001), found that project managers' primary success measure was quality and their most important objective was to satisfy customer requirements. The priority given to that objective did not change during the various stages of the project regardless of project type or industry classification. The choice of performance measures, however, was influenced by these factors. They go on to point out (by citing a range of authors) that only around 1 in 6 measures is typically achieved and that the objective the project manager focuses on is the one that he/she usually meets.

Thus project PMSs have developed to become multi-dimensional (a range of different measures are used), multi-observational (performance is assessed from the perspective of a number of different stakeholders) and multi-temporal (characteristics of the system vary according to the point in the project life cycle). State of the Art Project PMS can now be summarised by considering the performance of a project from three key perspectives: project (task oriented perspective), project management (internal and external perspectives) and project team (psycho-social perspective) (Bryde, 2002). Organisations that employ programme management techniques should also develop a more strategic perspective (Bryde et al 2004). Yet there is still no real consensus on how to measure project success, which is alarming given Pinto & Slevin's call some 16 years ago that, "An important point concerning the ambiguity of project success is that 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." (Pinto & Slevin, 1988, p.67). As with the project management CSFs, it should be clear that there is a genuine issue with knowledge transfer from academia to industry in terms of which project success measures

should be used and which measures *are* actually used.

Finally, there is some debate as to whether project PMS should be used at all. Cooke-Davies, (2002, p.188) implies that there is not necessarily a positive correlation between project performance and attainment of corporate goals. "Since corporations are increasingly recognizing the need for 'upstream' measures of 'downstream' financial success through the adoption of reporting against such devices as the balanced scorecard, (Kaplan & Norton, 1996), it is essential for a similar set of metrics to be developed for project performance in those areas where a proven link exists between project success and corporate success." Whilst Cleland (1988) argues that performance related individual and team rewards create competition and reduce mediocrity, in a long term study of 20 project management organisations, Lord (1993) found that many of the interviewees argued that such schemes were not in the best interests of the whole organisation, stating that 'rivalry' and 'conflict' had become endemic in the system. Moss Kanter (1989) goes further to argue that internal competition is a "value subtractor... a rationale embedded in American mythology as well as in management philosophies". "Considerable attention needs to be given to processes and metrics for tracking value added by the programme infrastructure, which consumes resources itself and through the imposition of some additional bureaucracy on the projects. If a project within a programme delivers according to its plan, it does not mean that necessarily that the programme has added value. Comparative techniques are needed whereby a 'without programme' scenario is created as a benchmark for evaluating programme performance and value added" (Pellegrinelli, 1997, p.148).

The opinions of the above authors and others, have been compiled into Table 3.5 to demonstrate the diversity of proposed performance measures on projects.

No.		Measure	Reference
1	Project Management Success	The project is delivered to time	Atkinson, 1999 Cleland, 1986 Freeman & Beale, 1992 Gardiner and Stewart, 2000 Kerzner, 1989 Larson & Gobeli, 1989 Might & Fischer, 1985 Powers and Dickson, 1973 Turner, 1993 Watetridge, 1998
2		The project is delivered to cost	Atkinson, 1999 Cleland, 1986 Freeman & Beale, 1992 Gardiner and Stewart, 2000 Kerzner, 1989 Larson & Gobeli, 1989 Might & Fischer, 1985 Powers and Dickson, 1973 Turner, 1993 Watetridge, 1998

3		The project is delivered to quality / specifications	Atkinson, 1999 Cleland, 1986 Freeman & Beale, 1992 Gardiner and Stewart, 2000 Kerzner, 1989, 1998 Larson & Gobeli, 1989 Might & Fischer, 1985 Turner, 1993 Watetridge, 1998
4		Speed of project termination (if necessary)	Morris & Hough, 1987
5		The project is delivered with minimum or mutually agreed upon scope change	Kerzner, 1989
6		The project is delivered without disturbing the main flow of work of the organisation	Kerzner, 1989
7		The project is delivered without changing the corporate culture	Kerzner, 1989
8		The system measures both project success and project management success and has a way of linking them to assess the accuracy with which performance predicts success.	Cooke-Davies, 2002
9		Smoothness of handover	Freeman & Beale, 1992
10		Technical innovativeness	Freeman & Beale, 1992
11		The implementation process is efficient and effective	Pinto & Mantel, 1990
12		Anticipating all project requirements, having sufficient resources to meet project needs in a timely manner, and using these resources efficiently to accomplish the right task at the right time and in the right manner	Tuman, 1986
13		Dealing with issues early or as soon as they surface and keeping management informed	Lientz & Rea, 1995
14		Minimum scope changes, no disturbance to the organisation's main flow of work and no disturbance to corporate culture	Kerzner, 1992
15	Project Success	The project achieves its purpose	de Witt, 1988 Morris & Hough, 1987 Powers and Dickson, 1973 Turner, 1993 Watetridge, 1998
16		The project realises its benefit	Cleland, 1986 Turner, 1993 Freeman & Beale, 1992 Pinto & Mantel, 1990 Watetridge, 1998

17		The project satisfies the customer (internal or external)	Bedell, 1983 Baker, Murphy & Fisher, 1983 DeCotiis & Dyer, 1979 Paolini & Glaser, 1977 Pinto & Mantel, 1990 Pinto & Slevin, 1988 Powers and Dickson, 1973
18	Psycho-social	The project satisfies the requirements of all stakeholders (project team, project manager, customer, end user, shareholders)	Turner, 1993 Baker, Murphy & Fisher, 1983 Freeman & Beale, 1992 PMI, 1996 Stuckenbruck, 1986 Tuman, 1986 Watetridge, 1998
19		The project satisfies the needs of the project team	Turner, 1993
20		The project satisfies team member growth aspirations	Freeman & Beale, 1992
21		The project has effective coordination and relation patterns between project stakeholders	Baker et al, 1983

Table 3.5. Project performance measures proposed in the literature

Note that some of the factors grouped under the heading of project management success tend to be akin to project CSFs (Baccarini, 1999), once again highlighting the confusion between drivers of project success and the measures by which success or failure will be judged. Also note that some factors could belong to more than one group.

3.5.3 FUNCTIONAL REQUIREMENTS OF A PMS

In a piece of EU funded research conducted at Cranfield University, in to the re-use of knowledge in the innovation process, Roth (2002) investigated the functional requirements of performance measurement systems. These requirements are presented in Appendix II. The types of listed requirements include:

- The system and measures are aligned with the organisation's mission, vision, goals and strategy
- The system provides a balanced, well selected set of measures
- The measures are effective and actionable
- The system is simple, comprehensible and transparent for all users
- The system is reliable, stable and valid over time and locations

Whilst references to authors such as Hauser and Zettelmeyer (1997), Griffin and Page (1993), Packer (1983), Lim (1998), Beamont (1996), Hultnik and Robben (1996) represent the NPD and Knowledge Management community, the majority of the references relate to general performance measurement requirements. The requirements are considered pertinent as they may provide guidance in the development of a project / programme

performance monitoring tool.

3.5.4 IMPLEMENTING A PMS

Implementing PMSs is a much discussed topic, with approaches being offered by a wide range of authors (for example, see Bourne, 2004; Kaydos, 1998; Neely et al., 2002). One representative approach to implementing PMSs is to focus effort onto three stages (Clark and Zirner, 1993, quoted in Johnson, 2000):

1. Prepare for implementation
   - Enhance awareness of the need to measure throughout the organisation subsystem
   - Train and educate the people who will use the information
   - Train and educate the people who will convert data to information
   - Identify and eliminate roadblocks
   - Develop upper management support

2. Implementation at the organisational target subsystem
   - Decide where the information will go
   - Develop a schedule for when to implement given portions of the measurement system
   - Measure and present information
   - Validate the system
   - Monitor correct usage of tools and measures
   - Publicise success

3. Implementation throughout the organisation
   - After implementation the measurement system in the target system, it can be expanded to other organisational subsystems.

3.5.5 SECTION CONCLUSIONS

Project PMSs have developed since the 1960s to become balanced systems adopting the perspective of different stakeholders using a range of measures and fluctuating the emphasis of these measures at different points in the project life cycle. Despite this development, there appears to be no overriding framework compared with the world of continuous business operations where the use of the BSC is rife. Further, there appear to be significant issues with the transfer of academic research into industry as many authors continue to propose solutions that originated many decades ago. Perhaps this relates to researchers not fully appreciating the challenge of implementing such complex PMSs in increasingly dynamic environments. This seems likely given that the majority of studies adopt low-interaction, questionnaire-based methodological approaches.

Two key PMSs have been introduced and their inapplicability to programme and project management environments has been discussed. The development of the performance measurement field within the project management domain has been presented with a table of potential project management measures. Finally the functional requirements of a PMS and an approach for implementing PMSs have been reviewed.

3.6 COMMUNICATING IN PROJECT & PROGRAMME ENVIRONMENTS

This section will review extant literature on communication in project and programme environments. Firstly, a brief review of research from the field of project management is presented. Then, the limited amount of research on communication from performance measurement is offered. The section then progresses to consider the role of information design, and more specifically the role that visual language can play in communicating project performance information.

3.6.1 PROJECT & PROGRAMME COMMUNICATION

A Guide to the Project Management Body of Knowledge (PMBOK Guide) (PMI, 1996, p.103), defines project communication management as "the processes required to ensure timely and appropriate generation, collection, dissemination, storage and ultimate disposition of project information." Thomas et al, (1999) reaffirm the importance of communication to project success. They cite 129 out of 173 Construction Industry Institute publications addressing the communications issue as evidence. Cook (1999, p.52) states that communications management "is one of the major challenges faced by project teams." Maltz (2000, p.110) also argues that "Enhancing communication between functions is crucial to successful product development and management." Similarly the OGC (1999) place a strong emphasis on the role of communication throughout its guide. In a 1999 study of internal communication activity, Stewart (1999) reports that more than half of 'well-performing organisations' have effective formal communications programmes compared to 25 per cent of their 'poorly performing' counterparts. "Empirical research shows that organisations also use programmes... as the primary means of exercising direction and control, in some cases replacing the traditional reporting hierarchy." (Pellegrinelli, 1997, p.141).

With regard to product development, Kivimäki, et al (2000) found that intra-organisational aspects of communication, such as encouragement of initiatives and critical evaluation of performance, were positively correlated with innovative performance. Shiffler (1998) refers to recent polls of corporate human resources professionals, which have found that the most important skill that companies look for in potential staff is to be an effective communicator. That is, people who can write, speak, question and listen. Regarding to strategic internal communication, Lee (2001, p.1) writes an extremely insightful article. He argues that "The fundamental purpose of communication in an organization [sic] is to enable and energize [sic] employees to carry out its strategic intent. Organizations [sic] need the capability to rapidly identify, send, receive, and understand strategic information that is credible, sensible and relevant."

The lack of progress in the field of project communication is due to the difficulty in measuring communication effectiveness (Tucker et al, 1996). This is consistent with the common headline in performance management, 'You get what you measure'. Michalski (2000, p.84) cites two causes of poor communication: unclear expectations and confusion about who to contact for information. This can be rectified by developing a communications plan to ensure that "communications remain open and timely and neither

group is hit with surprising news." Based on data gathered from more than 150 engineering supervisors, Sims (1993) found that every one of them admitted to misinforming other people. The following reasons were the most common, cited by at least 25% of the sample: lack of effort, timing factors, social niceties, self-defence, incompetence and politicking. "When task-force members put off communicating with the rest of the organization [sic], they prevent people from understanding the design principles that guided them, the lessons they learned from previous experience, the trade-offs they had to make. They unwittingly prevent the people who are expected to implement the change from participating or buying in. As a consequence, no matter how good the new design turns out to be, it doesn't produce the expected results." (Duck, 1993, p.110).

Hollingsworth (1986) identifies four major parts to the communications process: the communicator, the message, the medium and the recipient. She found that project managers' success is dependent on their ability to communicate at three levels: the project team, support and competing project teams, and corporate managers and clients. With regard to the skill set required to achieve this, Terrell (1999) suggests 5 steps: Listen intently, think clearly, discuss openly, develop sensitivity and respond quickly to needs. Perry (1996) suggests that effective communication is central in the development of trust and credibility in projects. He cites some practical 'pros' and 'cons' to achieve this. Project managers should be proactive, proficient and pro-people while avoiding confrontation, conflict and contrived approaches.

3.6.1.1 Communication Mode & PIQ

Moenaart and Souder (1996), found that information transmitted across functions through oral, as opposed to written channels is less comprehensible. Whilst the majority of users of the tool will belong to the programme management department, the tool will also be distributed to the customer and sponsor of each project. So using a 'written' channel of communication seems appropriate.

Maltz (2000) has conducted an interesting and highly relevant piece of research in which the effects of communication mode on Perceived Information Quality (PIQ) between marketing and non-marketing managers were assessed. PIQ is based on credibility, comprehensibility, relevance and timeliness and was assessed across a number of communication modes:

- written communications, which is broken down into formal written communications (such as reports) and ad hoc written communications (such as memos),
- electronic (comprising e-mail and transfer of electronic documents).
- Telephone, categorised into scheduled phone calls and impromptu phone calls
- Face to Face communications, which consists of scheduled meetings and 'hall talk'.

Selected findings include:

- E-mail transmitted with supporting documentation, such as tables and graphs, improves PIQ because it signals to the receiver that the sender has taken care in formatting the information prior to transmission. Thus, the receiver is more likely to focus his/her attention on the subject and more fully process the information.

- However, written reports seem to reduce PIQ with information overload playing an underlying role. "Managers spoke of, and provided examples of, reports they received that either were totally irrelevant for their job or had lots of irrelevant information".
- Formal meetings can improve PIQ due to the richness of information exchange. However too many meetings will reduce PIQ as managers will not have time to prepare for them and therefore will not be in a position to exploit their potential.
- E-mail has become a prime contributor to information overload.

The implications of Maltz's findings for this research are that relevant information should be presented graphically and should be supported by a meeting, if appropriate to facilitate the interchange of ideas.

A number of scholars have empirically validated a strong link between the perceived quality of information and degree to which it is actually used to make decisions (see for example Deshpande & Zaltman, 1982; Maltz & Kohli, 1996 and Moenaart & Sounder, 1994). The implication of such research is that the data that is being transmitted may be accurate and useful but if the receiver's PIQ is low then it will not be used. It could therefore be argued that there is little point in implementing a PMS if the mode of communication is not considered as the data may not be incorporated into the decision-making process.

Robertson (2001) highlights the difference between developing information and communicating it. "Information is the raw product that is used in the communication process to create an output or result which is shared understanding and meaning... Communication is a much more sophisticated process than transmitting or disseminating information because it seeks to produce a cognitive, and/or emotional, result and then determine how well it was achieved by acquiring feedback from the listener/receiver... In other words, 'if it hasn't got feedback, it isn't communication'". The impact of this distinction is that merely producing reports is inadequate; they must be supported by other modes of communication, such as one-to-one discussions and team meetings. However formal meetings can improve PIQ due to the richness of information exchange but too many meetings will reduce PIQ as managers will not have time to prepare for them and therefore will not be in a position to exploit their potential, (Maltz, 2000).

Elting et al (1999) investigated the effect of the method of data display on physician investigators' decision to stop hypothetical clinical trials for an unplanned statistical analysis. It was found that the accuracy of decision was affected by the type of data display and the positive or negative framing of the data.

3.6.2 COMMUNICATING THE OUTPUT OF PMS

While there is an abundance of literature in the performance measurement and management field detailing how to develop, implement and maintain PMSs, there is a distinct lack of literature which assess the most effective way of communicating the output of the system.

There seems to be a definite drive to use performance measurement as the core structure in programme management communication and control systems. Organisations that use programmes believe that they benefit from "greater visibility of projects to senior

management and through more comprehensive reporting of progress. Whilst project reporting systems tend to focus on performance against plan or specific objectives, programme reporting can better address strategic performance by tracking progress relative to competitors", (Pellegrinelli, 1997, p.142). Levene & Braganza (1996, p.337) identify the importance of holistic reporting systems: "Control of initiatives of this type [multiple BPR projects] require not complex scheduling and monitoring of individual projects but an overview of the programme as a whole."

There is an increasing reference to the need for measures to be clearly displayed (Bourne and Neely, 1998) and not just on the shop floor but also in product development and design engineering project environments (Johnson, 2000; Buchheim, 2000). The term transparency, used as a core principle of visual control within Lean Thinking (Womack and Jones, 1996), is developed by Johnson (2000) to describe performance measures that are both easy to understand and easy to see through and these dimensions critically affect performance system usability. Stewart (2001) reports the use of a traffic light (red, amber, green) reporting system to track and communicate project success. In support of this Buchheim (2000) recommends, where possible, the use of data and measurement systems which already exist, as the data will already have been accepted as important and then it is a case of reformatting it to meet new communication and decision making needs. Crawford and Cox (1990) also believe that graphs should be the primary method of reporting performance data. Kennerly & Neely (2003) argue that each measure must have a 'visual impact'.

3.6.3 INFORMATION DESIGN / VISUAL LANGUAGE

Information design is an emerging academic discipline, in response to the modern challenges of information overload. Though fast-breaking, information design has been gathering pace for over half a century and is robust in nature (Tufte, 1983). Visual language is at the forefront of information design (Horn, 1999).[2]

Information about the use of visual language comes from a wide range of disciplines, including:

- Artificial intelligence
- Graphic Design
- GUI Design
- Marketing
- Performance measurement
- Cognitive ergonomics
- Cognitive psychology
- Neuropsychology
- Communication
- Education
- Documentation design
- Structured writing
- Process mapping

[2] A summary of design principles used throughout this research is included in Appendix I.

3.6.3.1 Definitions of ID/VL

As one would expect from a highly fragmented discipline, definitions vary. For example:

"Information design is concerned with making information accessible and usable to people." (Sless, 1990).

"Information design can be hard to define, because it is an interdisciplinary approach which combines skills in graphic design, writing and editing, illustration and human factors. Information designers seek to combine in these fields to make complex information easier to understand." (Information Design Association, 1990).

"Information design is the art and the science of presenting information so that it is understandable and easy to use: effective, efficient, attractive." (Information Design Journal, 2000).

"Information Design is the art and science of preparing information so that it can be used by human beings with efficiency and effectiveness." (Horn, 1999, p.1)

"Graphical excellence is well designed presentation of interpreting data – a matter of substance, of statistics and of design.

Graphical excellence consists of complex ideas, communicated with clarity precision and efficiency.

Graphical excellence is that which gives to the viewer greatest number of ideas in the shortest time with the least ink in the smallest space.

Graphical excellence is nearly always multi-variate. And graphical excellence requires telling the truth about data." (Tufte, 1983, p.51).

"Visual Language is defined as the "tight coupling of words, images and shapes into a unified communication unit" (Horn, 1998). "Tight coupling means that you cannot remove the words or the images or the shapes from a piece of visual language without destroying or radically diminishing the meaning the reader can obtain from it." (Horn, 1999).

"The effectiveness of a display can be expressed as the completeness and accuracy with which the viewer can perceive the displayed information in a given time. (MoD, 1996).

3.6.3.2 Why Should VL be Considered as a Communications Format?

Research by Mayer (2001) found that by adding visuals to words, learning improved by 23%. In another group of studies, adding visuals to words improved transfer of learning by 89%. Maltz's (2000) study of Perceived Information Quality (PIQ), based on measures of information credibility, comprehensibility, relevance and timeliness, found that communication supported with tables and graphs improves PIQ. With support from developments in information technology to develop such graphic displays, visual language has the potential for increasing human 'bandwidth', the capacity to take in, comprehend,

and more efficiently synthesize large amounts of new information. (Horn, 2001; Paivio, 1968). The number of applications are virtually unlimited but are likely to be most beneficial in environments where large amounts of information must be processed quickly, such as in interdisciplinary work (which is becoming increasingly common), or in day-to-day single discipline operations where large volumes of data must be processed in order to do the job. Project and programme environments fit both these criteria. In addition, information design and the process of designing can play an important role in developing ideas and theories, "Diagrammatic displays are not just a way of decorating our conclusions, they also provide a way of reaching them." (Dey, 1993). Diagramming "also demands that the analyst think very carefully about the logic of relationships because if the relationships are not clear, then the diagrams come across as muddled and confused." (Strauss and Corbin, 1993). In contrast, textual descriptions or presentation of concepts are often 'muddled', but it can be much less clear to the analyst and reader why this is so.

3.6.3.3 Establishing a Theoretical Basis for the use of Visual Language

Humans have highly limited cognitive capabilities. Consider some of the factors that might affect the reading of a 50 page text document, including (adapted from Horn, 2002):

- Humans have between a 14 and 25 minute attention span. 20 minutes is about average. We are prone to daydreaming, or to letting our minds wander.
- The cognitive process is easily distracted by background noise, music or colleagues popping in for a chat, disrupting our chain of thought.
- Our memories are notoriously selective and defective.
- Social influences produce groupthink.
- We have a limited rate of comprehension.
- We make decisions based on emotions, regardless of how objective we think we might be.
- We often let short-term benefits win the battle over long-term gains.
- We reduce complex problems to simple models in order to 'understand' the issues.

One of the premises of visual language is that if we present information graphically it is a more efficient way to process information (i.e. it can be understood more quickly compared with text based documents) and it is more effective (i.e. it is easier to remember the information).

3.6.3.3.1 The Learning Process

This section of the review adopts a cognitive psychology view of learning, which is thought of as "the development and linking of a network of cognitive structures" (Najjar, 1995, p.6). Before continuing reading this section, it should be carefully acknowledged that a key drawback of many of the psychological tests is whether their findings are generalisable to organisational settings.

There is a wide range of literature, focused on the way that people sense, store and retrieve information. This section focuses on four learning theories, pertinent to this research, as they advocate the use of pictorial representations as an effective learning method. They are:

- Mayer's theory of explanative illustrations
- Paivio's dual coding theory
- Kozma's theory of learning with media, and
- Baggett's bushiness hypothesis

Mayer's theory of explanative illustrations

Previous research (Atkinson, 1975; Bower, 1972; Paivio, 1971, 1986) found that pictures or images improved memory for arbirtrary lists and paired-associates. Mayer (1993) however, chose to look at more meaningful learning. The output of his research, salient to this research, was a model of the cognitive system for learning from text and illustrations (Figure 3.8), and a set of hypotheses of how different types of diagrams affect learning.

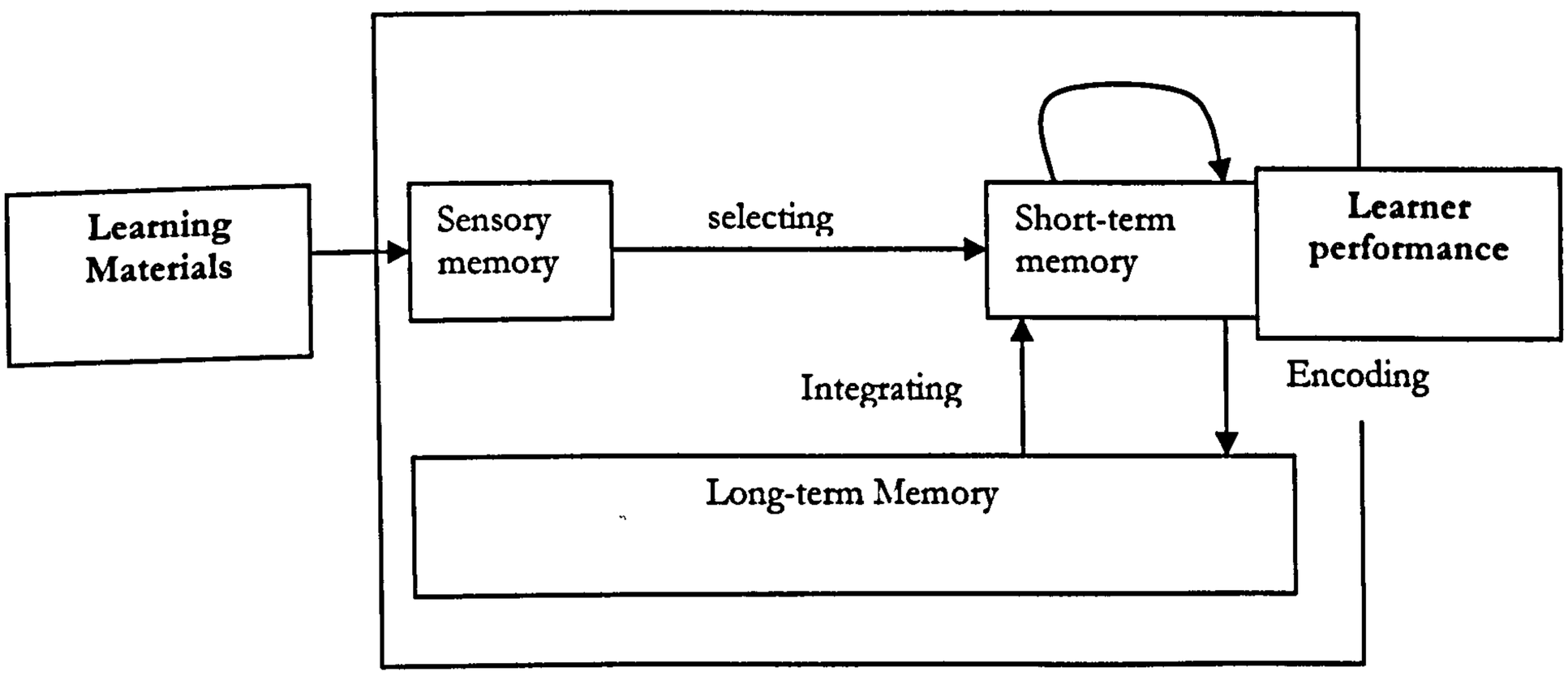


Figure 3.8. A model of the cognitive system for learning from text and illustrations (Mayer, 1993)

Classification of Illustrations

The following schema, defined by Mayer, is exemplified through a bicycle pump instruction booklet.

Decorative: e.g. a picture of a boy riding a bike. Decorative illustrations do not affect learning.

Representational: e.g. a simple drawing of a bicycle pump. Representational illustrations affect the selecting process because they direct the learner's attention.

Organizational: e.g. a drawing of a bicycle pump with labels for each of the major parts. Organizational illustrations affect the selecting and organizing process by focusing the learners attention and helping the learner to build connections between illustrated components.

Explanative: e.g. a drawing of a bicycle pump with labels for the major parts plus arrows and text describing how the parts work together in sequence. Such cause and effect

representations affect the selecting, organizing and integrating processes and very effectively improve learning.

Later research by Mayer (2001) found that by adding visuals to words, learning improved by 23%. In another group of studies, adding visuals to words improved transfer of learning by 89%.

Paivio's dual coding theory

Paivio's theory (1971, 1991; Clark and Paivio, 1991) proposes that one channel of the brain process verbal information, such as text or audio (locogens) ,while the other processes non-verbal images such as illustrations and sounds in the environment (imagens).

Information can be processed through both channels. This occurs for example, when a person sees a picture of a dog and processes the word 'dog'. Information processed through both channels has an additive effect on recall (Mayer and Anderson, 1991; Paivio and Csapo, 1973) because the learner has more cognitive paths from which to retrieve the information. This additivity hypothesis (Paivio, 1967, 1991) suggests that information that uses text and relevant illustrations will be learned better than information that uses text alone, audio alone, text and audio or illustrations alone.

Paivio's research also supports the picture superiority effect (Nelson et al, 1976; Paivio et al, 1968) which proposes that pictures can be recalled more easily than words because pictures access semantic meaning more quickly and completely than words.

Kozma's theory of learning with media

Kozma (1991) argues that many factors affect the ability to learn from media, including:

- The construction of representations
- The operations performed on these representations
- The characteristics of the medium
- Instructional designs
- Characteristics of learners
- Characteristics of the learner's tasks

One key premise of the design process should be to match the symbol system (type of media) to the required task. For example, the phrase that a picture paints a thousand words is true when it comes to constructing a mental model of how a machine operates.

Baggett's bushiness hypothesis

Baggett's (Baggett, 1984, 1989; Baggett and Ehrenfeucht 1982, 1983) hypothesis proposes that conceptual memory is a semantic network in which the nodes are concepts. The hypothesis asserts that people can form more connections with visual concepts than with their verbal counterparts. Visual concepts are 'bushier' than verbal concepts and as such are

a more effective method of learning.

In summary there appears to be consensus that pictures and other forms of media are an effective method of representing information, even if the explanations of why it is effective differ.

3.6.3.4 Other ID/VL Literatures

Other research into presentation graphics has been conducted by a range of academics. Kosslyn (1994), provides an excellent account of chart design from a psychology perspective. Zelazny (1991) offers a similar, if less scientific perspective. Cleveland (1985) and Everitt (1978) focus on graphing data and Bertin (1981) on a process for extracting maximum value from data sets and the presentation thereof. Sibbett (1980) has devised a set of techniques for graphically recording the process of group dynamics as they develop during a meeting. Tyman (1979) provides an analysis of how many types of static information design direct eye movement. Otto Neurath (1973), popularised the use of pictorial statistics, while Horton (1994) focuses on icon design. Tufte remains a key player in the field having published three important books: The Visual Display of Quantitative Information (1983), Envisioning Information (1990) and Visual Explanations (1997). Finally, Horn (for examples see 1998, 1999, 2001, 2002) has published extensively and is the main proponent of visual language though has been active in the field for some time having also been at the fore of information mapping.

One of the problems for those authors providing guidance of the use of computer-related technologies will always fall fowl of advancements in IT and their advice will quickly seem outdated. Those authors providing guidance on design principles fall into two camps: those based on psychology principles and those based on practitioner experience. Authors who propose psychology could be criticised for a adopting a laboratory-based approach to their investigations whilst practitioners' advice could be criticised for being based on individual taste and not on scientific evidence – for example it could be biased by fashion and design constraints such as corporate branding issues, budgetary concerns, and so on.

3.6.3.5 Applications of ID/VL in Industrial Contexts

Treasury Board of Canada Secretariat (2002) provide guidance on developing 'Executive Dashboards' to track the health of IT investment portfolio. Goodson (2002) presents a basic structure to a typical project performance report, presented as a dashboard and used at programme management consultancy Mantix. Other organisations have set up with their sole purpose being to develop and implement Executive Dashboards, (see http://www.sulis-it.com/index.htm). As part of this research, the use of Dashboards have been identified in a range of large organisations to control strategic change, for example, AA, British Gas, Abbey National, Nissan Technology Centre – Europe and Enterprise Plc. A simple on-line search using Google and the phrase 'Executive Dashboard' returns 301,000 citations world wide and 6,090 in the UK alone (Date searched 16/07/2004). So industry appears to regard the Executive Dashboard as a useful tool. Another simple search using all the available databases on ABI Proquest returns only 13 articles (Date searched 16/07/2004), of which 2 can be discounted as repetitions and only one of which was published in a recognised academic journals (the rest were typically one or two page articles in trade magazines). The one academic paper by Rosow et al (2003), provides

insight into the introduction of a real-time Executive Dashboard in a healthcare organisation. However, the benefits cited relate to the transfer from a paper-based communication and control system to enterprise-wide software and not to the mining and analysis of salient data to provide actionable information, as in this research.

However, with such a groundswell of use in the private and to some extent the public sector, further academic investigation into the use and utility of Executive Dashboards seems worthy.

3.6.4 SECTION CONCLUSIONS

This section of the review has demonstrated the importance of having an effective communications strategy in project management environments. The effect on presentation mode and PIQ suggests that project and programme reports would benefit from being presented graphically and on one page, and supported by meetings and one to one consultations. An academic grounding in VL validates the decision to use it as a communication mode. A series of definitions have been presented to introduce the reader to this frequently overlooked domain. A range of benefits have been identified and the drivers for those benefits (i.e. the cognitive limitations of the human brain) have been explored. Finally the few cases that have incorporated information design as a reporting mechanism within an industrial context have been presented.

3.7 CHAPTER CONCLUSIONS

There is increasing interest in project and programme management reporting systems and in analysing the critical success factors in project environments. A common factor emerging from these two sub-domains is the importance of communication. PMSs, such as the Balanced Scorecard (Kaplan & Norton, 1996, 2001) and the Performance Prism (Neely & Adams, 2000) have been developed but they have not been widely implemented in project and programme environments. Where PMSs have been implemented, the emphasis has been on what to measure and to generate the data, but not on how to report and present the data to enable efficient and effective interpretation. Research shows that communication can be made more effective and efficient (Mayer, 2001) but that application into project and programme environments have not been considered. Therefore this research will address these gaps by an empirical study on the design and use of visual reporting of project and programme performance. The following Chapter investigates the utility of Dashboard communication systems at the Pilot Study Organisation, which is a national utilities company.

4 PILOT STUDY

This chapter reports on the findings of the Pilot Study, which can be considered a more pragmatic exploration of the concepts associated with Dashboard reporting in programme management environments.

4.1 INTRODUCTION

As established in previous chapters, the research objective is to find out how visual reporting systems can be employed in project and programme management environments and the issues associated with their implementation and maintenance. In order to gain an initial appreciation of these pertinent issues, a pilot case study was conducted. The application of this technique is considered appropriate given the lack of previous research in this inter-disciplinary domain (Yin, 1994). As a result of the research being structured in this way, it is consistent with the grounded theory approach proposed by Strauss and Corbin (1998).

In this chapter an operational research methodology is first defined before the findings of the pilot study are presented. The data collected relates to a wide range of areas, as would be expected from a pilot study for exploratory research. Common discussion themes, guided by semi-structured interviews, relate to the content of the tool, implementation process, applications of the tool, benefits and drawbacks, how users read the tool and the distinguishing features that have made the system successful. Finally, and of particular interest, is how the tool has been leveraged as a basis for improved relationships between a range of different stakeholders. The data collected as part of this study will be used, in conjunction with the literature presented in Chapter 3 and any other salient literature arising as a result of this study, to develop an initial model. This beta model, presented in Chapter 5, aims to provide guidance for how Dashboard reporting solutions could be setup, maintained and leveraged in other programme management organisations. The model is refined via a second case study, which is presented in Chapter 6 and the two cases are compared and contrasted in Chapter 7, Discussion.

4.2 METHODOLOGY

A total of 8 interviews were conducted over an eight week period, from the 25th March to the 14th May 2002 (see table 4.1). A range of staff were interviewed, including personnel involved in the supply of information, the collation, printing and distribution of the Dashboard as well as 12 users. The interviews were conducted on-site in the Pilot Study Organisation's (PSO) offices at Staines, Basingstoke and Chertsey. The format of the interviews was fairly unstructured so that the interviewees had the opportunity to discuss

Job Title	Principle Brand	Date	Code
Programme Office Manager	Roadside recovery organisation	25/03/2002	PSO/01
Programme Directors	Roadside recovery organisation	25/03/2002	PSO/02
Programme Manager	National utilities company	29/04/2002	PSO/03
Planning Consultant	Roadside recovery organisation	29/04/2002	PSO/04
Programme Manager	National utilities company	29/04/2002	PSO/05
Director of Operations	National utilities company	30/04/2002	PSO/06
Programme Office Analyst	National utilities company	01/05/2002	PSO/07
Director of eBusiness	Parent company	02/05/2002	PSO/08
IT Director	National utilities company	14/05/2002	PSO/09

Table 4.1. Pilot Study Interviewees & relevant data.

any issues they felt were important in relation to the Dashboard and the general reporting process. "One cannot know at the outset what the issues, the perceptions, the theory will be. Case researchers entering the scene expecting, even knowing, that certain events, problems, relationships will be important, yet discover that some are actually of little consequence." (Strauss and Corbin, 1998). However, a range of questions were developed and trialled before the interviews and were structured in-line with Strauss and Corbin's (1998) four part typology:

Sensitizing Questions. These are very open, general questions that are typically used at the start of a research project to direct further inquiry. For example, 'Could you explain the content of the Dashboard to me?'
Theoretical Questions. These help to illuminate process, variations and linkage between concepts. 'Do you find that the Dashboard is as useful now as it was when it was introduced?'
Practical Questions. Such as 'Who should I talk to about to about the Project Evaluation Process?'
Guiding Questions. These tend to become more specific as the research develops, but may include, 'What benefits does the Dashboard provide?'

"Because the aim of open coding is to discover, name, and categorize phenomenon according to their properties and dimensions, it follows that the aim of data gathering at this time is to keep the collection process open to all possibilities." (Strauss and Corbin, 1998, p.206). Indeed, this broad focus is reflected in the structure of the question guides, which were customised according to the interviewee's position within the organisation and the degree of involvement in the Dashboard tool. As an example, the following questions formed the interview guide for the Programme Office Analyst, who was responsible for producing and distributing the Dashboard:

Data Collection

- How much time do you spend collecting the data?
- Is the data normally provided on time?
- Is the data normally complete?
- Is the data consistent across projects? (i.e. do the Project Managers use the same formulae?).
- What other reports do you draw the information from? When are they published?

Software

- How long has it taken to learn how to use Visio?
- Any the other software? (Excel / Access that sits behind Visio?)
- How much time do you spend putting the Dashboard together each month?

Printing & Distribution

- What is your experience of using the plotter?
- On what date is the Dashboard Published?
- Why this date? Related to other meetings / reporting cycles?

On-going Maintenance

- How often do you change the measures?
- How often do you change the graphics?
- Do you think it is better to keep it looking fresh or better to keep it standardised?
- If you could make any change to The Dashboard, or to the way in which you collect the data, what would it be?

Additional data sources were also used including project documentation, organisation documentation, diaries, semi-structured interviews, informal conversations with programme stakeholders, attending a four programme meetings and analysing their minutes, workshops and training activity. These data collection activities were guided by Robson (1993). Miles & Huberman's (1994) and Strauss & Corbin's (1997) seminal guides were used as a basis for the analysis of the data. Techniques such as memoing, open coding and axial coding techniques were used to categorise, sort and analyse the interview data.

Having collected the data, it was transferred into a common, usable medium. Interview tapes were transcribed, electronic files were printed and notes from meetings were typed up. The researcher then began to 'open code' the data (Strauss & Corbin, 1997) which involves looking for common themes, patterns and meanings in the data and was achieved via micro-analysis, which is defined as "The detailed line-by-line analysis necessary at the beginning of a study to generate initial categories (with their properties and dimensions) and to suggest relationships among categories; a combination of open and axial coding." (Strauss and Corbin, 1998, p.57). In practice this was achieved by printing out the data and cutting out relevant quotes from it. These quotes were then grouped to form an initial cluster. The clusters were then re-grouped a number of times by viewing the quotes through different 'lenses' (Miles & Huberman, 1994). This provided a more comprehensive coding structure in the longer-term and was found to be an effective technique for clarifying research questions and in ultimately determining the direction of the research. As an example, the role of the tool as a knowledge transfer mechanism was not foreseen in the design stages of the research but became more prominent following the analysis of the pilot study data, which brought the issue to the fore. Table 4.2 shows the key themes that the Researcher elicited from the data and the number of interviewees that made

reference to the theme. This helped to focus the remainder of the research.

General Theme	Specific Theme	No. of References
Developing the Dashboard	Identifying information requirements	3
	Working with stakeholders	3
Producing the Dashboard	Contributors	2
	Chasing for information	2
	Time	3
	Printing	2
	Distribution	2
Using the Dashboard	Displaying the Dashboard	4
	Reading the Dashboard	2
	Culture	3
Benefits	General support	9
	Structure meetings	3
	Holistic perspective	6
	Enhanced communications	7
	Knowledge Transfer	4
	Marketing device	3
	Continuous improvement	3
	Information repository	4
	Capitalises on existing information	4
	Increased visibility over performance	6
	Low cost	2
	History of the format	1
Drawbacks	Setup cost	2
	On-going costs	2
	General access	3
	Real time access	3
	Functionality	3
Performance Measurement	Integrity of the data	2
	Commonality of the data	3
	Actionable information	1
Design	Visual nature of display	8
	A0 / 1 piece of Paper	7
	Layout	2
	Simplicity of presentation	3
	Positivity	2
Project / Programme Management	Issue resolution	4
	Dependencies	3
	Risks	3
	Controlling performance	4
	Resources	5
	Project evaluation process	4
	Volume of change	5
	Programming / technical issues	3

	Co-ordination of resources	3
	Small change	2
	Business as usual	2
	Achievements	2

Table 4.2 Emergent Themes

Having open coded the data, a process of axial coding began (Strauss & Corbin, 1997), which involves matching conditions, context, action / interactional strategies and consequences. In addition to coding, the researcher used the memoing system described by Glaser & Strauss (1967) and more recently by Strauss & Corbin (1997) as "The researchers record of analysis, thoughts, interpretations, questions, and directions for further data collection" (p.110). The data themes presented have been selected due to their high thematic frequency and the importance bestowed on them by research participants. Individual quotes were selected based on the insight they provide and/or the expression of the statement.

Although a significant body of literature has already been reviewed in Chapter 2 of this thesis, the researcher will continue to interject relevant literatures as new themes emerge from the data. "When an investigator has finished his or her data collection and analysis and is in the writing stage, the literature can be used to confirm findings *and*, just the reverse, findings can be used to illustrate where the literature is incorrect, is overly simplistic, or only partially explains phenomena. Bringing the literature into the writing not only demonstrates scholarliness but also allows for extending, validating and refining knowledge in the field." (Strauss and Corbin, 1998, p. 51).

4.3 INTRODUCING THE PILOT STUDY ORGANISATION

The Pilot Study Organisation (PSO) is a FTSE100 organisation and, at the time of investigation, incorporated three core brands: a utilities company, a roadside recovery organisation and a financial services company. Subsequently, the roadside recovery brand and financial services brand have been divested. The researcher worked specifically with the Information Systems (IS) division of the PSO, which supports strategic, tactical and mandatory (legislative) change across all three brands, primarily in the areas of IT and business change.

The organisation was selected to participate in the research because they were considered to be representative of good practice in the field of programme-level visual reporting. The tools discussed here are more sophisticated than those used by seven other FTSE100 organisations visited and subsequent discussions with over 30 academics, 23 practitioners and 5 senior consultants in multinational management consultancies has validated this perspective. As the first study in this research, the focus was around the production and utility of the Dashboard. It is important to note however, that the Dashboard is one of a number of reports within an overall hierarchy. To provide context the reporting structure is summarised in Figure 4.1.

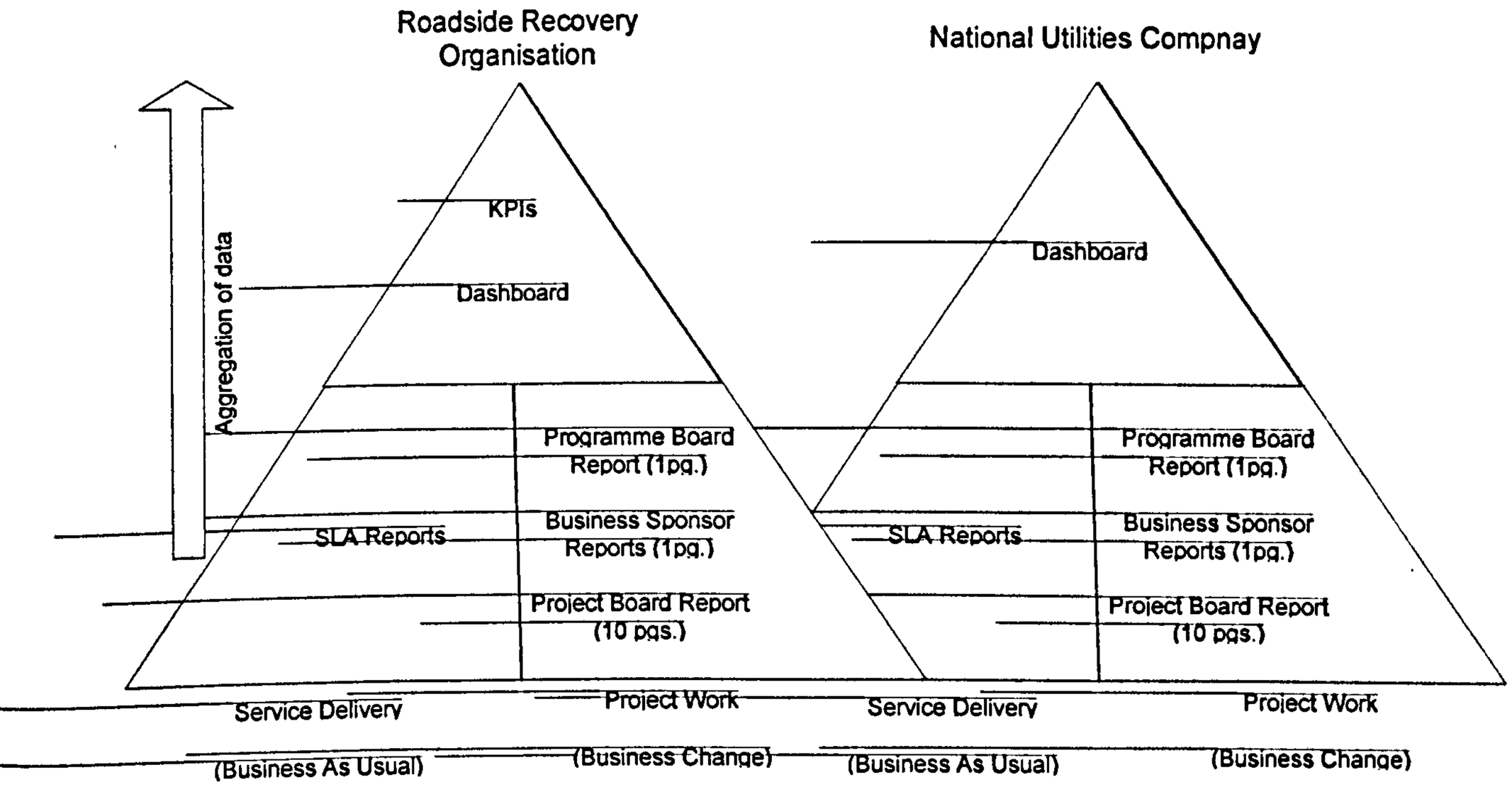


Figure 4.1. Dashboard report in the context of the overall programme reporting structure.

The units of study were the Dashboard reporting systems at the utilities and roadside recovery organisations. The tool was used by the IS Division to manage, control and provide visibility over the projects and programmes being delivered for the two brands of the PSO. These projects involved upgrading existing systems and introducing new IT systems used by the respective brands. The introduction of new or amended systems also typically involves a degree of business and process change, which was also managed and supported by the IS Division in conjunction with the relevant areas of the business. As IT systems grow and expand, they become increasingly inter-connected, which means that the linkages between projects become ever more important, strengthening the requirement for management processes above the traditional project-level. To manage this, the IS Division has regular meetings with Business Sponsors to discuss progress and issues and also has to report to the Board of Directors at monthly meetings.

Prior to the introduction of a Dashboard, information was produced in lengthy text-based reports, with little consistency across projects. It was therefore difficult to consolidate and aggregate this data to get an overview of the scale of change and the dependencies between projects. Although text-based reports are still produced, these have been complimented by the introduction of a Dashboard, which graphically represents the different projects and important performance measures in order to track the delivery of the change portfolio. Both organisations use a Dashboard report called 'The Big Picture'. All quoted references to The Big Picture are presented verbatim, for purposes of accuracy though refer to what has hitherto been known as the Dashboard. It is a paper-based tool which provides an overview of the critical information for the programme management division in the utilities and roadside recovery divisions. The Dashboard is primarily owned by the IS Division Programme Director but is also made available to the Board of Directors, Programme Managers, the Programme Management office and is displayed in communal areas around project and programme offices to promote inter-project communication. Information is graphically represented and is made available to a number of senior staff including IS

Directors, Programme Managers and Business Customers. It is published once a month in an A0 (poster-size) format. Scaled down examples of the tool can be found in figures 4.2 and 4.3.

4.4 EXAMPLES & BREAKDOWN OF THE DASHBOARDS USED AT THE PSO

This section presents examples of two Dashboards used at the PSO. The first reports performance of programme activity relating to the National Utilities Company and the second displays the performance of change activity at the Roadside Recovery Organisation. The Dashboards contains eight and nine information components respectively, pertaining to different areas of performance. A more detailed presentation of key components is presented in the following chapter but for now a brief summary should suffice. The National Utilities Company Dashboard contains the following information components:

Front Door Team: This component highlights the progression of proposed projects through the qualification process and is important for the purpose of high level resource allocation, as well as communicating the types of projects that personnel will be involved in at a later date.

Human IS Resource Availability: Tracks the capacity and demand for staff by job function and provides an indication of the demand for contract or short-term staff.

Non-Human IS Resource: IT availability: Another resource constraint is the availability of IT applications and other environments such as physical structures, software and hardware.

Change Portfolio: This section is the most regularly used component of the display. It illustrates the current status of projects and programmes in the portfolio (via a traffic light coding scheme) as well as key risks, issues and dependencies.

Release Plan: This part of the display presents key activities, from a projects department perspective, in a calendar-style format. Its purpose is to ensure that all previously made commitments can be met.

Testing Services Group Project Progress: As the name implies, this section demonstrates the progress of the Testing Services Group in terms of quality assurance across a range of new IT systems.

Application Change Capacity: Highlights the capacity for software to be copied and developed in parallel before being spliced back together.

Site event plan: This component illustrates the number and size of projects that will be delivered to the functional business areas in order to highlight whether a department's capacity to change has been breached.

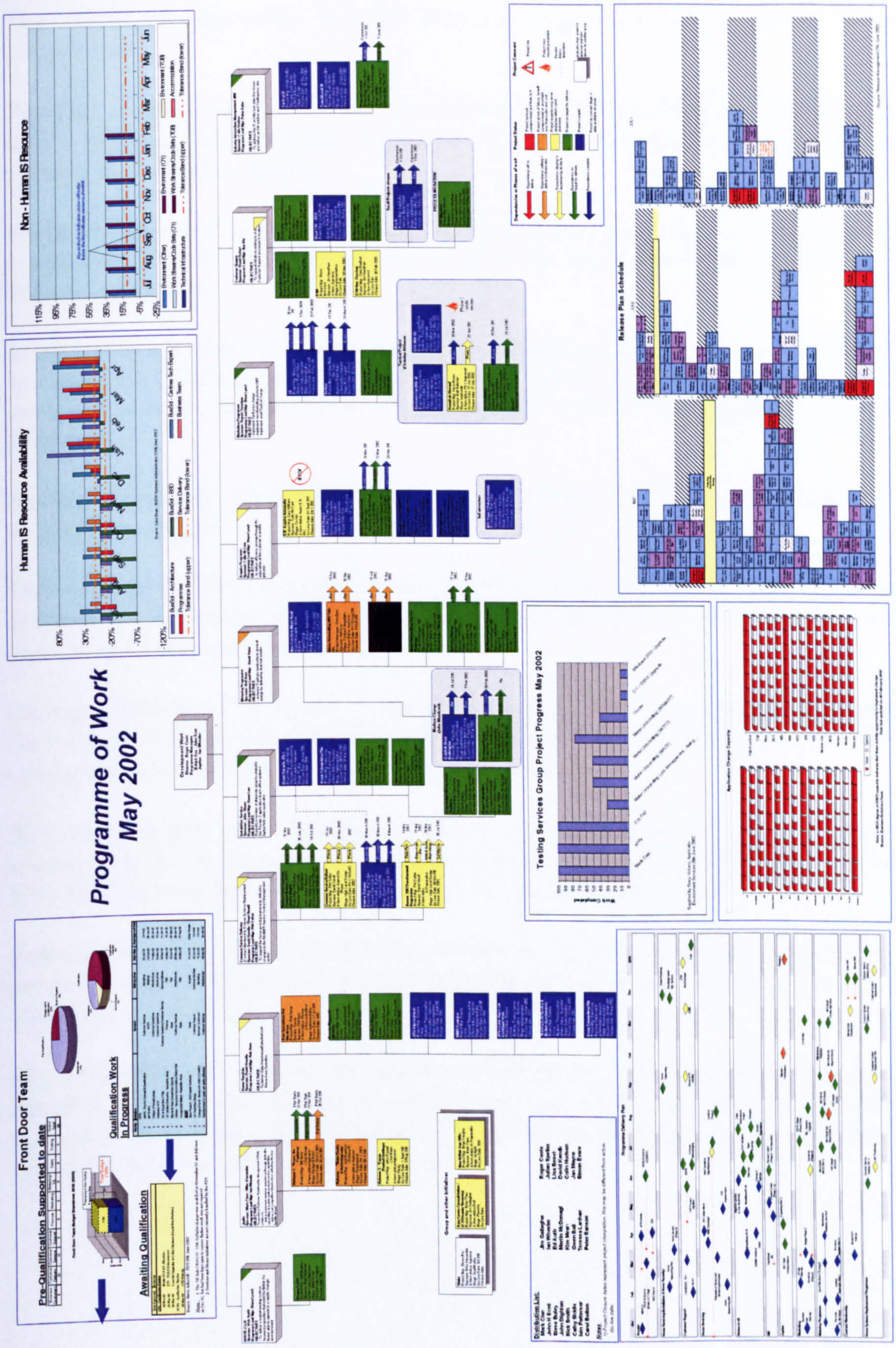


Figure 4.2. An example Dashboard used at the National Utilities Company.

The Dashboard used at the Roadside Recovery Organisation has a number of similar components:

Pipeline: Similar in content to the Front Door Team in the British Gas Dashboard but with a different style of design that more effectively displays the progress of projects through the evaluation process.

Small Change: Due to the high volume of change in the Roadside Recovery Organisation, a separate component was developed to track the impact of smaller initiatives across different operations.

Service delivery: The structure of the organisation is such that the programme department has additional 'business as usual' responsibilities. To make sure that these responsibilities were not over looked in favour of the project work an additional component was developed.

Resource Capacity: Comparable in content to Human IS Resource Availability but with an improved design.

Site event plan: This component illustrates the number and size of projects that will be delivered to the functional business areas in order to highlight whether a department's capacity to change has been breached.

Change Portfolio: This section is the most regularly used component of the display. It illustrates the current status of projects and programmes in the portfolio (via a traffic light coding scheme) as well as key risks, issues and dependencies.

ICT Architecture map: industries which are dominated by ICT may follow a dual strategy; one for the business (as represented by the corporate strategy map) and one for ICT. Such organisations may find it useful to represent both strategies.

Release Plan: This part of the display presents key activities, from a projects department perspective, in a calendar-style format. Its purpose is to ensure that all previously made commitments can be met.

Key achievements: One of the drawbacks associated with management by exception reporting system is that the process can become very negative as issues are only raised as they fail to meet their original objectives. A section representing the department's recent key achievements is therefore included.

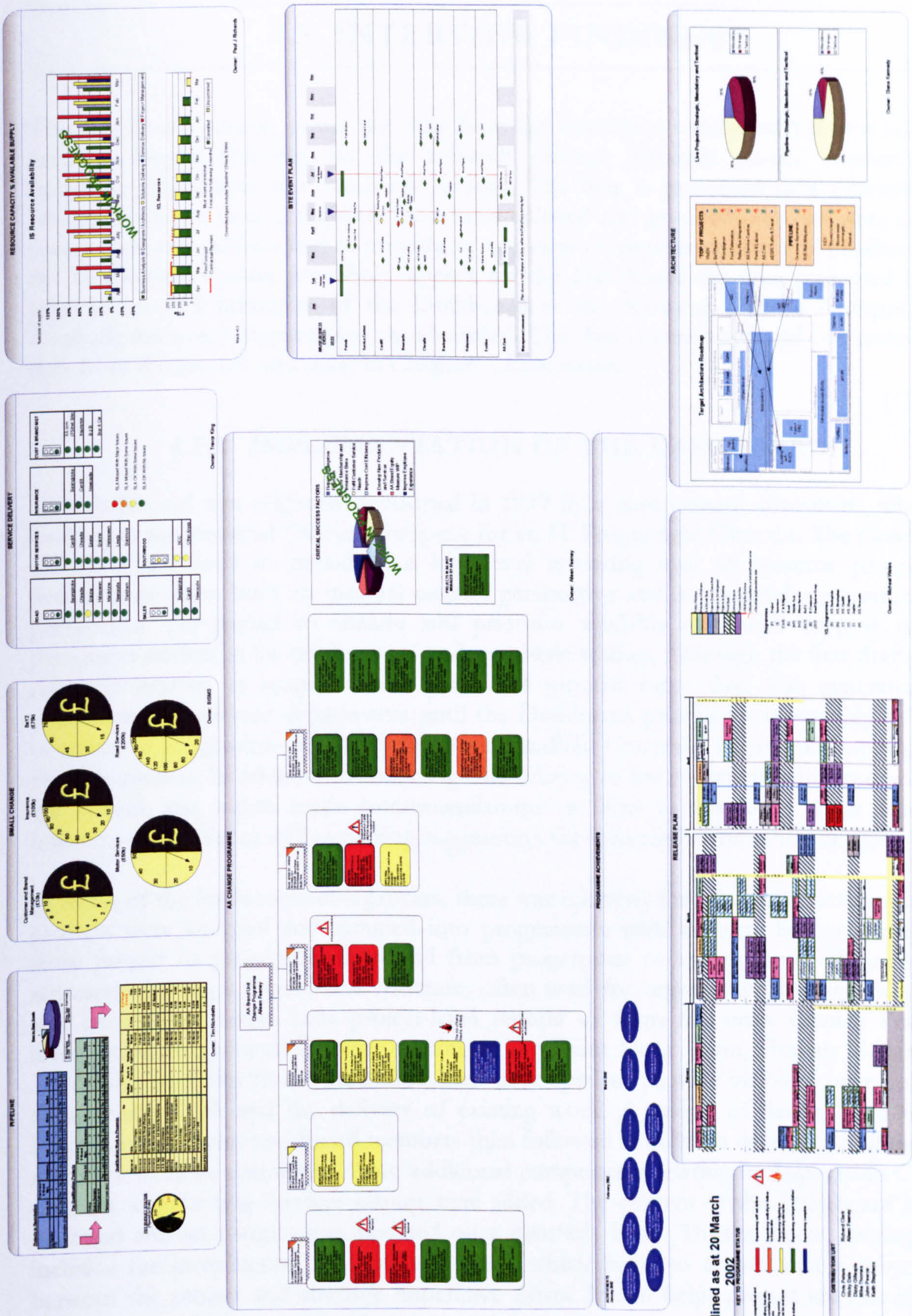


Figure 4.3. An early example of the Dashboard used at The Roadside Recovery Organisation.

4.5 INTERVIEW FINDINGS

The data in this section comes not only from the interviews conducted but as a result of Steering Group Meetings for the research project, informal on-site conversations, telephone discussions and document reviews. The data is presented in a relatively raw format. Interview data and quotes have been collated and grouped into emergent themes (using open and axial coding) to provide an overview of implementation and production of the Dashboard. Quotes providing support for the Dashboard are then presented before applications and principles of the Dashboard at the National Utilities Company and Roadside Recovery Organisation are identified. The data is compared and contrasted with data from the second case study in Chapter 7, Discussion.

4.5.1 IMPLEMENTATION OF THE DASHBOARD

The Dashboard was originally developed in 1999 by a management consultant, who was working at the National Utilities Company for an IT Programme Director. The Consultant identified the need to introduce a high-level reporting tool to monitor programme performance from both an internal control perspective and an external communications perspective. He started to analyse and prioritise available data with support from a placement student in his third year of undergraduate studies. Although the first drafts were relatively narrow in scope, over a period of months more data was generated and contributed by relevant departments until the Dashboard provided a reasonably balanced overview of programme status. At this stage Cranfield University began collaborating with the organisation. In addition to collecting data relating to the implementation and utility of the system, the author made recommendations on how to develop a more balanced, holistic perspective, as well as making suggestions for enhanced information design.

In terms of the implementation process, there was relatively little formal structure. Current projects were analysed and grouped into programmes with strategic linkage established from project to programme-level and from programme to strategy-level. Projects were represented using a hierarchical structure, often used for organisational charts. Key risks and issues were taken from project-level reports to form the main Change Portfolio information component. Displays relating to the Front Door Team, Human IS Resource Availability and Site Event Plan were then developed to provide visibility over potential forthcoming work and the delivery of existing work. A period of liaising with the IT Programme Director and Board members then followed in order to develop a tool that had relevance to all its customers. Thus, additional components relating to Application Change Capacity and Testing Services Group were added. The content of the Dashboard is now reviewed and its composition updated on a quarterly basis. Thus a recent development includes the introduction of a Strategy Map, which helps to ensure that a robust link between the project and strategic imperative exists. It also helps project staff to identify how they contribute to the development of the organisation.

In early 2002, a number of senior staff (including the IT Programme Director) were transferred from the National Utilities Company to another operating division of the PSO, the Roadside Recovery Organisation, whereupon the Dashboard implementation process was replicated to show all of the projects and programmes being managed by the

Roadside Recovery Organisation's IS Division. The implementation was overseen by another IT Programme Director and this second incarnation focused on issues with greater relevance to programme management, such as the allocation of capital using a strategic buckets approach and had less emphasis on the more technical matters, such as Application Change Capacity. Again, the implementation process was fairly informal and followed a similar pattern to the previous implementation.

4.5.2 PRODUCING THE DASHBOARD

Information is documented by a wide range of staff. For example, the planning team provide finished displays for the Site Event Plan and the Front Door Team provide information relating to the evaluation of project ideas. Contributors then e-mail their content to the Programme Management Office, typically as Microsoft Excel files. The Dashboard is then compiled by the Programme Office Analyst, using Microsoft Visio and takes approximately one day per month to produce the report and make final formatting amendments. In addition to copying and pasting data into the relevant sections of the Dashboard, the Analyst is responsible for collecting ROYG status and key risks, issues and dependencies from Project Managers and Programme Managers.

The tool is compiled using several sources of common data in project management environments. Data relating to the capacity and demand of a range of staff categories is drawn from Microsoft Project or from accounting data. Other data is taken from spreadsheets and databases and translated into an appropriate graphical format using MS Excel for charts and MS Visio for other data. It is printed using a large-scale printer called a plotter, which is capable of printing poster-size (A0) displays.

The tool is distributed to all Operational Directors, the overall Programme Director and is displayed in the Programme Management Office and in the project management work areas. In addition, it is displayed in 'social' areas such as the coffee room and the corridors around the project offices.

4.5.3 HOW USERS INTERACT WITH THE DASHBOARD

This section is based on interview data, informal conversations with staff and by watching users read the tool in different scenarios.

Scenario #1
The user scans the tool from their desk to get an overall impression of portfolio status. Given that users may be up to five metres from the display, the use of colour is important as it provides the core means of communication. For example, it is used to identify the status of many different components of information: project / programme status, resource availability, portfolio balance, etc. Font sizes for titles should be of a size sufficient for reading from this distance.

Scenario #2
For a more in-depth reading, users tended to stand around one metre away, sometimes in groups (such as in meetings, casual chats and showing new personnel or contractors the department's activity). Colour continues to be important as it directs the reader to the

most significant information. However, the role of text becomes more important as users look for the next level of detail, such as the name of the project manager on a project with a red status.

Scenario #3
Finally, when reviewing the Dashboard on an individual basis, users get very close to the tool, tracing their hands across the page to help establish linkages between the information. At this range, the smallest text and therefore the greatest detail can be read, for example information presented in the management comment boxes. When users get this close to the display, it can be at the expense of seeing the overall picture.

4.5.4 SUPPORT FOR THE DASHBOARD

Throughout the series of interviews conducted, genuinely positive feedback was given regarding the content and the way in which the information was presented.

"I've nothing against The Big Picture. I think it's a superb leap forward" (PSO/08).

"It does give a good picture. It helps bring together all the individual projects." (PSO/03).

"The big picture is in my view an important management tool…" (PSO/04).

Interviewer: Do you find that these sorts of graphical tools are effective?
"Yes. I think so. It really targets the issues. If you come in and see from the report that you are yellow, it makes you think 'I want to do something about it' because I don't want to be yellow, I want to be green." (PSO/08). [Note: the reference to yellow and green relates to a traffic light coding system, where green status means there are no problems on that project and yellow means there are minor problems].

"When you're running a portfolio, having a picture of that portfolio as in the Big Picture can be absolutely fundamentally useful because that's the only place that you start consolidating up what could be reasonably disparate projects to the common point where they do join." (PSO/06).

The only criticisms of the Dashboard related to the quality of the underlying data. By using existing information to minimise costs, it could be argued that the approach overly relies on potentially poor quality data. It seems sensible that where there are concerns over how robust the data is that a review of existing data structures is commissioned.

4.5.5 APPLICATIONS OF THE DASHBOARD

During the interview process a number of applications or utility of the Dashboard were identified. These were as a communications tool, as a tool to control the execution of the change portfolio, as an information repository, as a template to structure meetings, as a marketing device and to facilitate continuous improvement within the department. These applications are now presented in more detail with supporting quotes from the interviews.

As a Communications Tool

Whilst matrix organisations are the only practical way of effectively delivering complex change programmes, communication along both the functional silo and across the organisation can become complex and difficult to manage. First and foremost, the Dashboard is regarded as a communications tool, intended to tackle this issue.

"...the communication [aspect of the Dashboard] is fundamental" (PSO/02)

"The other thing that it's [Application Change Capacity] good at is setting a level of expectation. If they [the business] want a change done on a system and we're showing it as red for the next three months, well their expectation is set that there's not much point in asking for this because there's not much chance that they're going to get it." (PSO/09)

"...a critical part of the job of leadership is about communicating. Be it communicating the vision, communicating progress, communicating the culture, communicating what your expectations are, whatever it is management is all about somebody getting a group of people to want to do what they want them to do and then for them then to do it. If communication is one of those mechanisms then you have to find many different ways of doing it and if you can supplement big visual images with inspirational speeches with a tightly written document and you can hit people with many different communications with the same basic point then you'll get it in." (PSO/08)

"I have projects in several programmes. There's a project there, a project there and a project there. I also have a group of projects there. So this [The Big Picture] helps me to see across them." (PSO/06)

"Everybody's going down their silos and silo mentality I agree with that because particularly in projects people need that, and if you don't have that you're dissipating their concentration on delivery but who's going to look at what's happening in parallel? Who's going to look at what's happening above and below? That's where we're missing out." (PSO/04)

"Now when The Big Picture came into play, it was at a time when there wasn't a lot of focus in the delivery capability within IS. There was muddled information and the information flows were very, very poor and it was a way of saying, 'let's cut the crap. Here is a simple representation of what the issues are. It's at a level that you should be interested in. If you don't want to get into too much detail, only focus on the ones that you need to. This is us protecting your time as much as anything else'." (PSO/08)

As a Tool to Control the execution of the Change Portfolio

Whilst a number of other control systems exist within both the National Utilities Company and the Roadside Recovery Organisation (such as the reporting and meeting framework, and traditional project management control systems based around the PRINCE2 project management methodology), the enhanced visibility that the Big Picture provides appears to aid the control process.

"The Big Picture that [the IT Directors] put together came out of the fire fighting exercise in 2000 ... because nobody really understood where projects actually were. Nor did they understand why they weren't progressing at the rate they ought to be progressing." (PSO/04)

"I guess what that [The Big Picture] was looking to do, quite simply, was looking at all of the development for a delivery piece and the resource constraints around that delivery piece and so on one piece of paper, albeit A0, you could look at and see where you were. And it was colourful and very, very brief level of description, it highlighted the issues. In terms of a Senior Directors' view of life, it gave them all they really ever needed. All they wanted to know." (PSO/08)

Other Anecdotal evidence suggests that bottlenecks in the system are resolved more quickly. One example is that Project Sponsors are more likely to get involved to resolve constraining issues.

As an Information Repository

Although the Dashboard can only represent a limited amount of information, the fact that it is A0 in size and must therefore be displayed on walls means that it acts as a convenient source of information.

"I mean I look at it and see some of the information. I might look at it if I wanted to know who was a project manager or who is covering this piece of work or if it's my change, what's gone red. I don't use a lot of the peripheral stuff, the stuff around the edges; I use it as a source of information on individual projects." (PSO/06)

"It's [The Big Picture] I actually use more when I'm looking at somebody else's projects. I know where mine are. I've got Project Boards, I've got Programme Boards and I'm Chair on them or some of the ones that are locked into other programmes, somebody attends for me. So I know where mine are but in terms of seeing exactly what it says there in the Big Picture – where else are the hotspots, where else are the bubbles – well that's better for other people's projects." (PSO/09)

As a Template to Structure Meetings

At a Steering Group meeting, two panel members commented on the power of the Dashboard as a tool to structure meetings. Anecdotal evidence suggests that review meetings at a number of levels were unfocused and as a result would last for more than two hours. Now, with The Dashboard, the length of meetings has been reduced to approximately 40 minutes, depending on the number of issues that need to be discussed and resolved.

The Dashboard may be considered effective in this context because it provides a flexible structure with which to control the meeting. For example, it is highly likely that all projects with a red status will be reviewed. Thereafter, the projects with an orange, yellow or green status may or may not be discussed depending on pressures of time and how

many other important issues are on the agenda.

As an Internal Marketing Device

Although the Dashboard is primarily a tool for internal communication and control, the fact that it is distributed to the Business Sponsors (who are typically the Business Directors) means that it also serves as a tool to promote the performance of the IS Department. The section entitled 'Deliveries to Date' serves as a reminder to the Business Directors of successful projects already delivered, whilst the traffic lights status defines performance within pre-defined tolerances and by implication demonstrates effective management. Further, the Front Door Team (FDT) also summarises projects in the pipeline.

"...one of the things that The Big Picture does do is act as a marketing tool for IS to show to the business what is actually going on." (PSO/02)

"...that is saying to people in [the National Utilities Company], here we are, playing your Change Plan back to you to show you what it looks like." (PSO/02)

To Facilitate Continuous Improvement

In the medium-term, the Dashboard is being used to identify trends in programme management capability. For example, if project outputs are regularly delivered late, an investigation may be initiated and may look at:

- The skills / training of staff
- How realistic / thorough business case analysis is during the project evaluation process
- Resource issues

The output of this investigation may be an initiative to improve capabilities in relation to business case analysis, thereby improving forecasts and budgets, and in doing so, enhance programme management capability.

"...what a picture like this is highlighting is our inability to manage. It's not a criticism, it's a positive thing. That's a positive statement because it highlights our inability. Why are these things red? It's because we've failed. I see it as positive because it's actually saying 'look, we've got a problem, we need to address it" (PSO/04).

4.5.6 DASHBOARD PRINCIPLES

An analysis of the data generated through the Pilot Study interviews showed that eight principles were important for the design of the Dashboard. These are discussed under two sub-headings, Performance Measurement and Information Design.

4.5.6.1.1 Integrity of the Data

As with all reporting systems, unless the underlying data is robust, salient and timely the report will lack credibility, no matter how engaging the format. It would be unfair to state that the Dashboard was widely criticised but concerns were raised by three interviewees regarding the quality of the underlying data.

"The big picture is in my view an important management tool. But like all management tools, it is only as good as the data that's in it." (PSO/08).

"Then the only time that life gets difficult is when you get data which is not perfect." (PSO/09).

"[The Big Picture] is only as good as your ability to interpret the data." (PSO/08).

"You don't want to put perceptions on here, you want reality." (PSO/04).

4.5.6.1.2 Commonality of Data

In order that the reporting process does not become a bureaucratic, arduous task it is important that the data collected is used more than once. The principle of 'collect once, use many' is regularly heard in meetings at the PSO. Thus if several reports can make use of the same data, presented in different formats or media, or aggregated to provide an alternative insight, the more efficient the communication and control process will be. In addition the process will be more acceptable to those personnel who report into it.

"The drive last year was to create commonality of data across project management and when people talk about being holistic they tend to merge together the format and the data, in their minds. So if I was to say 'I want this kind of report', if we can take away the link between the format and the data, life's going to be a lot easier, because in these reports it's got all the data you need for this report but people don't use it because people have a difficulty in taking [that] view". (PSO/08).

"What we try to do is use the PRINCE methodology. So anyone who works in my department will go on some sort of PRINCE training so that you'll have standard project plans and standard methods of reporting. If they talk to other Project or Programme Managers or other parts of the organisation, they'll use broadly the same tools because we've got one approach to project management". (PSO/02).

4.5.6.1.3 Objective, Actionable Information

Performance measurement based on subjective opinion is arguably flawed. The key to having a successful communication and control system is to provide credible, timely information. In order to achieve this, it is important that subjectivity is removed as far as possible.

"Most project dashboards are not connected to any quantified measurement device. Instead they draw from a witch's brew of rumour, hopes, innuendo and decisions about how much the PM [Project Manager] thinks he/she can get away with reporting this week!" (PSO/02).

Information Design

4.5.6.1.4 Understand the Purpose of the Communication

Without identifying the target audience, it is difficult to develop a tool that will satisfy its customers. The Dashboard has a range of customers at differing levels in the organisation yet because of the accessible presentation format, users seem more willing to dip into the report and take what information they need at the level of detail required.

"...if you don't know what you're communicating and why you're communicating, you're in trouble." (PSO/08).

The beauty of it is that it [The Big Picture] has a reason for being. That's why it gets used. (Post-interview PSO/02).

"...in one place you can access it [the information] bloody quickly, it gives you the information you want. You can use this information to manage and managers can home in on the different vagaries depending on the enquiry." (PSO/06).

4.5.6.1.5 1 Page

Given the number of interviewee references (a total of seven) on the importance of the display being presented on one piece of paper, it would seem that the presentation format is much more than a gimmick. The following represents a selection of those quotes:

"The important thing for me personally, is minimal number of pages to go through. If all of the information is in one place and I can see the linkages and I can understand it then I'm as happy if it's text based as it being diagrammatically based." (PSO/08).

"...the difference between having one piece and three pieces of paper may seem absolutely trivial but when you can just stand there and have no need to do anything apart from just look and understand and you don't have to flick the page because then your brain is starting to work on the process of when did you last see it, whereas if you're just looking it can just take it all in." (PSO/08).

Why do you think these types of tools are effective, assuming they are effective?
"I think they're effective for the likes of Dave because it gives him in one visual space a total view of what's happening in the area that he's responsible for." (PSO/06).

4.5.6.1.6 Layout

The order of the information on the page is also of importance, although the subject attracted little attention in the interviews. In fact the following was the only quote related to the layout of the report: "The whole thing is wrong really. Top left you should have your Front Door Team, which then feeds into Small Change. So, Top three, pipeline, Small Change and Resource Capacity should be on the top, followed by Projects, your AA Change Programme, the top 10 projects, then beneath that, you've got your Site Event Plan, your Critical Success Factors, your Release Plan and your Service Delivery. So if you move from top to bottom, you move from Pipeline to Resource Availability through the projects into what actually happened in delivery." (PSO/04).

As a general rule information should be presented in a symmetrical manner, for ease of reading. The sequencing of the information should be constructed based on the reader's psychological expectations. Alternatives include sequencing:

- according to frequency of use
- according to the importance of the information
- according to chronology
- from general to specific

Alternatively, the designer may choose to follow the Gutenburg Principle (Kosslyn, 1994), which states that the most natural movement for the eye is from the upper-left corner to the bottom right. Therefore the most important information should be presented in the top-left, decreasing in importance along the Gutenburg axis. Finally, the least important information should be in the bottom-left and top-right corners.

4.5.6.1.7 Keep it simple

Nearly all the interviewees made reference to the presentation format - the graphical nature of the display and one page presentation - making it easy to read. In addition, the information is highly focused and broken down into very accessible chunks, meaning that it is easy to decipher complex accounting formulae. This was a conscious effort and one that was appreciated by users.

"All of these reports… are fairly simple – I'm not trying to trick anybody here" (PSO/02).

"It's just easy to read. I can get what I want from it." (PSO/07).

4.5.6.1.8 Positivity

Given the complex, dynamic nature of programme management environments an enormous amount of information is generated for each project. Whilst attention can be focused by employing the principle of management by exception, the drawback of this approach can be that good work is rarely formally acknowledged. This can in some cases be a demotivating factor. The importance of recognising exemplary work, both formally and informally was discussed. That is that any project or programme management

Dashboard must emphasise the positives, not just the negatives of management by exception. (PSO/02).

4.5.7 BENEFITS AND DRAWBACKS OF THE DASHBOARD

This section identifies the major benefits and drawbacks to the Dashboard reporting process. The following factors were offered by Dashboard stakeholders during informal conversations or through the researcher's interpretation of the unit of study.

Benefits of the Dashboard

4.5.7.1.1 Capitalises on existing information

The cost associated with producing the display is minimised because it capitalises on information produced for other reporting purposes and therefore makes for an efficient reporting process. This also makes its existence more acceptable to Project and Programme Managers because it requires no additional effort on their behalf.

4.5.7.1.2 Increased visibility within project environment

The simple presentation of unambiguous data creates increased visibility. This allows for the identification and correction of poor performance and the acknowledgement of excellent performance.

4.5.7.1.3 Knowledge dissemination across projects and programmes

Where open communications are embraced, through the widespread display of the tool, knowledge dissemination across projects and programmes has anecdotally been found to increase.

4.5.7.1.4 Simplicity of presentation – reduced ambiguity

Information is not hidden in complex accounting formulae or through management jargon and corporate language / acronyms. The graphical format and simplicity of presentation also allows the tool to be effective at transcending barriers of language and culture.

Benefits over an IT system

4.5.7.1.5 Cost

The cost of introducing enterprise-wide programme management software varies enormously but can easily cost £100,000+. Whilst the Dashboard approach does not have the same degree of functionality, it offers a low cost method of creating visibility over the

performance of the programme management department. Further, it may be viewed as an effective means of improving the maturity of the programme management function until such point that the organisation is ready for enterprise-wide software.

4.5.7.1.6 1 page update provides all the information

Users of intranet and internet systems are likely to encounter one of the drawbacks associated with reading A4 reports. That is, establishing linkages and therefore conducting analysis on the information is made more difficult as a result of having to flick between several pages or screens of information.

4.5.7.1.7 The tool can be used to structure meetings

Anecdotal evidence suggests that the tool is extremely effective at structuring meetings. Progress meetings have been reduced from 2 hours to an average of 40 minutes in one of the collaborating organisations. It is not possible to structure a meeting around a computer monitor. Where projector screens are used, effectiveness is likely to be diminished as a result of the information being presented on a number of different screens.

4.5.7.1.8 The format has a history

As a result of the format having been established for over three years, a strong schemata is in place. Staff are now comfortable with the nature of the information and the way in which it is presented, meaning they can extract the information they need very quickly. This, of course, would not be a benefit for organisations who are interested in implementing such as system.

Drawbacks of the Tool

4.5.7.1.9 Set-up Costs

The principle drawback associated with the tool is in the cost of production. The collaborating organisations have invested in A0 Plotters (a type of printer which is fed by a roll of A0 width paper), which costs £2,000 - £4,000.

4.5.7.1.10 On-going Costs

Additional and on-going costs are incurred through the man power required to compile the document (approximately 1 day per month) and the cost of paper and ink. Input from Project Managers is minimal however because the tool takes advantage of existing information.

Drawbacks compared with an IT system

4.5.7.1.11 Cost of printing

The cost of printing each poster may be considered a drawback. To have an A0 colour poster printed costs around £30 when undertaken by a reprographics company. The cost is much lower however where a plotter is bought and the Dashboards are printed in-house. Depending on the marginal cost of one extra user where software is being used, the cost of printing may be considered a drawback or a benefit of the Dashboard approach when compared to an IT system.

4.5.7.1.12 General access

For employees who travel, most will consider it easier to access this type of information from a laptop (which they will probably require anyway) rather than carrying an additional roll of paper around.

4.5.7.1.13 Real time access

Information sourced from IT applications has the potential to be updated in real time and at intervals deemed appropriate by the organisation. The poster style display takes approximately one day per month to compile and distribute and by the time of publication may contain information that is up to three weeks out of date.

4.5.7.1.14 Functionality of the system

The Dashboard does not have the same degree of functionality compared with more sophisticated programme-level software, such as that from leading suppliers such as PMG, Primavera and Artemis.

4.6 LINKING PSO FINDINGS TO THE LITERATURE

Figure 4.4, diagrammatically represents the linkage between key PSO and literature review findings. Interestingly, limited literature had been identified during the review to support the PSO findings in relation to the structure of meetings, knowledge transfer and project/programme marketing. These themes could therefore be worthy of further investigation as they could provide an insight into where a contribution to knowledge could be made.

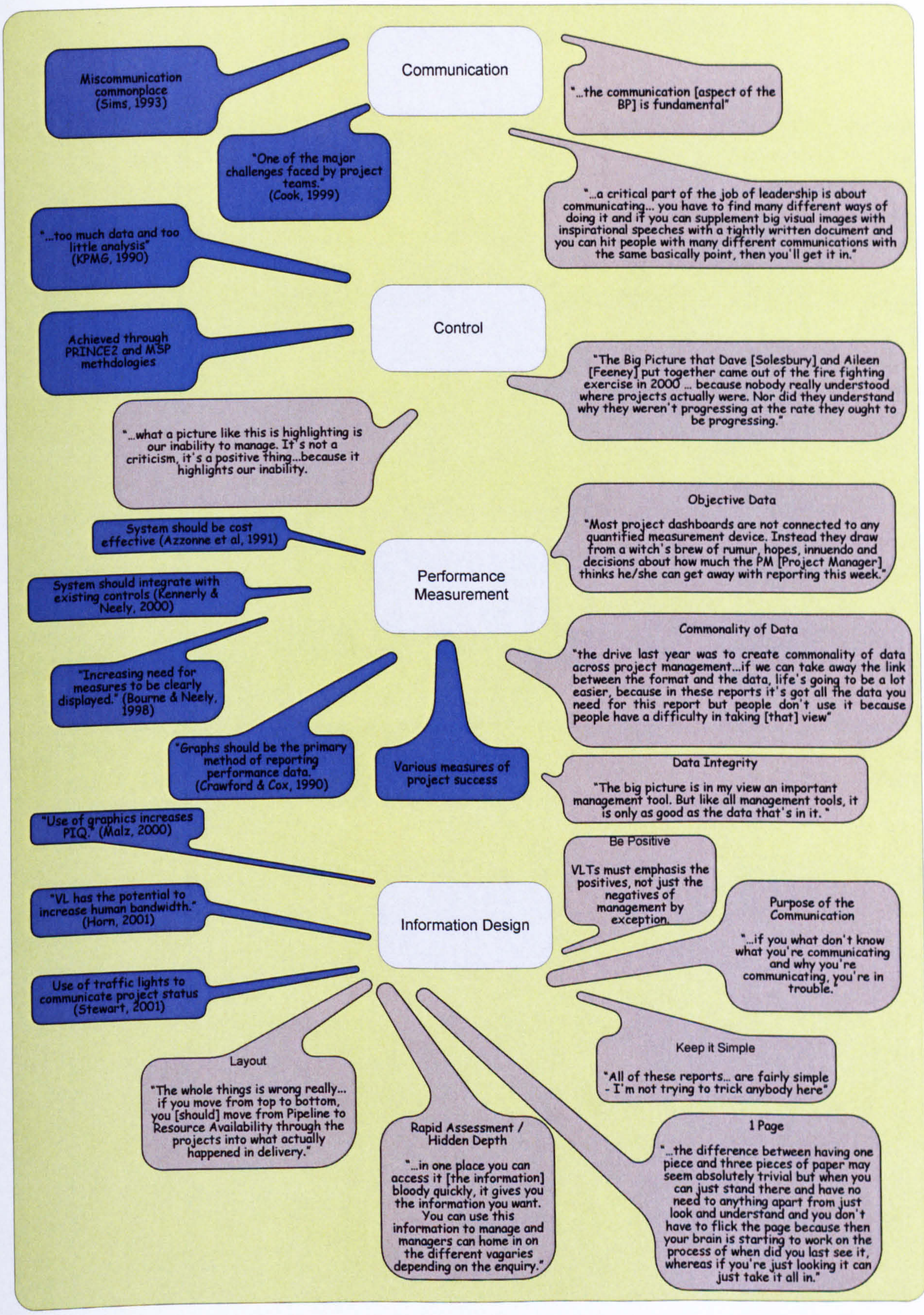


Figure 4.4. Linking the Pilot Study Data and Literature Review Findings.

4.7 CHAPTER CONCLUSIONS

This Chapter has presented the findings from a Pilot Study, which was executed using a case study approach. A total of eight formal interviews were conducted with on-going informal discussions and a review of company documentation. The data was analysed using the coding and memoing techniques prescribed by Miles and Huberman (1994) and Strauss and Corbin (1998). The PSO is a FTSE100 utilities organisation and its IS division uses a one page, poster-size display to communicate, control and provide visibility over the performance of IS programmes, delivered on behalf of the PSO. The tool, which is referred to in this Chapter as the Dashboard, has wide ranging support from those who developed it, produce it and use it. The tool has six main applications within the organisation; these are as a communications tool, as a tool to control the execution of the change portfolio, as an information repository, as a template to structure meetings, as a marketing device and as a means of facilitating continuous improvement within the department. An analysis of the data generated through the Study showed that eight principles were important for the design of the Dashboard. These have been discussed under two sub-headings, Performance Measurement and Information Design. Principles relating to performance measurement are the integrity of the data, commonality of data and presenting objective, actionable information. Factors relating to the design of the information are: understanding the purpose of the communication, presenting the information on one page, layout, keeping the design simple and being positive. Finally the benefits and drawbacks of using the tool have been presented. The principal benefits are that the tool increases visibility over the performance of programmes in the department and improves knowledge transfer amongst stakeholders. The main drawback of the tool is the cost of implementation and production, though these are considerably less in comparison to an IT system.

The following Chapter integrates the Pilot Study findings with the secondary data cited in the Literature Review to produce a Beta Model of how such tools could be implemented and maintained.

5 BETA MODEL

The purpose of this chapter is to present a Beta model, which will order the data collected thus far into some logical, intelligible order. The following chapters will then test and refine this ordering so that it is more robust, whereupon it will be presented as the Alpha Model.

5.1 INTRODUCTION

The Beta model encompasses a number of distinct elements. These elements have been developed by drawing on previous research, identified in the Literature Review and from the data collected in the first Pilot Study. In summary, the four elements that comprise the Beta Model are:

Performance Measurement Framework: the PMF is used to structure a diverse set of measures, some of which feed into the Dashboard while others are used in supporting reports.

The information components: a range of multi-variate information components have been developed to provide visibility over programme status. The components incorporate both performance measures and management information and the information is presented graphically. When a range of these information components are grouped together, they become a Dashboard.

Implementation process: An implementation process has been developed to aid organisations looking to introduce such tools, based on case study data and literature.

The Beta Model is then compared against the requirements identified as part of the Literature Review to ensure compliance.

5.2 METHODOLOGY FOR MODEL DEVELOPMENT

In its most simplistic form, the Grounded Theory approach to theory development moves through three phases: description, conceptual ordering and theorizing, (Strauss and Corbin, 1996). As described in Chapter 2, Research Methodology, this investigation will not move into the third theorizing phase given its breadth and exploratory nature. To do so would require more than two cases to be studied, which was unrealistic given the time frame for PhD research and the six months required investigating each case. Further, to theorize based upon two cases would be to stretch the research data beyond its natural limitations and would likely yield a brittle theory. Strauss & Corbin (1998, p.15) define the first of these phases, as "The use of words to convey a mental image of an event, a piece of scenery, a scene, an experience, an emotion, or a sensation; the account related from the

perspective of the person doing the depicting" whilst conceptual ordering is characterized as the "Organizing [sic] (and sometimes rating) of data according to a selective and specified set of properties and their dimensions".

The Beta model has been developed as a result of a detailed understanding the PSO and the tools and techniques used at the company. By reviewing extant literatures, conducting mini-case studies and expert interviews, the Researcher has developed parts of the tool based on an in-depth understanding of theory and practice in this area. This chapter will provide more detail into the system itself, rather than the phenomena associated with the system. As such the description phase of research bridges this and the previous chapter. The following section of the chapter will present each of the Dashboard information components. Data is conceptually ordered by presenting a performance measurement framework, which organises the project performance criteria into an integrated, holistic model; the implementation map, which develops and structures the implementation data presented in the previous chapter and a table indicating the relevance of each information component to project, multi-project and programme management environments.

5.3 DASHBOARD INFORMATION COMPONENTS

5.3.1 INTRODUCTION

In designing the beta model, some distinct tensions between project and programme management academic disciplines studies were borne out. For example, whilst single loop control systems such as those employed at a project-level may provide a warning that the project is not progressing to plan, such a system is inadequate at a programme-level. Thiry (2002) argues for double loop learning (Argyris & Schon, 1978), which requires emergent inputs to the process, such as those factors that might affect the validity of the strategy. Thus at the programme-level, two types of information component are required, one that identifies whether the projects that makeup the programme are performing to plan (see 5.3.4 Project Status) and one that monitors changes in the internal and external environment (see 5.3.9 Scanning & Futurizing).

Thus it was necessary to reflect upon these differing requirements and develop different types of information accordingly. It is anticipated that all the information components developed could have some application in programme management environments whilst around 50% of them could conceivably be applied to project environments. The distinction is not always clear however, as larger 'mega-projects', such as the Channel Tunnel assume some programme characteristics and the term multi-project management has yet to be given an accepted industry-wide definition. Whilst all information components *could* be relevant on a programme, not all components should be used. Managers must agree performance criteria with the stakeholders and implement appropriate mechanisms to monitor those criteria (Wateridge, 1998). There is also significant room for the customisation of each information component in terms of the way information is displayed and the way in which the data is generated. Organisations should therefore view the information components presented as a base line from which to develop and apply as

appropriate. Finally, in describing the components, it will be assumed for the sake of simplicity that they will be used in a programme management environment. Overall, the Dashboard aims to provide the management with the ability to:

- Monitor critical tasks
- Assist in tracking factors critical to customer satisfaction
- Observe trends across and within projects
- Set tolerance levels
- Provide early warning signals
- Assist in planning for continuous improvement
- Holistically communicate the status of the project / programme

The following sections explain each information component in more detail.

5.3.2 INFORMATION COMMON TO ALL COMPONENTS

Some basic information is common to all information components. For example, the Management Comment box allows for the qualitative analysis and interpretation of the largely quantitative data presented. This provides an opportunity for management or analysts to bestow insight into the following types of background information that would not be apparent to the casual reader of the display:

- Corrective actions taken where performance has deviated beyond recognised tolerances.
- An explanation where the quantitative data contains an anomaly, which requires further understanding
- To establish a link when information can be cross-referenced from one or more information components in order to develop a more sophisticated understanding. For example, to highlight the impact of authorising a project idea in the Project Evaluation Process and the impact that this will have on Resource Availability.

Secondly, in all information components the 'Owner' is identified. The owner is the person who can provide more information about a given topic. For example, a member of the programme management office may be identified as the owner of the Programme Delivery Plan, which maps out the delivery of projects into business functions across time. This signposting is important as the Dashboard provides a summary view of status and will often initiate a demand for more information.

5.3.3 STRATEGY MAP

Although a Strategy Map was not included in the original Dashboard at the PSO, communication of strategy to staff is advocated by many researchers. For example, Lee (2001, p.2) argues that "Individuals and teams in an organization [sic] seeking to implement a strategy must understand not only the strategy itself but also the reasons for it and the measures of its success. Only a communication system anchored in the company's external environment can provide that information in a compelling way and place it in a tenable context." It therefore seems appropriate that a high-level reporting system, such as the Dashboard, whether applied at project or programme-level, should contain some graphical

representation of the organisation's strategy. In this way, progress towards strategic objectives can be monitored, strategic alignment of projects can be demonstrated and teams and individuals can see how their work fits into the bigger picture.

A range of different graphical displays can be used to communicate strategy. All have some form of cause and effect structure, for example: the Balanced Scorecard, Strategy to Execution Matrix (STEM), Performance Prism, EFQM Model or Ishikawa diagram. The Balanced Scorecard Strategy Map is employed as an exemplar here due to its ubiquitous nature.

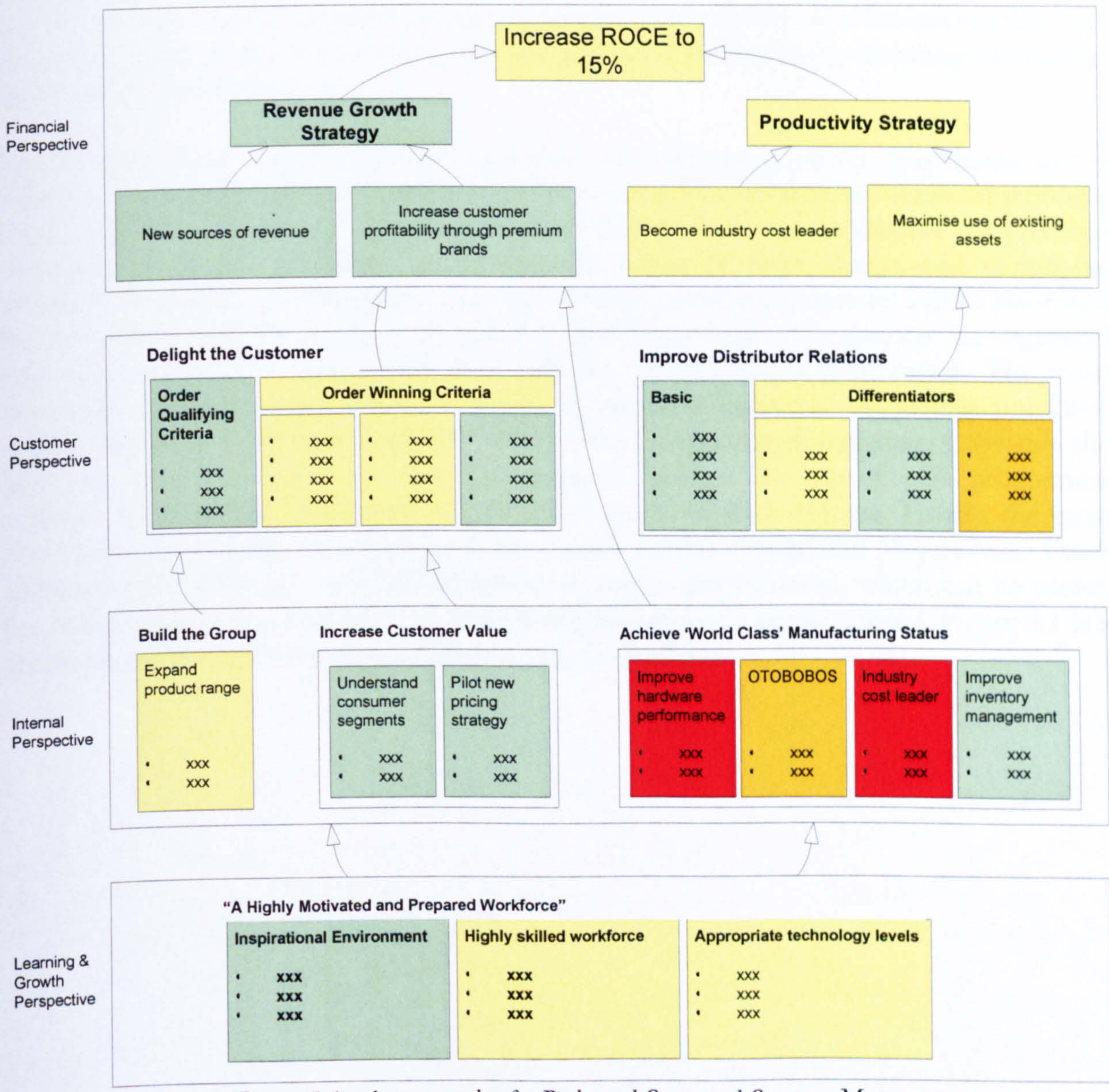


Figure 5.1. An example of a Balanced Scorecard Strategy Map (adapted from Kaplan & Norton, 2001).

Notice that ROYG status has been used again to indicate the status of progress towards strategic objective as compared against the business plan. It is recommended that formal procedures are documented to determine status at this level.

5.3.4 PROJECT STATUS

The Project Status section of the Dashboard is designed around the principles of Work Breakdown Structures (WBS) and organisation charts (Craig, 2000). Lawrence & Lorsch, (1967) state that an organisational chart shows authority relationships in the chain of command, formal channels of communication, formal work groups and formal lines of accountability. Youker (1993), when referring to the Logical Framework Method (LFM) developed by The American Aid Agency argues that the production of a hierarchy of project objectives acts as a communication tool and a clear target for the project team. The WBS proposed here is in many ways similar to the LFM. During this research it has been found that information presented in such a fashion acts not only as a communication tool and clear target to the project team but to all project stakeholders, including customers, sponsors and suppliers.

The Project Status section typically represents the main body of the Dashboard and is salient to both project and programme-level reporting. Due to the constraints of writing a relatively concise thesis, it is beyond the scope of this document to discuss the potential variations of each information component in terms of their design and underlying processes. However, for illustrative purposes, a range of different options will be presented for this component. Assuming a programme-level implementation, projects are organised into a hierarchical structure, with each column representing a programme. The most important programmes (as identified by the organisation/owner of the change portfolio) can be displayed on the left hand side of the WBS, decreasing in importance towards the right-hand side and the most important projects listed at the top of each programme column, decreasing in importance towards the bottom of each column. Finally, the most important projects can be represented via a thick border around the project box. These techniques allow for the swift identification of project prioritisation, which can be useful, for example if there is a resource conflict in the absence of a senior official. Figure 5.1 is a partial example of a Project Status information component:

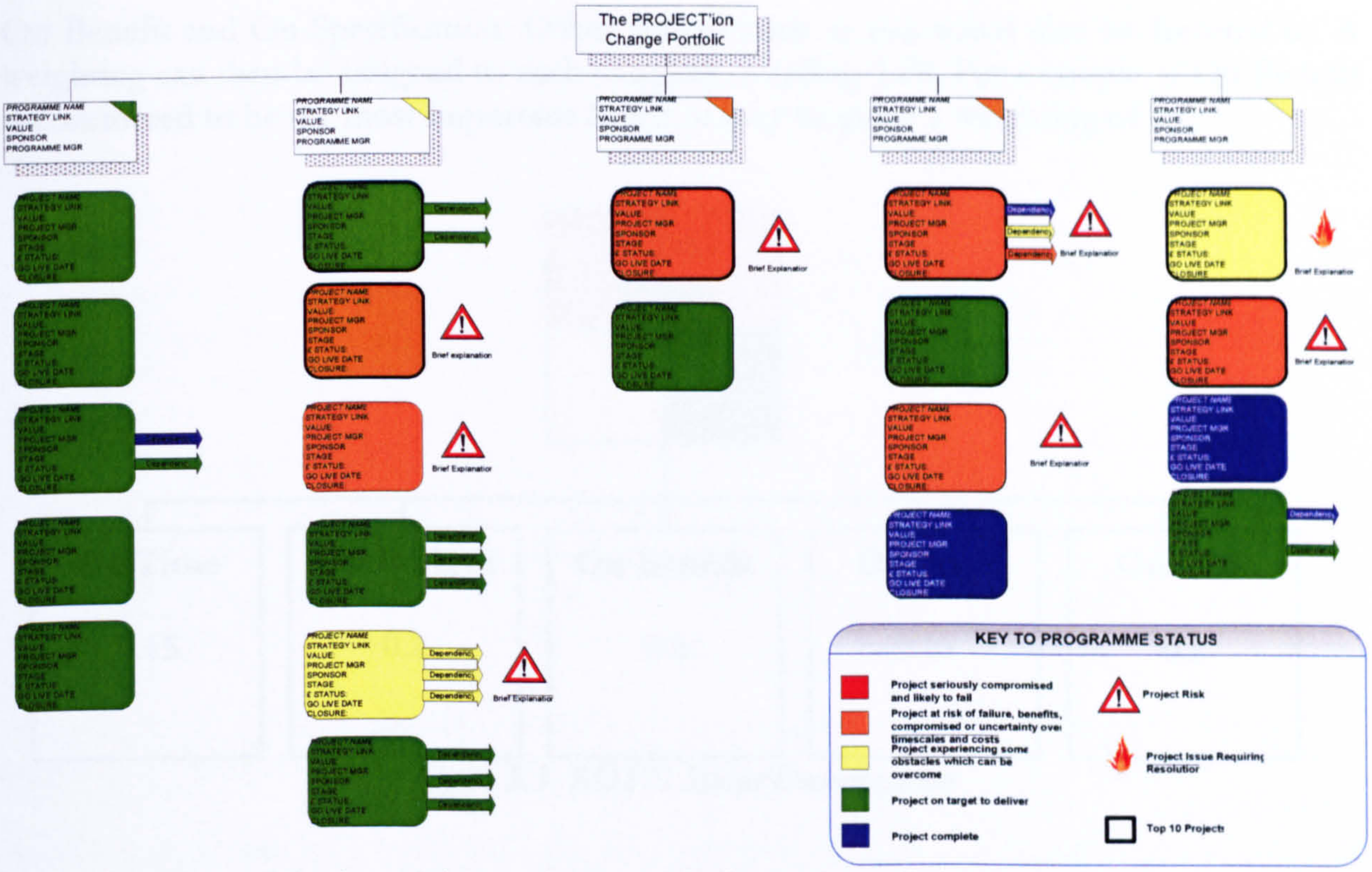


Figure 5.2. A partial representation of the Project Status Information Component

5.3.4.1 Colour Classifications

Interestingly, the PSO originally used the three traffic light colours to indicate status. This system was known as the RAG status (Red, Amber and Green) but was somewhat ineffective. Project Managers would tend to use Amber as a catch all status for use in anything other than extreme circumstances. This behaviour is consistent with the psychological behaviour behind Likert scales and is one of the problems associated with subjective reporting (Maurer & Pierce, 1998). A fourth colour, Yellow has therefore been added, to form the ROYG classification. The four states are defined as follows: red means the project has been seriously compromised and is likely to fail; orange that the project is either at risk of failure because the proposed benefits have been compromised or there is uncertainty over timescales and costs; yellow that the project is experiencing some obstacles which can be overcome and green, that the project is on target for delivery. A fifth colour, blue, is also used to denote a complete project. A project is represented for one month after it has been completed.

Block arrows are also used to indicate key project dependencies. A similar ROYG status is employed for dependencies. The definitions are as follows: red, the dependency will not deliver; orange, the dependency is unlikely to deliver to timescales, cost or benefits; yellow, the dependency is slipping or experiencing obstacles and green, the dependency is on target for delivery. Blue is again used to signify a completed dependency.

Organisations may decide that the Project or Programme Managers should be left free to determine the status of their work (as in the PSO). However, more formal guidelines for determining the ROYG status of projects can be applied. One method for achieving this is to decompose each project into key areas. The OTOBOBOS acronym may be applied here (Financial Services Organisation mini-case study), which stands for On Time, On Budget,

On Benefit and On Specification. Other factors such as risk could also be factored in. A weighting can then be assigned to each category, totalling 1.00. For example, if On Benefit is considered to be the most important factor, it may be given a weighting of 0.3:

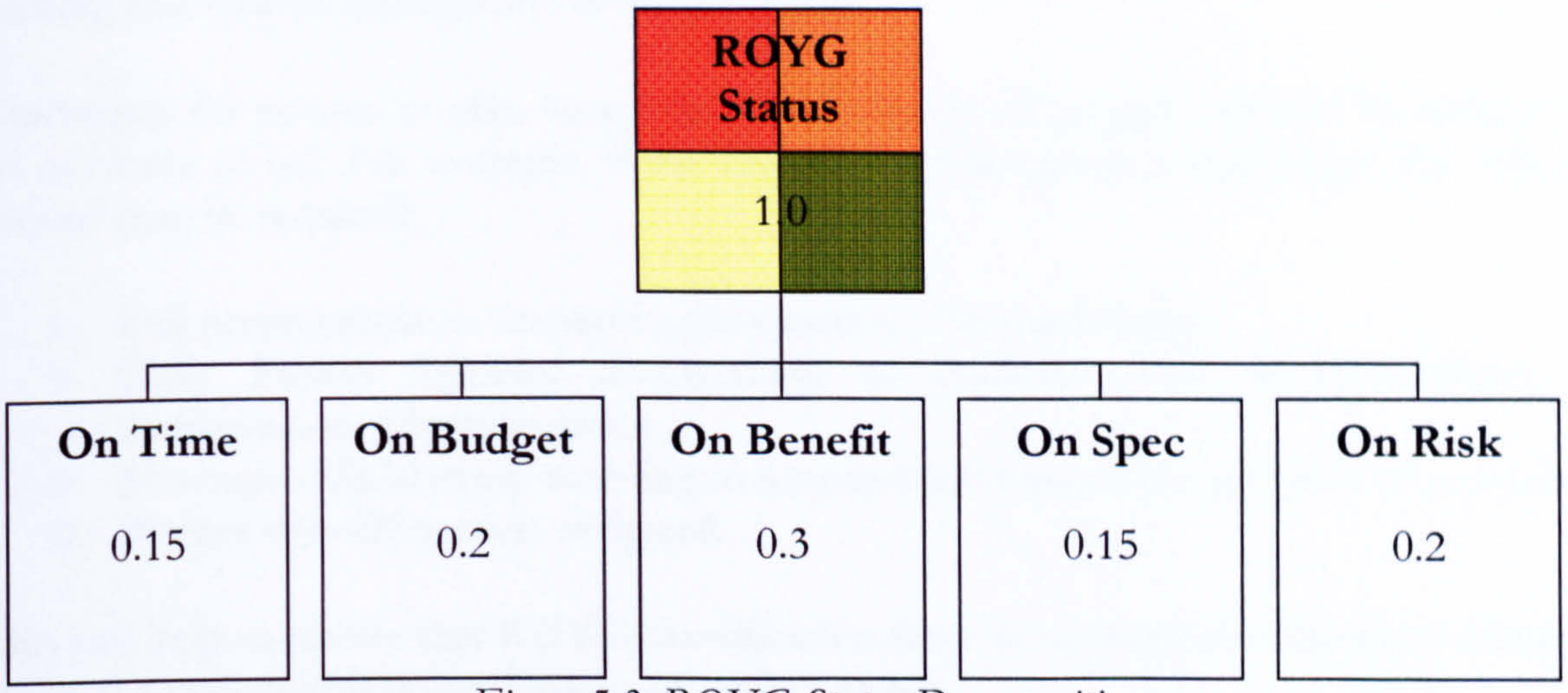


Figure 5.3. ROYG Status Decomposition

Guidelines should then be issued to aid the Project Manager in allocating a score for each section. For example:

On Time	
Score	**Status**
0.00 – 0.05	Project is >25% behind schedule
0.051 – 0.1	Project is between 6 – 25% behind schedule
0.11 – 0.15	Project is ahead or on schedule, or a maximum of 5% behind

Table 5.1. A flexible mechanism for the allocation of On Time performance data

The scores are then summed, providing a maximum score of 1. ROYG status is then assigned. For example:

Score	Recommended ROYG State
0.00 - 0.24	RED
0.25 – 0.49	ORANGE
0.50 – 0.74	YELLOW
0.75 – 1.00	GREEN

Table 5.2 Guidelines for the allocation of ROYG status.

There are several benefits to this process. Firstly, ROYG status is linked to quantifiable, objective data, not just informal conversations between Project Manager and their superior. Secondly, the system is useful for new project managers as it provides more guidance than an arbitrary system. Thirdly, it negates a situation where Project Managers avoid using

green and red states. Finally, it maintains a degree of flexibility for Project Managers because they can allocate their own score, within certain parameters. However, the system is more complicated than a straight-forward project/programme manager assessment and the data may therefore take more time to generate. Greater complexity also requires more training and may be more prone to human error.

Guidelines for actions to take based on ROYG status of project can also be defined (but do not have to be). For example, if the Project has been given a Red status, the following actions may be required:

- Full project audit to determine the cause(s) of the red status.
- Daily Project Sponsor involvement to facilitate swift decision-making and authorisation, where required.
- Meeting at 08:30 every morning to monitor and control the progress of activities.
- Budget sign-off powers reviewed.

This can help to ensure that ROYG classification leads to appropriate corrective action and hence the expeditious normalisation of project status.

ROYG status can also be shown for the previous month or two months. This can be achieved by using a small spot of colour in the ROYG status box, and would show whether the project is in decline or recovery.

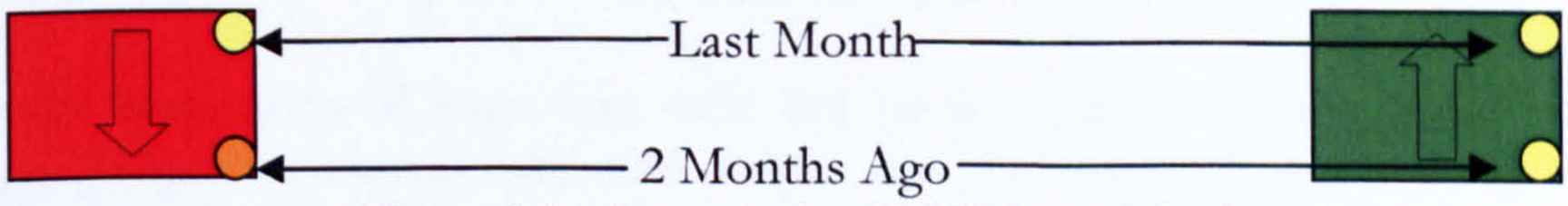


Figure 5.4. An example of ROYG trend display.

Alternatively ROYG status can be used to highlight the status for the previous and the forthcoming month. In this way the Project Manager can communicate the impact of a impending project issue.

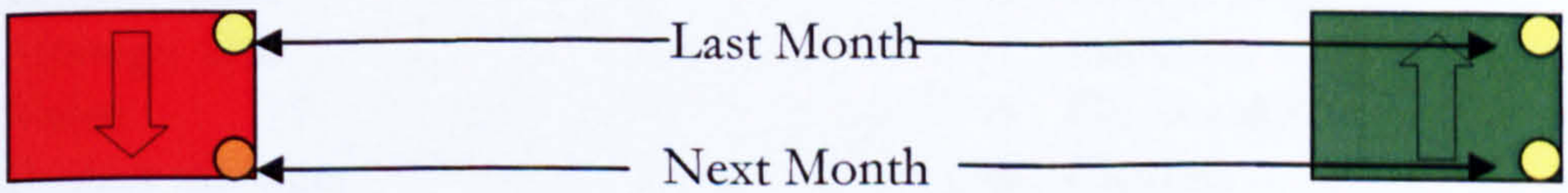
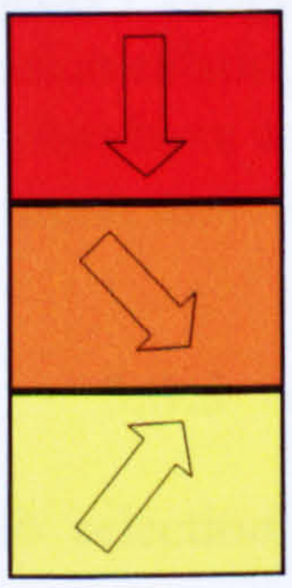


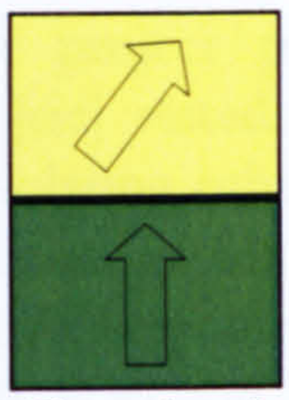
Figure 5.5. An example of ROYG trend display.

Finally, to ensure that those employees who are colour blind (which affects 1 in 20 men) are not at a disadvantage, ROYG status can be indicated by using transparent arrows. For example:



Red

Orange



Yellow

Green

Figure 5.6. Factoring the requirements of colour-blind people into the design of the Dashboard.

5.3.4.2 Icons & Other Information

A number of icons are also used within the project status display. For example,

Project terminated

Project issue requiring resolution

Project risk

Figure 5.7. Additional icons and their meanings

Due to the limitations of page size only key project risks and issues can be reported. However, programme-level risks and issues can be reported as part of a different information component.

Within each project box, a range of textual information is displayed. As with all the information components, the precise content should be developed and customised by case study organisation, however information typically presented includes:

- Project name
- Strategic link
- Value
- Project manager
- Project sponsor
- Project stage
- Financial status
- Go live date
- Closure

In summary, the Project Status information component is typically the central information component. It contains a lot of information but has been designed so that it can be read for different levels of information. For example, a quick glance will indicate whether there are any red projects / programmes that require attention while a more in-depth reading will provide information relating to the financial status of the project and the number of serious risks and issues that have arisen. This information, coupled with ROYG trend information could lead to a much more in-depth insight into the status of the project/programme.

5.3.5 PROJECT EVALUATION PROCESS

Project portfolio selection is "the periodic activity involved in selecting a portfolio,

from available project proposals and projects currently underway, that meets the organization's [sic] stated objectives in a desirable manner without exceeding available resources or violating other constraints." (Archer & Ghasemzadeh, 1999, p.208). Project portfolio selection is one of the differentiating characteristics between multi-project management and programme management because in multi-project management, project evaluation and selection processes either fall outside of the programme manager's responsibility or the processes do not exist. In true programme management environments, the selection processes operate as a multi-stage filtering process. Whilst the number of filtering stages will vary, along with assessment criteria and registration mechanisms, organisations should be easily able to modify the Figure 5.8 to their bespoke requirements.

Projects in Registration

	Ops 1		Ops 2		Ops 3		Ops 4		Ops 5		SSC 1		SSC 2		TOTAL	
On Register	0		0		0		0		0		0		0		0	
YTD	0		0		0		0		0		0		0		0	
	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben
Registered Value (£m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Pre-Qualification Projects

	Ops 1		Ops 2		Ops 3		Ops 4		Ops 5		SSC 1		SSC 2		TOTAL	
Waiting	0		0		0		0		0		0		0		0	
Work in Progress	0		0		0		0		0		0		0		0	
Waiting Approval	0		0		0		0		0		0		0		0	
	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost	Ben
"Ball-park" Value (£m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Qualification Work in Progress

Link to Strategy	Programme	Project Title	Cost / Status: Waiting Qual	Work In Progress	Waiting Approval	£m: Cost	Ben
			✔				
				✔			
					✔		
					✔		
			✔				
					✔		
	QUALIFICATION TOTAL					0.0	0.0

Qualification Work Approved for Delivery

Link to Strategy	Prog.	Project Title	Project Mgr	£m: Cost	Ben
	TOTAL PROJECTS PASSED TO DELIVERY			0.00	0.00

Figure 5.8 An example of the Project Evaluation Process information component.

This basic design shows the flow of projects through the evaluation and selection process and is independent of the value metrics employed and other underlying processes. It could be developed further by representing other aspects of the process, such as spend against strategic objective, or remaining capital for each strategic bucket.

5.3.6 RESOURCE AVAILABILITY

The Resource Availability information component provides a summary of the capacity of a range of different job categories (such as project managers) and if necessary of other constraints, (such as machinery) in the department and the demand for their services. Resource management is a key feature on large projects, and in multi-project and

programme environments. Figure 5.9 provides an example of the display. The display shows demand for resources that are currently allocated to projects (the green section of each histogram bar), demand for projects that have been assessed and approved but have not yet started (the yellow portion), and the overall capacity, or slack for that resource (the red segment). The demand for different resources can be taken from accounting data or aggregated project resource plans. The display is independent of delegation model / organisation structure.

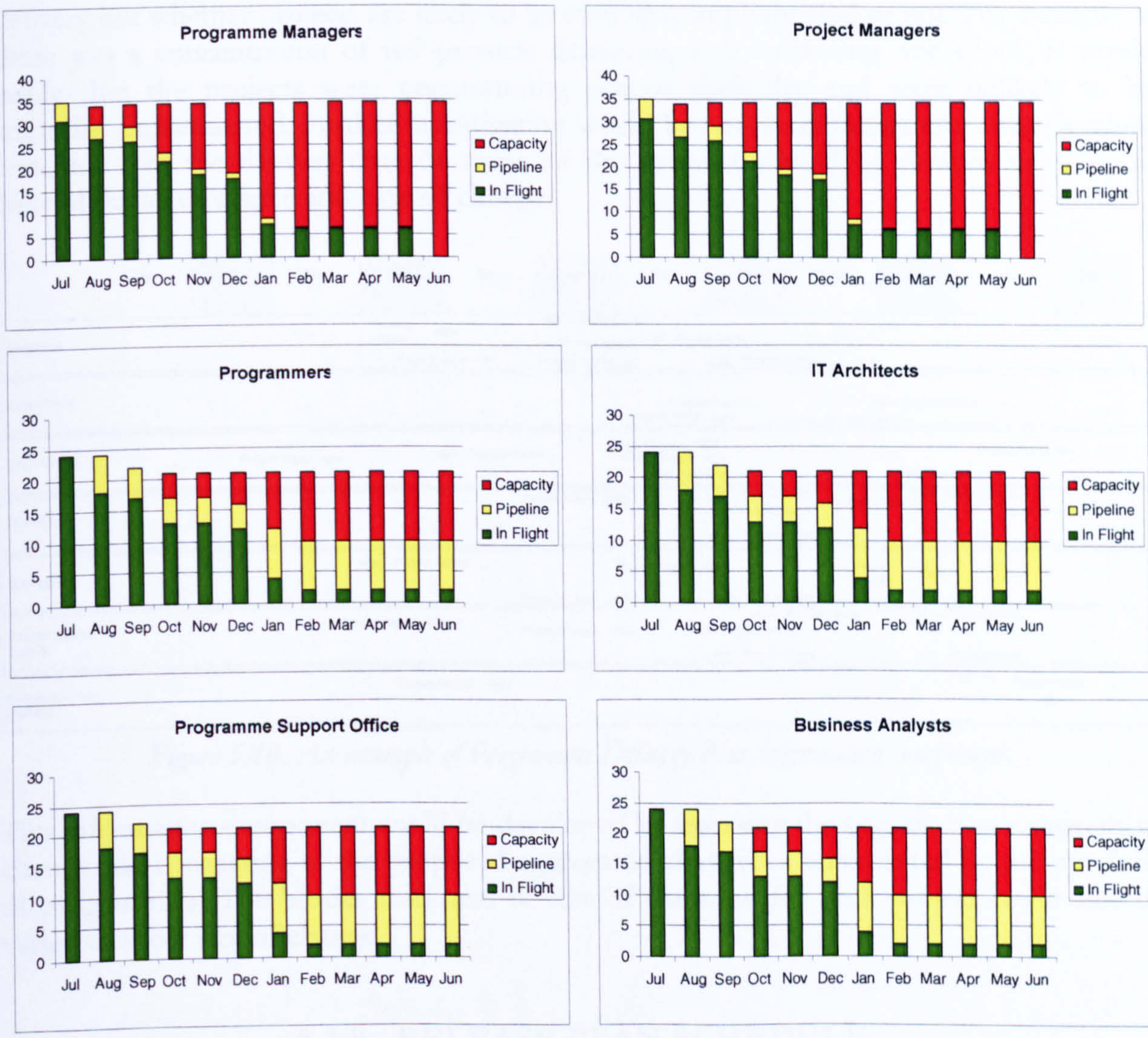


Figure 5.9. An example of the Resource Availability information component.

The profile of each of these displays is characteristic of the environments assessed. Resource availability for at least the current month was typically nil. As capacity is flexed in-line with demand through the hiring of consultants and contract staff, over capacity was rarely an issue. However, as the time horizon is broadened the profile suggests that a number of projects are due for completion and that the staff working on those projects have yet to be re-allocated (as seen in the red section of each histogram bar). These staff will be allocated onto other projects as they are approved.

5.3.7 PROGRAMME DELIVERY PLAN

The Programme Delivery Plan takes information from the Project Status component and represents the impact of the change plan across time and by business operation. Thus, if a number of projects are set to deliver in the same time period, this concentration will be highlighted. A decision can then be taken as to whether the volume of change breaches the organisation's capacity to change. The display is presented as a rolling 12 month view, less 2/3 months to show achievements, so that the horizon is 9/10 months away. ROYG status is incorporated into the display to highlight not only where there is a concentration of delivery but whether projects are likely to be smoothly implemented or not. For example, if there was a concentration of red projects delivering into marketing operations, it would imply that the projects were encountering serious difficulty and were unlikely to be smoothly implemented. Further investigation would be necessary but careful analysis might conclude that the delivery date of some of the projects should be delayed in order to control the level, degree and ease of change.

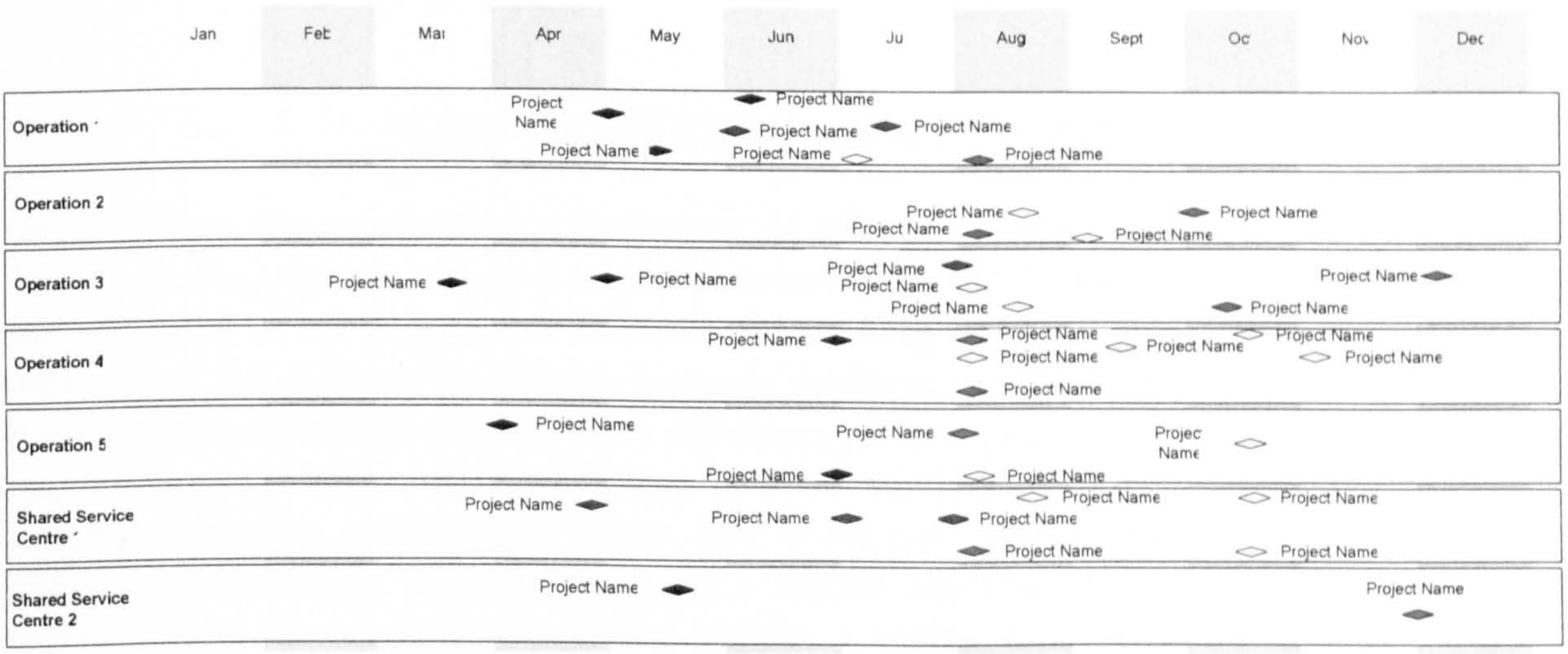


Figure 5.10. An example of Programme Delivery Plan information component.

This information component could be developed by assessing the organisation's capacity to change and comparing to the proposed aggregated change, as represented by the portfolio of programmes. The border thickness or size of diamond for each project could also be varied to show size of change.

5.3.8 RELEASE PLAN SCHEDULE

The Release Plan Schedule represents, in effect, an internal diary. This shows key activity from an internal perspective and differs to the Programme Delivery Plan, which has a customer focus. Thus in an IT environment, the Release Plan shows when various information systems will be off-line, when new systems will be uploaded (but will not necessarily be available for users), testing phases and finally the go live dates. This type of information is quite specific to systems development environments and will not be relevant to all organisations. The following is a current example:

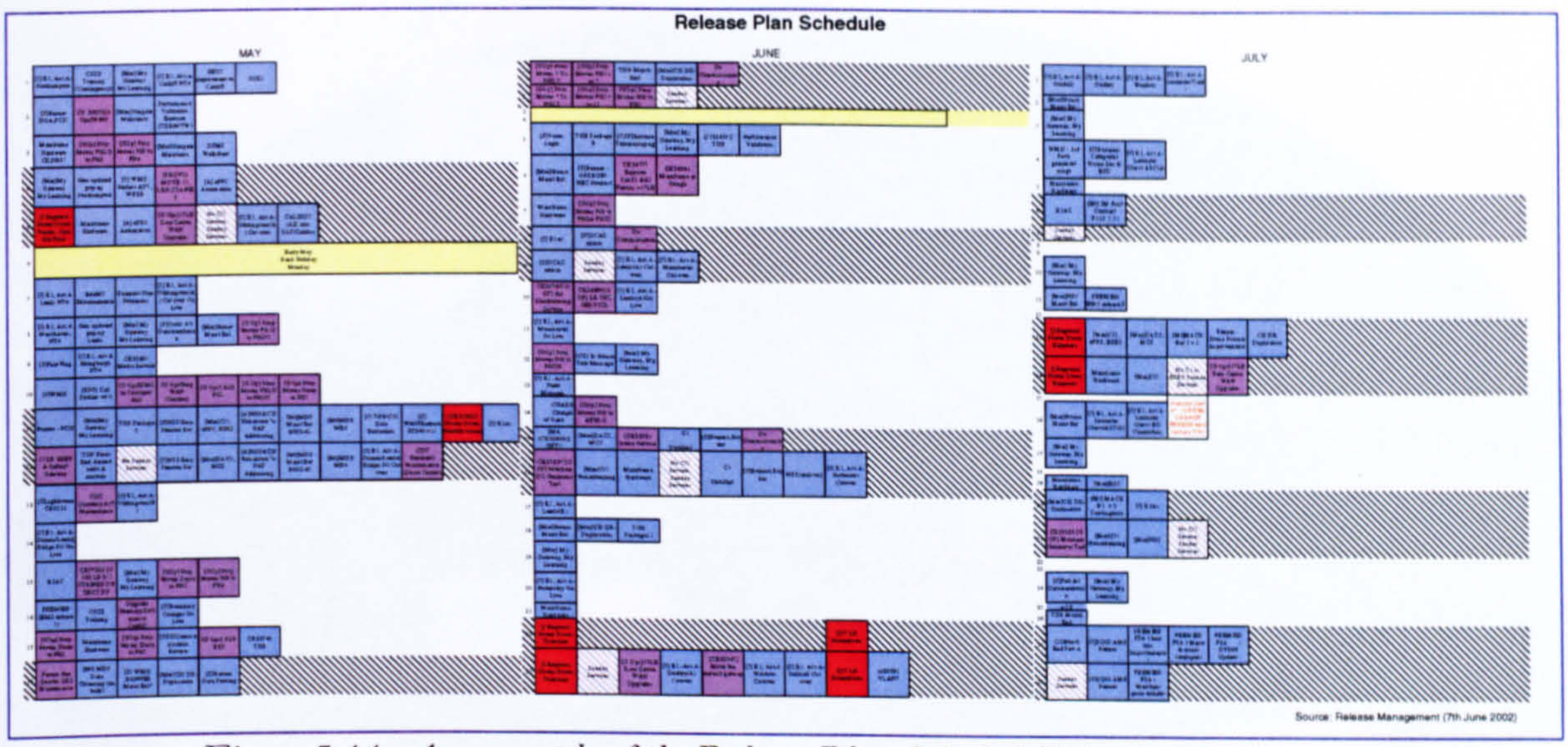


Figure 5.11. An example of the Release Plan Schedule Information Component.

5.3.9 SCANNING & FUTURIZING

Organisations executing large programmes of strategic change, may consider mechanisms for monitoring the internal and external environment for developments that could impact the execution of the programme. Known as scanning and futurizing, it can be an effective mechanism for collating embryonic business intelligence at the highest level. For example, if a key competitor is rumoured to be developing a new product, its impact on the strategy and hence the programme of work may be assessed. Thiry, (2002, p.223) argues that "The 'emergent' inputs, which will trigger the need for change, should also concern the programme manager; whether they are a simple adjustment in project parameters, or whether it is the circumstances that initiate a whole new series of actions". This is supported by Principal Consultant and member of the PROJECT'ion Project Steering Group, who stated that "This type of information is only being used by a few organisations but in my opinion it is extremely important" (PROJECT'ion Steering Group Meeting, 13/03/2003).

The Scanning & Futurizing component can therefore be viewed as an information repository for industry and intra-organisation intelligence. This intelligence can then subsequently be assessed to determine its validity and classification as either a programme risk or programme issue and will be dealt with appropriately. An example of the sort of intelligence that may require further investigation is the activity of regulatory bodies, or a key member of staff being headhunted. Such an information component is more appropriate to those organisations working in dynamic environments where organisation strategy tends to follow a more emergent path than a planned one as it supports double-loop learning (Argyris & Schon, 1978). Figure 5.12 provides an example of the display.

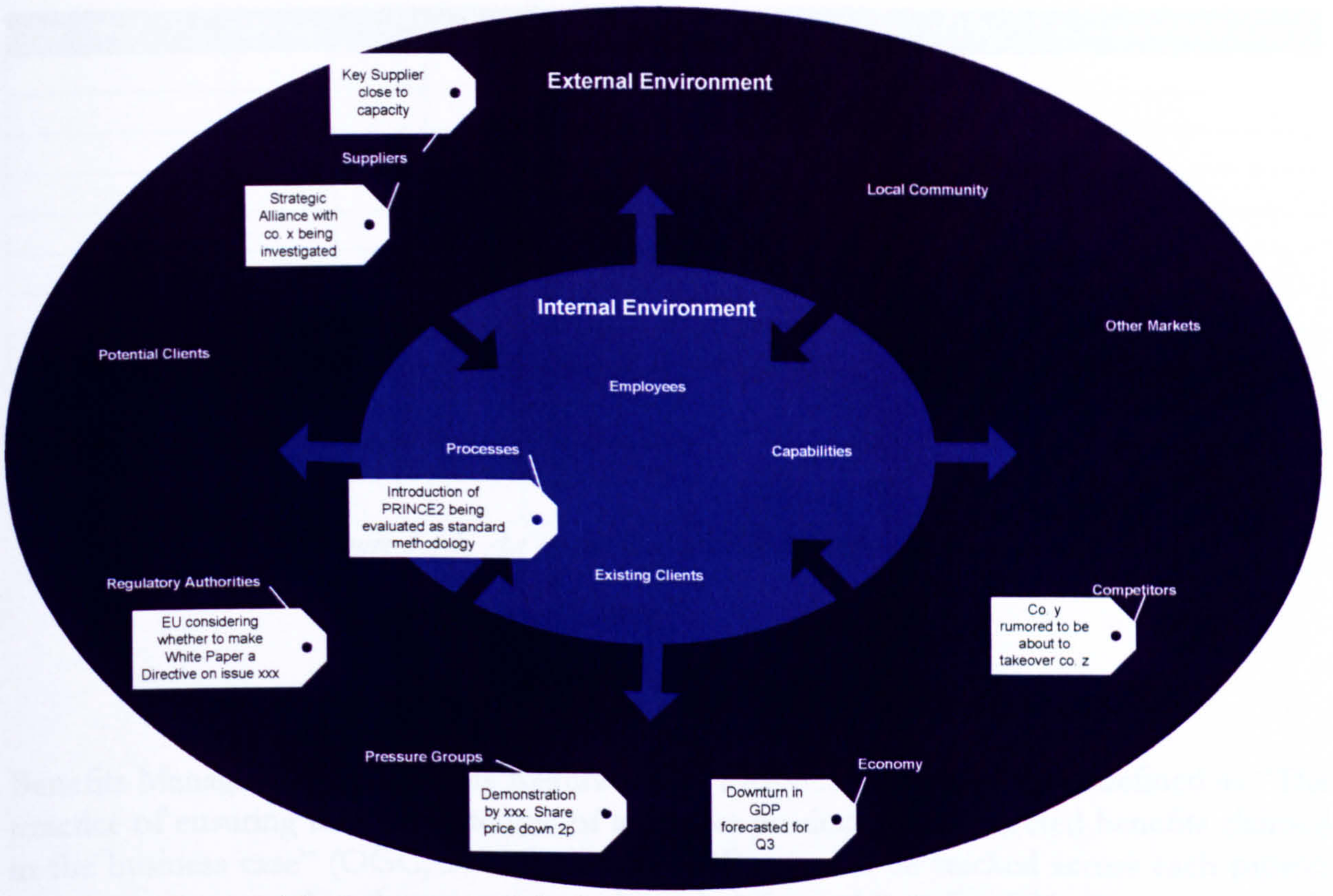


Figure 5.12. An example of the Scanning & Futurizing Information Component.

5.3.10 PROGRAMME-LEVEL RISK & ISSUE MANAGEMENT

Risk Management has been briefly discussed in section 5.3.4 Project Status, which covered the status and key information relating to each project in the programme. In section 5.3.4 it was stated that key project-level risks could be communicated. This section deals with programme-level risks. Essentially, risk management at the programme level should follow the same process as at the project level. Having identified the risk it should be analysed to determine the likelihood of it impacting and the size of the impact if it does. By assigning a score (such as between 1 and 5) to each of these factors and multiplying them together, each risk is given a priority rating. Action can then be taken against each risk: accept it (in the case of low priority risks), mitigate it (reduce likelihood of impact or size of impact), neutralise it (cancel it out completely) or transfer it (for example by insuring against it).

ROYG classification can again be used, to delineate risks of different priority. For example, risks receiving a priority score of greater than 20 may be considered red; between 14 and 20 amber; 8 and 14 yellow and below 8 green. Whilst quite a number of programme-level risks can be displayed on the Dashboard, space is ultimately limited. Organisations may therefore choose to only communicate red and amber risks as these represent the most serious risks likely to impact the programme. It is unlikely in any case that programme staff will be able to remember a long list of risks, so it may be considered prudent to communicate only salient risks. A typical display (without ROYG status), can be seen in Figure 5.13. A similar display can also be used to monitor programme-level issues.

Risk	Likelihood	Impact	Priority	Actior (Accept, Mitigate, Neutralise, Transfer)	Owner	Date	Actions to take if Risk Impacts

Figure 5.13. An example of a Risk Management Table.

5.3.11 BENEFITS MANAGEMENT

Benefits Management or Benefits Realisation in PRINCE2 terminology is defined as "The practice of ensuring that the outcome of a project produces the projected benefits claimed in the business case" (OGC, 2002, p.309). Benefits should be tracked across each project and programme, and in theory aggregated to identify total benefits. This is not necessarily always true and can be difficult in situations where, for example, brand enhancement or cost reduction projects fall across different programmes. Such a topic however, is beyond the scope of this thesis and could form a PhD in its own right. Suffice to say that benefits should be tracked from the project-level up.

In the example below, cash flow is also monitored. In this simplest of examples, a series of programmes are authorised and then, after a time the benefits begin to accrue until payback is achieved. In reality, programmes would start at different times and would have different payback periods. Some programmes, such as those imposed by regulatory authorities may have no payback. As such the cash flow diagram is likely to oscillate around a mean, with resources being deployed onto new programmes as benefits from legacy programmes accumulate.

Many organisations use a system known as Strategic Buckets to ring fence resources for different strategic objectives. For example an organisation may allocate £1m to IT development, £2m to new product development (NPD), £1.5m to marketing and so on. The allocation of capital should be in line with prioritisation of strategic objectives and should prevent an over-emphasis on fashionable objectives or those that fall into the remit of a particularly fervent Director. In more mature programme management environments, the strategic buckets system also allows for variation in process. For example, NPD projects may be subject to a different evaluation process compared with business process re-engineering (BPR) projects. Figure 5.14 shows a partial display for the Benefits Management information component.

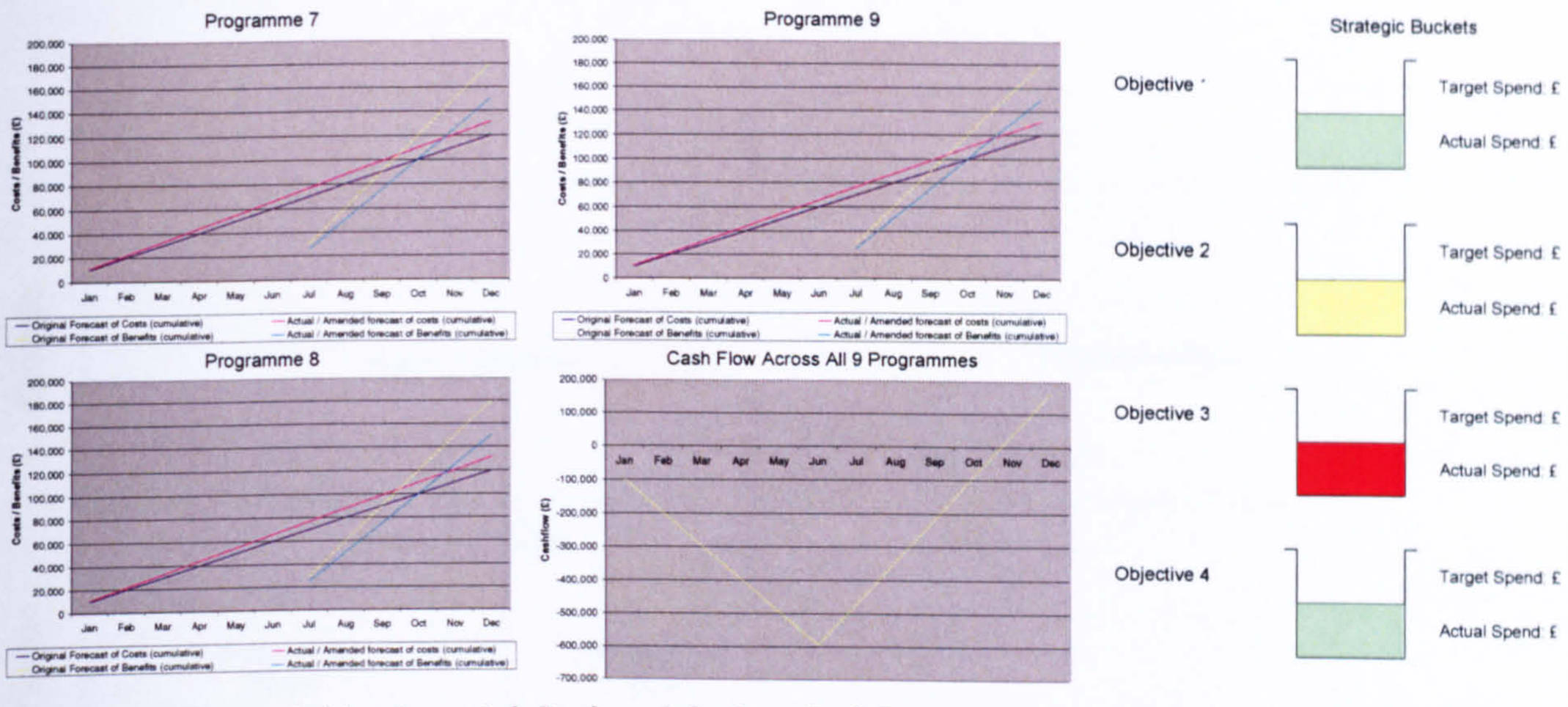


Figure 5.14. A partial display of the Benefits Management information component.

5.3.12 BALANCE OF THE PROGRAMME

Cooper et al (2001) suggest that a key factor in the long-term development of an organisation is its ability to maintain a balanced portfolio of development work. Balance can be viewed across many different dimensions depending on organisation context and typically take the form of a 2x2 or 3x3 matrix. Combinations of relevant factors are almost infinite but by way of example:

- Distribution of projects over time by strategic, tactical and mandatory classifications
- Market newness Vs Technical newness
- Risk-Benefits Matrix
- Boston Consulting Grid (BCG)

Cooper et al (2001) recommend that each organisation select the two or three perspectives that are most relevant to the organisation to ensure that each perspective retains some impact, and is not lost in a sea of matrices. The principal benefit of developing these perspectives is that the organisation does not develop a programme(s) of work that are focused for example on short-term, low-risk projects/programmes or projects/programmes that involve developing new technologies for hitherto undeveloped markets. Developing a balanced programme/multi-programme of work they argue is the key to sustainability as some projects should be 'safe' projects with a virtually guaranteed return whilst others may contain an acceptable level of risk given that it is these projects which represent breakthrough knowledge and sustain the organisation in the longer-term. Figure 5.15 Distribution of programmes over time by strategic, tactical and mandatory classifications, is an example of such a display.

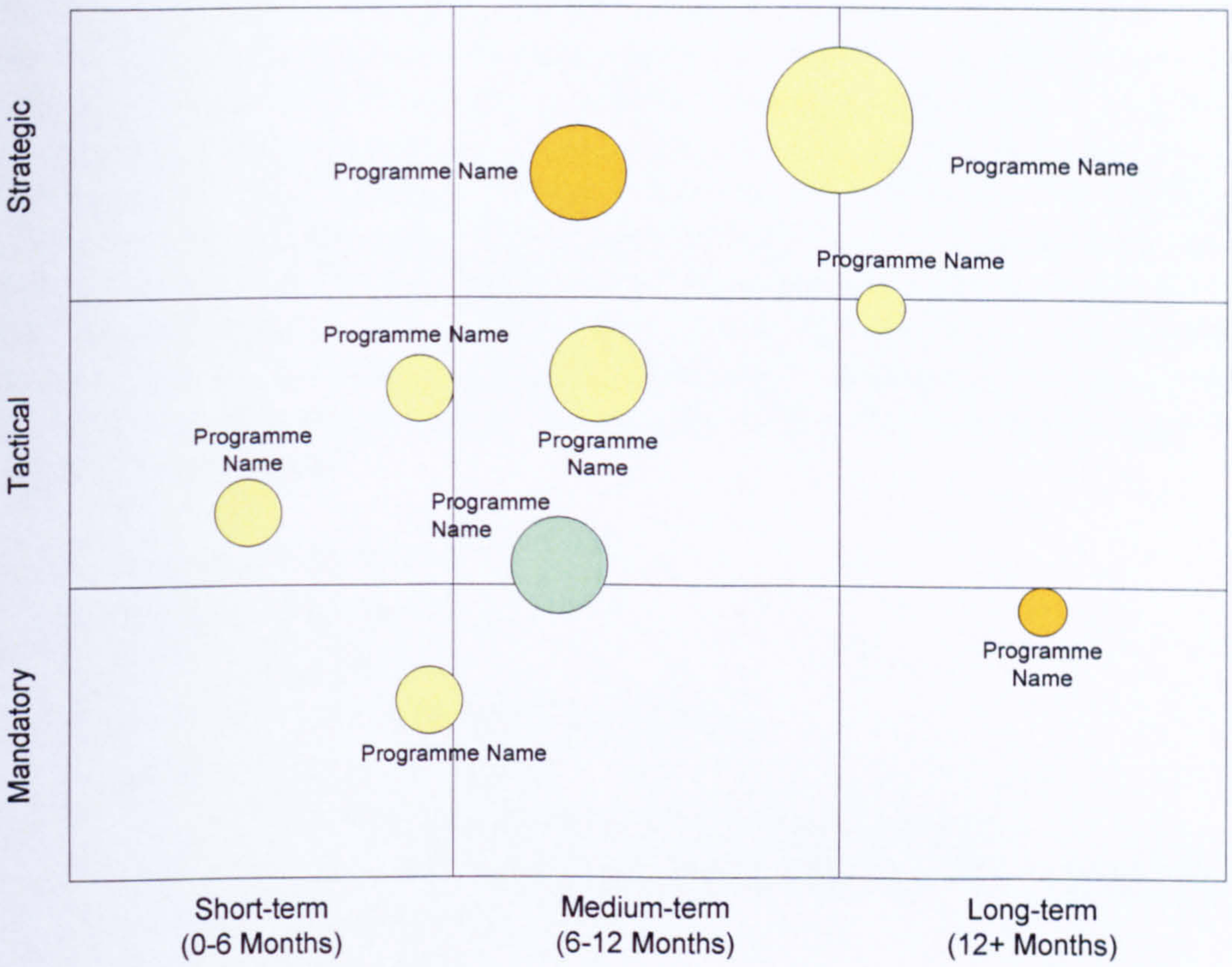


Figure 5.15. Distribution of Programmes over time by strategic, tactical and mandatory classifications.

The reader will note that the ROYG classification scheme is continued to denote project status and that the size of the bubble indicates the relative capital investment in the project. Thus a strategic, high-risk project that is represented by a large red bubble should be cause for serious concern. By using bubble size and colour, four dimensions of information are represented, helping to portray a richer image of programme status. If considered appropriate, various performance measures could be used to track the organisation's effectiveness at delivering different types of project. For example, performance may be excellent for low-risk, straight forward projects but may be poor for the less well-defined, strategic projects. Further research may instigate training and development initiatives to address the problem.

5.3.13 OTHER INFORMATION COMPONENTS

The range of information available in programme management environments is almost unlimited, though will be determined by a number of factors, including:

- Strategic objectives
- Industry
- Organisation structure
- Maturity of programme management process
- Quality / experience of analyst

As such, the purpose of this chapter has been to demonstrate the diversity of information available to organisations seeking to implement similar systems. It would be erroneous to offer a prescriptive formula for the content of Dashboards given these variables. Indeed, this viewpoint is supported by other academic research. An Exploratory study of fifteen strategic programmes across seven industry sectors by Partington et al (2004) suggests that programme environments are more likely to be characterised by heterogeneity than homogeneity. This finding is consistent with the work of Lycett et al (2004) who argue that a 'one size fits all' approach to programme management is based on a flawed assumption of homogeneity. This is also supported by the experience of the author in implementing Dashboard solutions across a wide range of organisations. Given the constraints of writing a thesis, it is not possible to present a taxonomy of information components. However, to provide a more comprehensive account, the author has seen or developed the following types of components:

- Supplier capabilities
- Supplier stock-levels
- IT Strategy Map
- Project status for small change initiatives
- Programme Achievements
- Programme News (presented as a newspaper front page)
- The performance of operational processes that fall within the jurisdiction of the programme department
- Project Prioritisation
- Staff Development
- Programme Actions
- Technical Information (such as Application Change Capacity)
- Transition Plans, where project staff have been TUPE'd (Transfer of Undertakings Regulations (Protection of Employees)) from one organisation to another
- Process, IT, culture and capability integration plans as part of the Mergers & Acquisitions (M&A) process

The following table is included to provide an indication of which information components are likely to be relevant in project, multi-project and programme management environments. As previously discussed, the distinction is not always clear as larger projects adopt some programme characteristics.

Information Component	Relevant to… Project Environment?	Multi-project environment?	Programme Environment?
Strategy Map	Y	Y	Y
Project Status	Y	Y	Y
Project Evaluation Process			Y
Resource Availability	Y	Y	Y
Programme Delivery Plan		Y	Y
Release Plan		Y	Y
Scanning & Futurizing			Y

Risk Management	Y	Y	Y
Issue Management	Y	Y	Y
Benefits Realisation	Y	Y	Y
Balance of the Programme			Y
Supplier Capabilities	Y	Y	Y
Supplier Stock Levels	Y	Y	Y
IT Strategy Map		Y	Y
Project status for small change initiatives		Y	Y
Achievements	Y	Y	Y
News	Y	Y	Y
The performance of operational processes		Y	Y
Project Prioritisation		Y	Y
Staff Development	Y	Y	Y
Actions	Y	Y	Y
Application Change Capacity		Y	Y
TUPE Transition Plans	Y	Y	Y
M&A integration plans		Y	Y

Table 5.3. An indication of the applicability of information components to project, multi-project and programme management environments (Developed by the author).

5.4 PMF UNDERPINNING THE DASHBOARD

In section 5.3, key information components developed by the Researcher to provide visibility over programme management environments were presented based on PSO data, a review of extant literatures, a series of mini-case studies and expert interviews. In this section, the performance measures used to complement these information components are presented.

In Chapter 3, Literature Review, the development of the field of project performance management was explored. As an output of this synthesis of the literature, a performance measurement framework (PMF) has been developed and is presented in Figure 5.16.

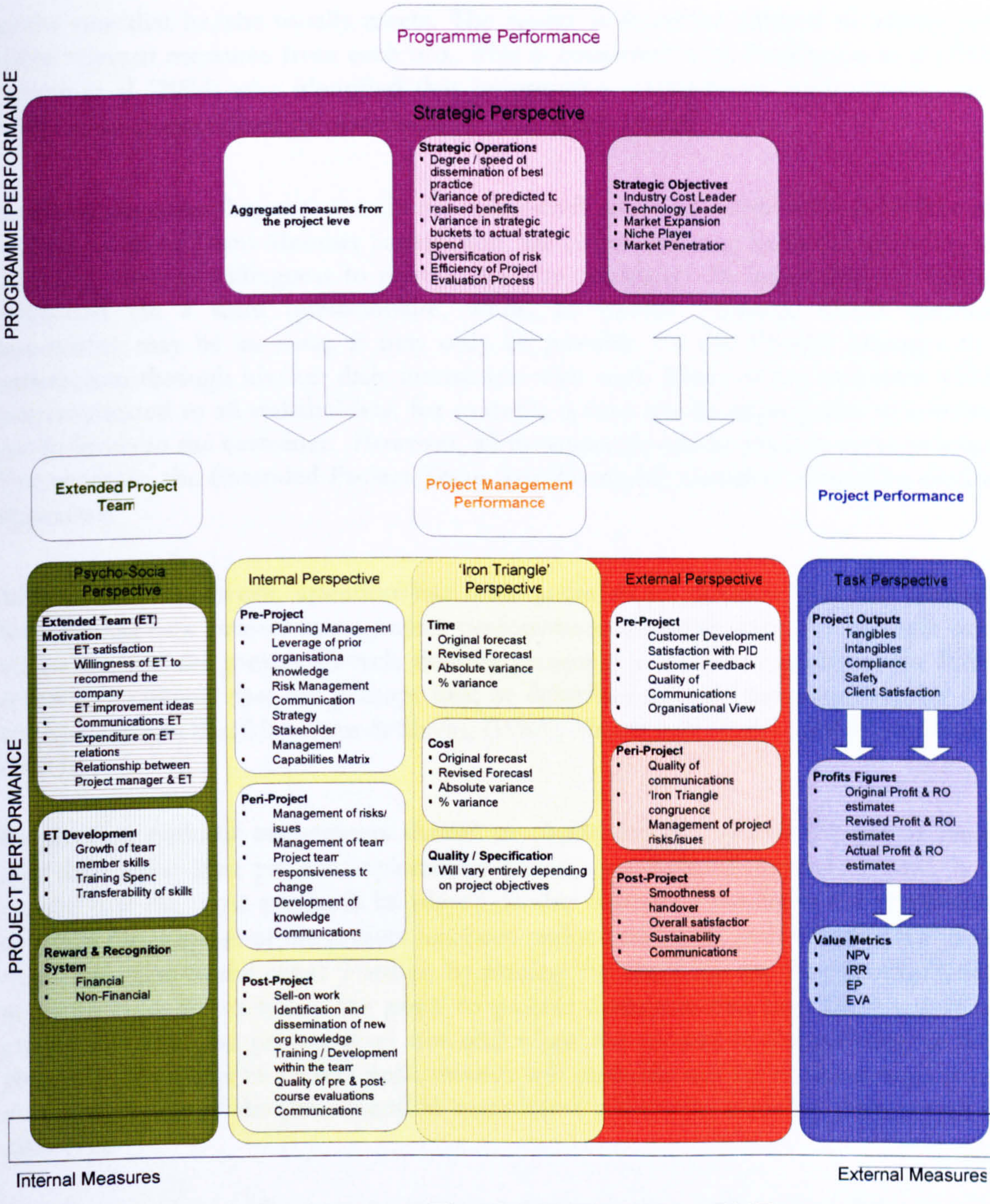


Figure 5.16. The PROJECT'ion Project PMF.

The framework in Figure 5.16 brings together the various evolutionary strands of performance measurement and takes an integrative and holistic view of the various research genres that have been present over the past twenty years. It brings together the strategic Programme-Level perspective; a Project Management viewpoint (incorporating the iron triangle; an internal (company) perspective and an external (customer-focused) perspective); a view on Project Performance and one from the standpoint of the Extended Project Team (psycho-social). The examples of measures are included for illustrative purposes only and are not meant to be prescriptive. Indeed, it has been pointed out by Tukel & Rom (2001) who, citing a range of authors, state that different measures will be used depending upon the project context. They go on to highlight the fact that only around 1 in 6 measures are achieved and that the objective the project manager focuses on

is the one that he/she usually meets. The reader is therefore advised to 'cherry pick' the most relevant measures from each box. This is consistent with Partington et al (2004) and Lycett et al (2004) who identified that programme management environments are more likely to be characterised by heterogeneity than homogeneity.

Some of the exemplary measures in the framework are 'hard', with well-established metrics. Others, such as Team Member Satisfaction, are softer and may be evaluated using a proxy measure, such as willingness to recommend the company. In larger projects this may be evaluated via a team questionnaire, whilst in smaller projects, where questionnaire anonymity may be an issue, it may only be possible for the Project Manager to gauge satisfaction through his/her daily interaction with staff. Many of the measures will not be communicated to all stakeholders, for example it may not be appropriate to communicate profit levels to the customer. However, all measures should be used in some practical way. For example, the Extended Project Team (psycho-social) measures should be used in staff appraisals.

Within this framework, attention has been given to its dynamic nature. Research has investigated how project management performance measures vary, for example according to the stage in the project lifecycle that the project is in. This morphing of the framework refers to a concept that can perhaps best be described as multi-temporal and this has been studied in more detail by Pinto & Slevin, (1988), Morris and Hough, (1987) and Baker, et al (1983).

In practice, periodic assessments should be conducted throughout the life of the project and then again after project implementation, at a pre-defined interval of time. It may be argued that the most emphasis be placed on this ultimate assessment for it will determine whether the purpose of the project has been realised and ultimately whether the project has delivered value to the client. Further, by placing this emphasis on the post-implementation assessment, it drives home the point to project managers that they have a duty to their clients and that the project does not end when the project is shipped out of the door. However, measures of project performance will probably not be available until at least the completion date of the project and in many cases will not be available for a period of time after that.

The framework provides a strong focus on the motivation and welfare of the project team; it is proposed that this is a necessary pre-requisite for success. The psycho-social orientation was originally proposed by Pinto and Pinto (1991) and whilst paying attention to different facets of performance, has now been extended further up the supply chain to potentially incorporate a wide range of stakeholders, such as: sponsors, users, customer, team, project organisation and suppliers. Psycho-social measures relate to the motivation, training and development, and the rewards and recognition system employed for the extended project team. This focus on stakeholder well-being is highlighted in the BSI's definition of project management, which states that it is the "planning, monitoring and control of all aspects of a project and the *motivation of all those involved* in it...." (BSI, 1996) and provides the rationale for theoretical developments in the literature, such as Theory W project management (Boehm & Ross, 1989). Implicit in the statements of proponents of the psycho-social perspective is that the increased cost associated with generating, collating and analysing psycho-social data is far less than the disruption that would be caused by ill-

motivated staff or the recruitment and induction costs of replacing staff who resign.

5.5 IMPLEMENTATION MAP

As part of the case study at the PSO, data was collected regarding the implementation of the Dashboard. This data has been rendered with salient literature from the NPD, PMS implementation and change management research domains. Specifically, the roadmap was inspired by Cooper et al's Stage-Gate™ process (2001, p. 14 and 272), which organisations can use to drive a new product from idea to launch. Figure 5.17 is a diagrammatic overview of the dashboard implementation process based on this primary and secondary research data. The primary data collected so far suggests that the process is highly iterative and this is represented in the diagram via a series of feedback arrows. For example, data structures may be so distributed that new stores might only be identified during the design phase, which may initiate a requirement to further define current practices. The overall process is explained in more detail in the remainder of this section.

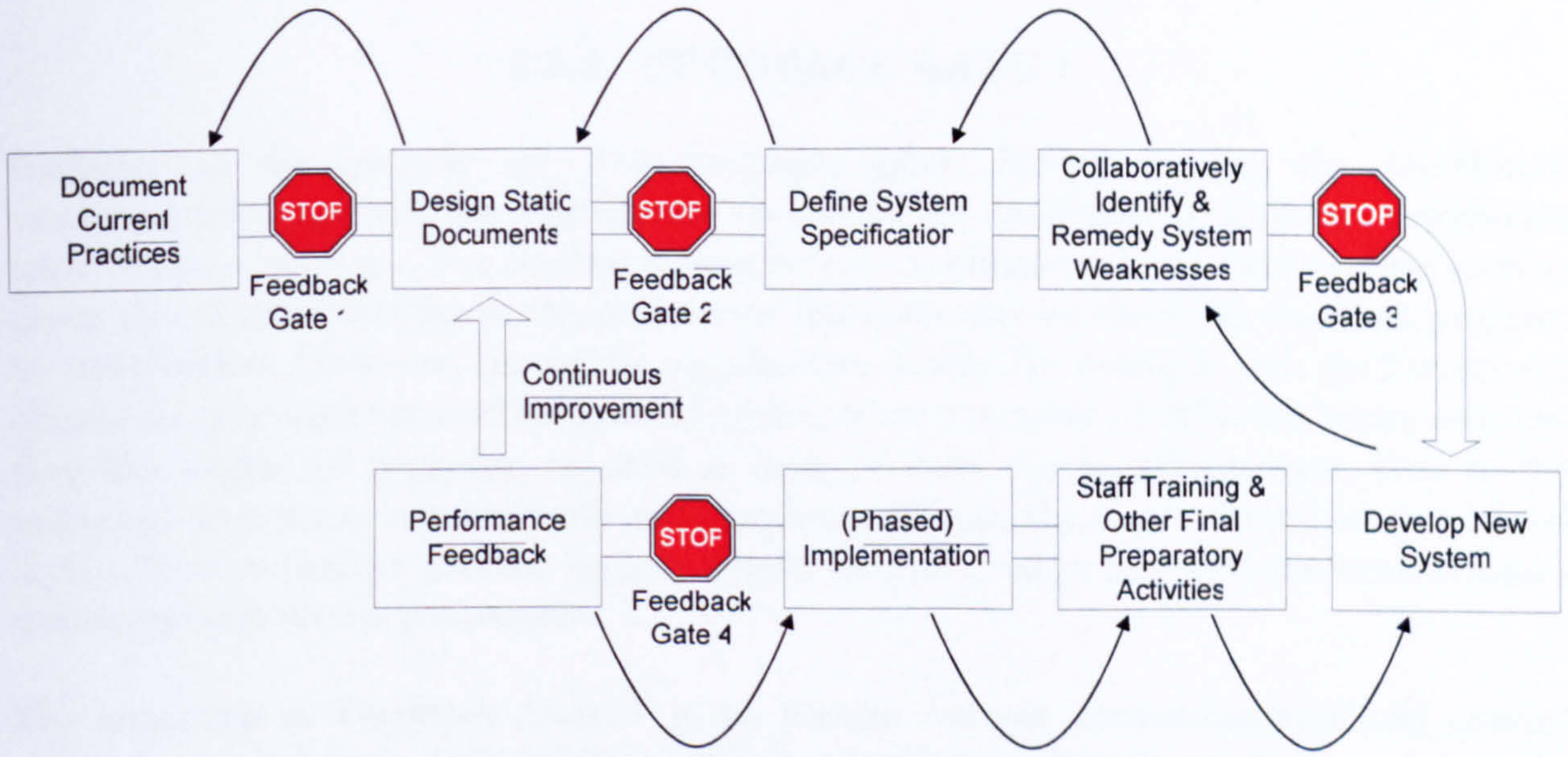


Figure 5.17. Dashboard Implementation Process.

5.5.1 DOCUMENT CURRENT PRACTICES

The objective of this phase of the process is to understand the organisation's existing processes. Sample questions include:

- Is there appropriate visibility over project activity?
- Is there appropriate visibility over the programme(s) of change?
- What information do key programme-level stakeholders require?
- Is the necessary information being tracked to improve performance?
- Will the organisational culture accept a high visibility, open communications tool?
- Does redundant data continue to be collected?
- Are the existing data repositories capable of expansion?

- How effective are the existing knowledge transfer capabilities and processes?

The picture of the organisation's current systems is developed by reviewing a range of documents, attending meetings, workshops and training sessions and interviewing stakeholders. A wide range of personnel may be consulted to help develop the 'AS-IS' picture, including Programme Directors and Managers, project and programme staff, as well as staff working in other functional areas of the business, such as the Finance & Accounting department. By the end of this stage, the following information will have been documented:

- Framework of existing programme information, in terms of content and location
- Reporting framework
- Meeting framework
- Cultural status of the organisation with regard to the acceptability of a high-visibility reporting tool
- A general understanding of the information requirements of key programme-level stakeholders

5.5.2 FEEDBACK GATE 1

Included in the process are four feedback gates. Before starting the Dashboard implementation process, the organisation should decide the degree of formality required at each of these junctures. For smaller, less technically sophisticated implementations, such as those described in this thesis, the purpose of the Gate may be simply to feedback progress to stakeholders. However, should the organisation decide, for example, that the Dashboard should be generated automatically, drawing data from a number of different legacy systems, then the degree of formality required at each of these Gates will increase. Due to the increased investment required with such implementations, the Gates should be considered as Go/No-Go barriers and the project should be evaluated in line with the organisation's normal project review procedures.

The objective at Feedback Gate 1 is to present current communication and control practices to relevant stakeholders and to develop a broad consensus about the requirements of the system before the next stage in the process commences.

5.5.3 DESIGN STATIC DOCUMENTS

The aim of this phase is to identify components of information that are appropriate to the organisation in terms of both information and design requirements. The data collected during the Document Current Practices stage should provide an initial impression. Having designed a static version of the Dashboard (and any supporting reports) using real data where possible, an iterative process will begin whereby the architect of the new system will liaise with users of the tool until such a time that the static version is signed off. The term static, in this context, means that the report is not linked to any external data sources and it will not automatically update. The importance of designing a solution that is in-line with user expectations should not be under-estimated. Research by Michalski (2000), concluded that clients could receive reports that were technically accurate and comprehensive yet they

could still be displeased because the look and format were not what they expected. Developing an appropriate solution is based on the answers to three key questions:

- What decisions do you need to make?
- What information do you need to make those decisions?
- How should that information be presented?

The output of this stage is a framework of 'static' reports that contain real data, where possible.

5.5.4 FEEDBACK GATE 2

The objective of this phase of the process is to present the static reports to key Dashboard stakeholders. From these templates, management should determine which information components are most relevant, possibly through facilitated scenario analysis. The output of this stage is authorisation to proceed to the next stage of the process, which will fully specify system requirements. The reader is reminded that the Feedback Gates may be more or less formal. They are included in the process because the data collected as part of this research, supported by prior research from salient domains, suggests that for purposes of control, communication and stakeholder expectation alignment they represent appropriate junctures. However, if the implementing organisation prefers to streamline the process, implementation procedures should be adapted as necessary.

5.5.5 DEFINE SYSTEM SPECIFICATION

The aim of this stage is to fully specify the content of the system. The resource requirements and time frame for this phase will be determined by the desired functionality of the new system. For example, in the case studies presented in Chapters 4 and 6 in this thesis, the technology requirements were relatively low. As such, most of the project / programme data were drawn from spreadsheets into Microsoft Visio and meant that in terms of defining the system specification, the focus was on who would provide what information, on what dates and in what format. However, for technically sophisticated solutions full software specification detail may be required. In general terms however, it will be important to define:

- Precise performance metrics (see Neely, 1998 for more information).
- The importance of different performance metrics over the project life cycle, as ranked by key stakeholders.
- Measurement intervals, which could be at a regular frequency, at milestones, or according to the stage in the project / programme lifecycle (i.e. business value may be impossible to measure until after the project is completed).
- Non-performance information requirements, such as the Programme News information component.
- The IT platform required to support the process
- Functional requirements of the software
- Persons responsible for supplying data in given reporting periods
- Person(s) responsible for analysing the data.
- Person(s) responsible for compiling and disseminating the information

- Publication intervals and distribution lists

The focus on this stage of the process is to collaboratively develop the system specification without hindering development speed. This can be achieved by conducting workshops to define certain system attributes, such as performance metrics, whilst working on a one-to-one basis for others, such as system hardware requirements. The outcome of this stage in the process then, is a fully specified system.

5.5.6 COLLABORATIVELY IDENTIFY & REMEDY SYSTEM WEAKNESSES

As the title implies, the purpose of this phase is to render the system by identifying its short-comings. This activity was not included in the two implementations at the PSO, however it is recognised in the literature that staff can subvert the process when introducing a new PMS (Bowey & Thorpe, 1989) and that one method of preventing this is to involve relevant staff in identifying and remedying ways in which this might happen. Neely, (1998) refers to this process as 'destructing the system'. This topic is discussed in more detail in section 5.6.3. The relevance and effectiveness of this process in implementing project performance and management information systems will be assessed in later case studies.

5.5.7 FEEDBACK GATE 3

The objective of this Gate is to present the work completed and to gain authorisation for the next phases of work, which will develop and implement the system. As at other Feedback Gate reviews, the format of the review is typically a workshop involving key stakeholders, where progress and next steps will be discussed.

5.5.8 DEVELOP NEW SYSTEM

The aim of this stage is to build and test the new system. Again, the resource inputs and duration of the phase is very much dependent on the requirements of the system. At one end of the spectrum, setting up the structure of a series of spreadsheets or a simple database and integrating where possible with a reporting tool, could take as little as week. At the other end, the development could be outsourced to a specialist IT company and may take several months if systems architecture and legacy integration are problematic. The outcome of this stage is a fully developed system, ready for implementation.

5.5.9 STAFF TRAINING & OTHER FINAL PREPARATORY ACTIVITIES

The purpose of this phase, which may be conducted concurrently with developing the new system, is to prepare the organisation for when the system 'goes live'. A range of activities should be completed, including:

- Training staff in new IT skills required
- Discussing how the new systems will be used

- Developing meeting structures to support the reports
- Training the analyst
- Ensuring that those responsible for generating the data are aware of the expectations placed upon them
- Showing users of the tool how to read and interpret the information
- Cultural preparation (if not already started)

The outcome of this part of the implementation is a workforce that is prepared and hopefully excited about the new system.

5.5.10 (PHASED) IMPLEMENTATION

The objective during this stage of the implementation process is to launch the new system. In the cases studies presented in this thesis, the Dashboards were phased-in over a number of months to avoid the problems associated with 'shotgun' implementations. That is, the increased disruption to normal working practices as staff become accustomed to new processes and technologies, and the cultural impact of having improved visibility over project and programme performance. For these phased implementations, two approaches are viable. Organisations can either identify the most important information components and start by implementing those (typically Strategy Map and Project Status components); additional components that contribute to the development of a broader picture can be subsequently implemented. Alternatively, organisations can identify the easiest information to implement (typically based on data that is already available and that staff are familiar with) and progress from there. For smaller implementations, or in organisations experienced in introducing new systems in one phase, a one stroke implementation may be equally effective. The outcome of this part of the process should be a fully implemented and live system.

5.5.11 FEEDBACK GATE 4

The aims for this stage of the process are to review the success of the implementation with the client organisation and to establish whether any further work is required to ease the implementation process. This may include:

- Further training
- Additional cultural development
- The identification of extra or more sophisticated information requirements
- Corrective actions required to resolve any software glitches

This activity should involve key stakeholders at all levels and can be conducted via a range of formats, such as a questionnaire, workshop and one-to-one meetings. By the conclusion of this Feedback Gate any minor issues that require attention should be identified and the work allocated to relevant staff.

5.5.12 PERFORMANCE FEEDBACK

The objective for this phase is to identify Programme Management processes that require

further development in both the short and medium-long term. Action should be taken immediately to remedy short-term, operational issues that are highlighted by the new reporting system. For example, projects assigned a red status, (which means that they are seriously compromised and likely to fail), should be dealt with immediately. In terms of longer-term capability development, the system should be left to bed-in for at least three months. This allows for data trends to be identified and assessed, and for the management team to develop a logical, structured development plan in-line with organisational requirements. For example, if the risk-related performance measures indicate that an alarming number of unforeseen risks are impacting projects across the programme, an action to investigate the maturity of the risk management process and the degree of conformity between project managers should be initiated. Based on this information a risk management capability development plan may be generated and executed. In this way, the Dashboard can be used to develop programme performance in both the short and medium to long-term.

5.5.13 SECTION CONCLUSIONS

In this section a process for implementing the Dashboard and associated reports has been described. It is based on the data collected as part of the first case study and developed using salient literature. The process is a twelve step, closed loop process that provides for multiple iterations. The process should be tailored to organisational requirements and may involve accelerating through certain steps of the process or in some cases skipping a stage altogether. Process customisation will be determined by a number of factors including the size of the implementation, the readiness of the organisation to accept a high visibility reporting tool and the experience of the organisation in implementing change initiatives. Chapter 6, which documents the experience of the main Case Study Organisation (CSO) will further develop this process.

5.6 CHECKING THE VALIDITY OF THE SYSTEM AGAINST PREVIOUS RESEARCH

In Chapter 3, Literature Review, a series of tables were presented based on previous research. Each table presented a different perspective on the types of information potentially required in a project or programme management environment or related to the characteristic requirements of such a system. The four tables presented listed core programme management activities, project Critical Success Factors (CSFs) & Critical Failure Factors (CFFs), and project management performance criteria. Finally, the functional requirements of a PMS were referenced from previous Cranfield University research by Roth (2002). In the Literature Review it was stated that the tables were presented so that these factors could be incorporated into the design of the tool. In the following sections, the tables are re-presented with detail justifying the inclusion / exclusion of that aspect. By defending the model against the criteria listed in these tables, the Beta Model can be considered robust.

5.6.1 PROGRAMME MANAGEMENT ACTIVITIES

The following table presents a list of programme management activities. This list has been rendered by programme management critical success factors and reasons cited for programme failure. The list has been drawn from literature discussing programmes of work, multi-project management or strategic projects (see Table 3.4 in Chapter 3 for reference to associated literature).

No.	Activity	Incorporated into the Tool? How?
1	Managing resources	The Resource Availability component tracks and forecasts the availability of both human and non-human resource constraints.
2	Managing throughput times	Variances between forecasted and actual timescales are monitored via the ROYG status in the Project Status section.
3	Managing costs	Compliance with budgetary forecasts is factored into the ROYG status definition.
4	Generating Projects (Depending on programme type)	An input into the Project Evaluation Process is a list of project ideas. This information is not typically presented on the Dashboard but represents an important underlying process.
5	Assessing potential projects and selecting the most valuable ones, aligned to strategy	Although the process will vary across organisations, the flow of projects through the appraisal process is a core information component.
6	Responding to changes in the internal and external environment	This type of business intelligence can be monitored through the Scanning & Futurizing section of the Dashboard.
7	Organising projects and their activities	Projects are organised into programmes and programmes are organised into a portfolio of work. Projects and programmes are prioritised and their strategic imperative defined.
8	On-going Benefits Management	The realisation of benefits, compared with forecasts in the business case is tracked at both programme and portfolio level.
9	Using Value Management techniques	Value Management techniques have not been used at the PSO or CSO studied as part of this research but could be incorporated into the reporting structure.
10	Addressing strategic performance	Progression towards strategic targets is typically included in the Strategy Map component, with performance communicated via ROYG status.
11	Ring-fencing resources	If the organisation uses a strategic buckets approach, information relating to the ring-fencing of resources can be incorporated.
12	Ensuring that projects are driven by business need (strategic imperative)	The strategic link of all projects and programmes should be explicitly documented in the central Project Status section of the display, via a reference to the appropriate section in the Strategy Map.
13	Recognising and understanding of dependencies	The key dependencies for a project can be denoted by using block arrows in the Project Status information component. However, due to limitations of the physical page, only 2 or 3 dependencies per project can be shown.
14	Identifying, evaluating and appraising risks	Key project risks can be highlighted by using the hazard warning icon. Programme-level risks can be displayed in more detail via the Programme-level risks table. However, it is recommended that a more sophisticated risk management system provides the input to the Dashboard.

15	Aligning and consolidating information for reporting and communication purposes	As part of the Dashboard implementation process, a review of existing data repositories and data frameworks should be made to eliminate any redundant information and consolidate the remaining systems.
16	Managing conflicting goals	The Dashboard does not directly provide for the management of conflicting goals. However, by presenting relevant information to this activity, the Dashboard can be used to initiate and structure this debate.
17	Prioritising Projects	Projects are prioritised within each programme column and each programme is prioritised within the overall portfolio.
18	Monitoring performance against programme objectives and against the competition to facilitate renewal / dissolution decisions	Performance can be monitored at the project, programme and corporate levels internally. Comparison can be made against competitors if this is an area the Scanning and Futurizing process is leveraged for.
19	Minimising disbenefits through common / conflicting projects or the introduction of standardised processes / technologies	Having structured the portfolio of work into programmes and projects on the basis of strategic alignment, projects with common objectives may be merged, or at least their synergies exploited. Conflicting project objectives may result in the termination of the lower priority project. In the longer-term, the tool can be used in conjunction with other tools (such as a maturity assessment framework) to develop capability development plans, which will deal with standardisation of process, technologies, etc.
20	Enabling effective delegation (i.e. prevents staff over-load)	Resource Capacity and demand can be monitored at the portfolio-level and should be monitored using an appropriate delegation model and software at the individual-level.
21	Ensures all issues are recognised and managed	Again, due to physical limitations of the printed page only key project issues can be communicated via the fire icon. More programme-level issues can be documented but as with risk management, it is recommended that a more comprehensive process is employed to feed data into the Dashboard.
22	Ensuring the smooth delivery and integration of change	The Dashboard cannot guarantee smooth project delivery. However, the Programme Delivery Plan does display the number, size and ROYG status of projects over time and the functional area of the business they will affect. In this way the organisation's capacity to change can be assessed and compared with the change demand. In this way, the over-loading of operational environments should be minimised, helping to ensure smooth project delivery.
23	Lobbying	The Dashboard may provide for a more rational, objective debate, rather than the type of personal demands based on subjective data that organisations with poor reporting systems often face.

24	Ensuring processes are in place to provide accurate estimates	The accuracy of costs and benefits over a period of time can be visually tracked on the Dashboard by using a line graph, to show the variance between forecasted and actual values. The accuracy of other variables, such as project status (as typically defined by the parameters of time cost and quality), can be displayed by using a colour coding scheme, such ROYG, to provide a snapshot in time. The conformance of individual projects to the iron triangle over a period of time can be assessed by the analyst using historical data. This is true of a variety of other variables, as exemplified in the PROJECT'ion Project PMF. So whilst the Dashboard cannot ensure the accuracy of estimates *per se* the enhanced visibility that is typically brought about by using a structured, holistic approach can be used as a driver for improved estimates.
25	Communicating with all stakeholders	The Dashboard can be used to improve communications at all levels within the project organisation and with a variety of external stakeholders as well.
26	Defining the PMO structure	As with all organisations, the formal structure of the PMO should be properly documented. The Dashboard provides some guidance however by documenting the relationships between Project Managers and their Programme Manager, and between the Programme Managers and the Programme Director.
27	Liaising with the Programme Board	The Dashboard system does not ensure effective integration between programme and board level but it should guarantee that accurate, timely and relevant information is available to both parties. The ROYG classification in the Project Status section provides a clear, visual mechanism for those projects/programmes do require attention.
28	Conducting programme appraisals / portfolio reviews	If supported by an appropriate meeting structure and more focused complimentary reports, the Dashboard can form the structure for programme and portfolio reviews.
29	Ensuring employee participation at all stages	One of the CSFs identified in section 5.6 was the importance of collaborative solution development from design, through to implementation and while the system is in use.
30	Not breaching the organisation's capacity to change	By interpreting the information presented in the Programme Delivery Plan, the number of projects due to deliver into a particular operation within a given time period can be identified. In addition, the status of each project and its value can be identified. This provides a method of evaluating the volume of change required (though will be supported by more detailed data). The organisations capacity to change must be judged on a range of factors, beyond the scope of this thesis.
31	Accurately assess and reward project management performance	The PROJECT'ion PMF, which underpins certain sections of the Dashboard and provides a balanced model with which to measure performance, should support this activity.

Table 5.4. Programme Management Activities.

5.6.2 PROJECT CSFS / CFFS

Table 5.5 comprises a combination of theoretical and empirical studies, which have assessed the key reasons that projects succeed and fail (see Appendix I for reference to associated literature).

No.	Activity	Incorporated into the Tool? How?
1	Establishing and maintaining executive commitment	Executive commitment cannot be guaranteed, however, by including details of the project sponsor for each project in the Project Status box, the executive associated with the project will be clearly defined, helping to prevent 'pet project' syndrome.
2	Having skilled project management / project management performing to the required level	The performance of Project Management can be monitored using the PROJECT'ion PMF. Where performance is sub-par, appropriate training and development procedures should be implemented.
3	Having clearly defined and communicated project objective(s)	The implementing organisation may choose to include project objectives in the Project Status component, as textual information. However, none of the collaborating organisations studied as part of this research chose to do so. In such cases, the high-level objectives can be inferred from the strategic link.
4	Effectively managing the matrix structure	Again, the Dashboard cannot ensure effective management of the matrix *per se*, but it will provide appropriate information relating to resource requirements and demand, and organisation structure, which can be used as an input into the management process.
5	Not being techno-centric (obsessed with technology)	The Dashboard neither promotes nor hinders the application of technology.
6	Having inadequate resources	The dashboard can be used to monitor the capacity and demand for human and non-human resources.
7	Accurately defining project dependencies and integrating the project accordingly	Key project dependencies can be displayed in the dashboard. A more in-depth dependency analysis should be conducted and used as an input to the Dashboard process.
8	Using an appropriate methodology	Whilst different methodologies can be employed by the various Project Managers, it is recommended that organisations take the opportunity to standardised vocabulary, process and IT across the department as part of the structured development plan.
9	Poorly scoping the project	If projects are poorly scoped, this should become apparent from the lack of conformance with time, cost, quality and benefits parameters. If this occurs, the analyst should determine whether the issue relates to one person or the whole department. Appropriate action should then be taken.
10	Poorly implementing the project	By introducing standardised working procedures, the number of poorly implemented projects should be reduced. Further, by using information components, such as the Programme Delivery Plan, the organisation's capacity to change should not be breached.
11	Change management process poorly controlled	The Dashboard reports discussed in this research have not tracked the number of change requests or the efficiency of the process. However, if this was deemed to be of concern for the organisation, relevant measures should be introduced.
12	Inadequate / weak training of staff who are affected by the change	The Dashboard system does not impact the identification of staff training requirements or the quality of training delivered.

13	Poor stakeholder management	By applying the Dashboard approach to communicate information, stakeholders appear to feel more involved in the process and feel better managed.
14	Weak project management culture	Anecdotal evidence suggests that the Dashboard approach can create a more participative, discursive culture along formal communication lines (such as project meetings) and informal lines (such as discussions in communal areas where the Dashboard is displayed).
15	Poor delegation model (staff over-loaded)	The dashboard approach should take advantage of existing data with regard to staff availability and demand. It is anticipated that where the underlying delegation model is not appropriate to the organisation's requirements, it is reviewed and developed in-line with other capability development initiatives.
16	Poor Configuration management	The Dashboard system will not address the issue of poor configuration management.
17	Poor Planning	The Dashboard system will not directly address the issue of poor planning but should highlight where poor planning has occurred through ROYG states or through use of the issue icon.
18	Poor recruitment & selection of team / lack of skills within the team	One of the inputs into the overall process can be a matrix defining the skill requirements and availability with the project management environment. If there are insufficient skills, the training of existing staff or the recruitment of new staff should feed into the capability development plan.
19	Insufficient technology support	The Dashboard neither promotes nor hinders the application of technology.
20	Client is not consulted	If the Dashboard is used to communicate project strategy, performance, structure, benefits, etc it can be a very effective method of gaining client acceptance. This is clearly demonstrated in subsequent case studies.
21	Monitoring and feedback mechanisms are not effective	The Dashboard system will provide salient information, which is intended to be used to improve communications and the subsequent actions taken.
22	Success criteria poorly defined (this area is expanded upon in section 3.5.2, specifically Table 3.6).	The success criteria should be defined before the project is officially launched. Mechanisms for generating, analysing and communicating this data should be considered before relevant stakeholders rank the importance of differing aspects of performance.
23	Lack of stakeholder involvement	In later case studies, it will be shown how the degree of stakeholder involvement increased as more information was communicated to them and their participation encouraged.
24	Project team is motivated to succeed / lack of urgency	The Dashboard will not directly motivate staff. However, if the project does not perform in accordance with the business plan, management will have the visibility to communicate this to staff.
25	Lack of 'fallback' options	The Dashboard does not improve 'fallback' options. It is recommended however that organisations operating in particularly dynamic environments try to develop exit routes from the project at key milestones. In this way the project should be designed so that it delivers value during each stage.
26	Project Managers employ McGregor's (1960) Theory X (stick) approach when problems arise	One of the underlying CSFs for the Dashboard approach is the development of a no blame culture, which is supported by two other CSFs, collaborative solution development and a commitment to open communications. Later cases will demonstrate the importance of these factors.

27	New ideas are starved to death through inertia	Inertia is likely to be a symptom of underlying cultural issues, some of which may be dealt with as part of the standard implementation process.
28	Feasibility studies are not conducted into new ideas	The effectiveness and efficiency of the project evaluation process should be monitored to ensure that project ideas of all kinds are evaluated.
29	Project trade-offs are not understood	Certain project trade-offs can be considered using the Dashboard. For example, the effect of a strategy shift on the alignment of the current portfolio or the impact of authorising a project on resource availability.
30	Political expediency and infighting dictate crucial project decisions	Political expediency and infighting is also likely to be symptomatic of deeper issues. The Dashboard may help by making explicit information such as project prioritisation, resource availability, standardised project evaluation process, and so on.
31	Lines of responsibility not clear	Whilst the Dashboard does not provide a complete organisation structure, the Project Status section illustrates the relationship between project and programme managers, project managers and sponsors, and programme managers and their sponsors.
32	Poor risk management	The quality of risk management can be monitored by using metrics such as the number of unforeseen risks impacting the project. Further, as part of the capability development initiative, the quality and degree of standardisation in process should be reviewed.
33	Delays caused by bureaucratic administrative systems	The Dashboard will not necessarily improve the bureaucratic efficiency of the organisation however, by using existing information where possible it should not place additional demands on the system.
34	Conflict between team and support organisations	The Dashboard approach will not directly affect this conflict, however if this is an issue, by making explicit the requirement of supporting organisations and representing their performance on the Dashboard, requirements should be formally documented.
35	Project Manager lacks experience in managing projects of a similar or larger size	The Dashboard will not impact this factor.
36	Project managers reward the wrong actions	The Dashboard will not impact this factor.
37	Trouble shooting / issue resolution is poor	If the Dashboard is applied at a more operational level, for example to structure project meetings, the resolution of issues may be incorporated into the display.
38	Environmental events	The Dashboard will not affect the number or size of environmental issues impacting the project.
39	Project manager is not on-site to manage the project	The Dashboard will not impact this factor.
40	Project Manager is not involved throughout the project lifecycle	The Dashboard will not impact this factor.
41	No project reviews	The Dashboard display should form a key part of an overall monitoring and feedback function, existing processes for which should be addressed as part of the implementation.
42	Weak benefits management process	The benefits management process, if ineffective, will be highlighted in the Benefits Realisation component, if realisation variances are significant across the programmes of work.

Table 5.5. Project CSFs / CFFs.

5.6.3 FUNCTIONAL REQUIREMENTS OF A PMS

This table presents previous research conducted at Cranfield University, into the functional requirements of performance measurement systems (Roth, 2002) and the way in which the Dashboard approach satisfies or rejects these requirements (see Appendix II for reference to associated literature).

No	Functional requirements	Incorporated into the Tool? How?
1	The system and measures are aligned with the mission, vision, goals and strategies of the user organisation	A clear path should be demonstrated between each project and strategic objective to ensure the strategic alignment of every project. The PMS should be customised so that it is consistent with the strategy of the organisation, for example if the organisation is following a cost leadership strategy, the importance of cost compliance in determining the project ROYG status should be increased relative to the other factors.
2	The system provides a balanced, well-selected and customised set of measures, which reflects all relevant aspects and dimensions of performance over time which are presented in user-oriented formats (visualisation, reporting, operations, etc.)	The issue of balance is considered in the next section in order to consider the issue in full. With regard to the presentation format, the Dashboards presented in this thesis have all been developed in conjunction with users of the tool to ensure relevant display.
3	Measures are effective, actionable, flexible and qualified over time, locations, hierarchies and different users	The makeup of the PMS will be customised according to organisational requirements. It is recommended that a review of the PMS be conducted after 6 months; if any measures are redundant, do not reflect reality or are not used to improve performance in either the short or medium to long-term they should be expunged or modified as necessary.
4	The system is simple, comprehensible and transparent for all users	All stakeholders should have the relevant aspects of the PMS explained to them. By visually documenting the new PMS and explaining in practical terms the benefit for the individual, team and organisation comprehension should be achieved.
5	The system is reliable, stable and valid over time and locations	As previously mentioned, the system should be reviewed after 6 months to ensure the validity of the measures. During this review, attention should also be focused on the reliability and efficiency of the system.
6	The system provides timely, efficient and effective feedback and signals in a positive, but attentive manner	Reporting frequency will be determined by the organisation but it is recommended that at the programme-level the Dashboard is published once per month with a portfolio review occurring once per quarter.
7	The system integrates with existing management, control and information systems and techniques supporting an effective and efficient data and information flow; i.e. acquisition, collation, filtering, analysis and dissemination	The system has been designed to leverage existing information to minimise disruption but to develop new processes with a view to organisational development where appropriate. In this way, an appropriate balance should be achieved between the efficiency and effectiveness of the implementation.

No	Functional requirements	Incorporated into the Tool? How?
8	The system is cost-effective with respect to design, build, implementation and maintenance	The Dashboard approach leverages as much available data as possible, in order to shorten development time and decrease costs. The degree of technical sophistication incorporated into the solution will be determined by the organisation and will significantly impact overall costs. Maintenance costs are likely to be comparable to similar systems.
9	Measures are process-oriented and aligned with cycle-time of activities	Many of the measures are process-oriented, such as those that relate to project management performance. Some however are output-based, for example benefits realisation metrics. The inclusion of output-based measures is congruent with literature in the project management domain. The system has been designed so that it can morph throughout the various stages of the project lifecycle meaning that the measures are aligned with activity cycle-times.
10	The system is accepted, considered fair and used as an instructive tool in day-to-day operations	The degree of acceptance is likely to vary from one organisation to another, depending on their readiness to accept a high visibility reporting tool. However in Case 1, the system met all these criterion, as detailed in Chapter 4.
11	Users and measurement subjects are actively involved in system design, implementation and use	One of the identified CSFs in implementing a system which makes the performance of a range of stakeholders transparent is that there should be a strong emphasis on co-creation and implementation of the system.
12	The design and implementation pursues a systematic and consistent approach	Although the implementation process, outlined in section 5.5, is embryonic in its development, it is anticipated that it will form the basis of a structured implementation approach.
13	Measured factors are controllable by the measurement subject	This can only be determined during the detailed design of the new PMS and will be affected by the competence of the project team. As such it is an extraneous factor.
14	The system minimises data and information processing efforts	By drawing heavily on information that is currently available, the production requirements are minimised.
15	The system supplies key measures for aggregation and combination for example on management or corporate level	Many of the measures presented at project-level will be aggregated to the programme-level. Other programme-level measures, such as development of new organisational knowledge may be measured at the project-level but typically aggregated to the programme-level for communication purposes.
16	The system and measures communicate targets (demanding, but achievable), achievement, contribution and agreements	The degree of difficulty associated with a given target will be determined by a senior member of staff and the person whose performance is being monitored via the measure. Achievements can be monitored through project / programme ROYG statuses (or when the project is delivered through the blue status), benefits realisation, achievement of strategic objectives, client satisfaction, smoothness of handover, etcetera, depending on how the system has been designed.
17	The system and measures focus on significant cause-and-effect relationships	The PROJECT'ion PMS is a synthesis of previous research in order to develop a holistic, balanced perspective of project/programme performance. By implication, if a balanced set of measures are undertaken then balanced progression towards target will ultimately yield successful projects.

No	Functional requirements	Incorporated into the Tool? How?
18	The system supports and facilitates strategic / ex-ante learning and continuous improvement	The system aims to identify actions for improved performance in both the short-term, via for example project status and in the medium to long-term via, for example benefits realisation trend analysis.
19	The system provides norms, standard methods and units of counting and documentation and reference values and benchmarks	The system should be fully supported by appropriate documentation, such as user guides (including reference values and benchmarks where available). Standard methods will be implemented across the implementation unit.
20	The system includes measurement structures and techniques	The Dashboard approach is based around two key measurement structures: the PROJECT'ion PMF and a range of customisable information displays. A range of techniques associated with the development and implementation of both of these structures has been detailed in the earlier section of this chapter.
21	Measures distinguish project levels from program levels	Many of the measures can be aggregated from the project to programme-level (project status). Others will be measured at the project-level but communicated at the programme-level (development of new knowledge). Others still will operate independently at the programme-level (increase in market share).
22	The system captures and reports external and internal contributions	The structure of the implementing organisation will determine the balance of internal and external measures. For example in Case 1, the programme department served a number of brands and was set up as an independent operating unit. In such cases 'external' includes the performance of the department in relation to customer and suppliers. Internal relates to the performance of internal operations, such as those defined in the project management perspective of the PROJECT'ion PMF.
23	The system establishes clear standards of measurement and counting	As part of the implementation process, mechanisms for generating, collating, analysing, formatting and distributing data will be defined.
24	The system provides a commonly agreed baseline	Baselines will be agreed by relevant stakeholders, a process which supports CSF#3, Collaborative Solution Development.

Table 5.6. Functional Requirements of a PMS

5.6.4 ACHIEVING SYSTEM BALANCE

This final section will demonstrate how the Dashboard system achieves balance across a number of dimensions, commonly identified in academic literature and trade magazines. The explanations provided to support each dimension of balance are based on typical implementations. It should be noted however that each system should be customised to the requirements of the organisation. Thus, if an organisation had a preference for quantitative over qualitative data, this would be reflected in the design of the system.

- Quantitative / Qualitative. The Dashboard balances quantitative performance measures, such as Project Status, management information, for example the Programme Delivery Plan and qualitative analysis via the management comment boxes.

- Objective / Subjective. There is a balance of objective measures (such as in compliance with the iron triangle and benefits delivered) and of subjective measures (for example,

customer satisfaction, smoothness of handover and quality of communications). Depending on the detailed design of the system, subjectivity may be provided for in calculating the ROYG status. Project Managers could assign a ROYG score within certain parameters, defined by general performance (see section 5.3.3.1 for more detail). This allows the Project Manager to interpret project performance based on their more intimate understanding of project status.

- Hard analytical / Soft fuzzy. Some of the exemplary measures in the framework are hard, with well-established metrics. Others, such as Team Member Satisfaction, are softer and may be evaluated using a proxy measure, such as willingness to recommend the company.

- Long-term / Short-term. By using dimensions that can measure current performance during project execution (iron triangle) but also can offer longer term measures of performance, such as NPV, customer satisfaction and organisation propensity to secure follow-on work, the Dashboard approach achieves a balance of long and short-term measures. "...project managers must be mindful to the business aspects of their company. They can no longer avoid looking at the big picture and just concentrate on getting the job done". (Shenhar et al, 1997, p.10).

- Internal / External. In a typical implementation, there will be a genuine mix of measures that focus on internal as well as external measures. For example, measures that are used as an input into determining ROYG project status are internal process oriented measures whereas those focusing on benefits realisation refer to the financial value that the project has delivered to the client.

- Leading / Lagging. A key challenge in designing any PMS is to develop forward-looking measures that tell the organisation today how they will perform tomorrow. Previous research in this area is limited. Nikander & Eloranta (2001), detail a typology of early warnings that indicate when a project is likely to deviate from schedule. However, the majority of factors are intangible, such as 'gut feeling', 'the mood of the team', or the 'tone of verbal communication'. As such, their inclusion into formal project management processes is extremely difficult. In this model, the main method for identifying likely future performance is by extrapolating historical data. However, scenario analysis may also be appropriate.

- Strategic / Operational. The Dashboard approach provides a healthy balance between strategic and operational measures. Some metrics relate to day-to-day or week-to-week issues encountered during the project management process while others relate to whether programmes of work have delivered predicted benefits in the form of strategy actualisation.

5.7 CHAPTER CONCLUSIONS

This chapter has covered a lot of information by presenting a range of information components typically used, the PMF synthesised from the literature and the backbone behind a range of components and an implementation plan derived from

literature and case study data. Finally, a range of tables were presented rooted in the literature, which identified system requirements across a range of dimensions and the way in which the Dashboard process satisfies (or not) these requirements. The following chapter, which documents the second case study via two units of analysis, will serve to support or challenge the model presented in this chapter. Chapter 7, Discussion will then compare and contrast the findings of the two cases.

6 VALIDATION CASE STUDY

This chapter reports on the implementation of the Beta model in an industrial context. It also documents the data collected as part of a scoping exercise at a regional development agency.

6.1 INTRODUCTION

Having designed a range of information components and a methodology for their implementation based on triangulated data from the Pilot Study and relevant literature, the next stage in the research process was to implement the Dashboard in a real world situation. The Case Study Organisation (CSO) is a FTSE100 support services organisation. During a six month period, between May and November 2003, the researcher worked alongside staff on an e-learning project to implement a Dashboard. This Chapter reports on the data collected throughout this period with regard to the implementation, production and maintenance process. As per the Pilot Study, supporting statements, applications, benefits and drawbacks of the dashboard approach are also identified. Finally, a series of critical success factors in implementing the Dashboard are proposed.

A discussion of the overall research findings is presented in Chapter 7.

6.2 INTRODUCING THE CASE STUDY ORGANISATION

The CSO is a major support services company that undertakes long-term contracts with large utility organisations and urban authorities. The CSO has a wide service offering with projects ranging from maintaining roads and street lighting to installing gas pipelines, with values of up to £250 million per project. The Researcher worked with a recently acquired business unit who provide project and programme management training and consultancy, and manage shorter-term contracts such as maintaining and developing school IT systems. During the researcher's time at the organisation, the Company was listed on the AIM stock exchange, though is now listed on the FTSE100.

The principle unit of study was a two year project, which will be referred to as e-learn. The principal objective of the project was to improve the level of Information and Communication Technology (ICT) skills in one of the UK's regions by 138,000 people. The initial term for the project was between 1st April 2001 and 31st March 2004, with an approximate value of £1.2 million. e-learn is part of a much larger programme of work, which aims to train 1.38 million people from in the region in ICT by 2010. The original e-learn team consisted of a Project Manager and three project team members called Advocates, who were responsible for selling the e-learning material to companies and other small organisations. The Advocates worked remotely, based in their respective sub-regions,

splitting their time between working at home and travelling to interested parties to discuss their options. Additional internal support was provided by a Departmental Secretary who processed the sales generated by the Advocates. External support was provided through an independent telephone help line, operated by a national learning organisation, where prospective learners could discuss their options with a trained member of staff. An on-line portal, also externally managed, had been established to provide further information to potential learners by directing them to relevant third party web sites. The e-learning material was provided by a Suppliers' Consortium, which consisted of a number of leading companies who had agreed to provide low-cost CD-ROMs in return for high sales volumes. In March 2003, following the purchase of the SBU by the CSO, a new management team was appointed to the project (previously, the project had been managed by the former Directors of the SBU).

At this stage, the e-learn Project Manager began liaising with Cranfield University regarding a potential collaboration and implementation of a Dashboard-style approach in order to provide visibility over the performance of the project. Though not a programme of work like the Pilot Study, the opportunity to implement the Dashboard on a project that was understood to be performing below acceptable tolerances represented several research benefits. As such as series of case study objectives were defined:

- Given that the Dashboard had been introduced at the PSO following the appointment of a new Programme Director to provide a programme-level view, could the Dashboard provide a similarly effective view for a newly appointed Project Manager?
- Would the tool be considered useful at a project, as opposed to programme-level?
- Whilst the PSO provided an opportunity to document a wide range of issues associated with using the Dashboard, discussions regarding the implementation of the tool were retrospective in nature and therefore subject to the vagaries of the human mind. The e-learn case would importantly therefore provide an opportunity to test the implementation model in real time, based on triangulated data and salient literatures. Therefore, how could the implementation model be improved?
- What variations in information requirements were there between the project and programme level?

Selecting a case in this way is known as theoretical sampling, which is defined as "Sampling on the basis of emerging concepts, with the aim being to explore the dimensional range or varied conditions along which the properties of concepts vary." (Strauss and Corbin, 1998, p.73). The aim of theoretical sampling is to maximise opportunities to compare events, incidents, or happenings to determine how a category varies in terms of its properties and dimensions... [and] is considered important when exploring new or unchartered areas because it enables the researcher to choose those avenues of sampling that bring about the greatest theoretical return." (Strauss and Corbin, 1998, p.202). Indeed, the case appeared to satisfy all of these requirements and was therefore accepted.

6.3 E-LEARN METHODOLOGY

During the Researcher's six month placement at the CSO, he worked closely

along side the project members and members of the SBU Senior Management Team. The researcher was based on-site, at CSO's headquarters and played a leading role in the review of existing systems and the implementation of new systems, with the e-learn Project Manager acting as a "co-researcher" (Heron & Reason, 2001). The Researcher provided technical input to the process, with the Project Manager providing company-specific knowledge and the appropriate seniority to progress the implementation.

This type of methodology is known as Action Research (AR), which is a generic term, covering many forms of action-oriented research (Reason and Bradbury, 2001). Coughlan and Coghlan (2002), quoting a wide range of authors, identify the following characteristics to action research. Firstly, AR is research *in* action rather than research *about* action. In this case, the researcher was an active agent in the creation and implementation of the solution, moving far beyond the traditional notion of the researcher being external to the environment being studied. Secondly, the research should be participative. In this instance, the solution was developed collaboratively, principally by the Researcher and Project Manager but also by the project team and Project Director. Thirdly, AR is research concurrent with action. "The goal is to make that action more effective while simultaneously building up a body of scientific knowledge" (Coughlan and Coghlan, 2002). This has certainly been the goal of this research with conceptual models and supporting and challenging literatures being reviewed concurrently with the implementation and maintenance of the system. Finally, AR is a sequence of events and an approach to problem solving. In this case, the sequence of events has been highly iterative; as the research domain has been understood, further data sets have been collected and analysed. These data sets were typically collected through informal conversations with project staff or more formally through meetings and workshops. For example, once culture was identified as an emergent theme it was discussed as part of a meeting on implementing the Dashboard. The AR approach and, in particular this iterative cycle of collecting primary data>secondary data>primary data, has required the co-operation of the CSO and members of the organisation under study. This iterative approach is a key aspect of the Action Research methodology and is supported by Eden and Huxham (1996).

AR is distinct from consultancy for three main reasons. Firstly, approximately one day per week was spent maintaining a researcher diary, reading relevant literature to support/challenge findings, reflecting on the process, conducting initial analysis and developing models. Secondly, there was not an all-out emphasis on forcing a successful outcome as in a paid-consultancy environment. Clearly, the Researcher wanted to implement a system that would be beneficial to the collaborating organisation but they were aware that the over-riding objective was to document the utility of a relatively undeveloped, novel approach, rather than to deliver value into the organisation. Finally, if the approach was not successful there would be no comeback for the Researcher. Given that the CSO were interested in developing the approach into a boxed product, the research was truly collaborative: there was a clear incentive for both parties to document the performance and utility of the approach as it was transferred from one context to another.

With regard to data collection activity for this case, a range of sources were used including project documentation, organisation documentation, a researcher diary, semi-structured interviews, informal conversations with programme stakeholders, attending a range of project meetings, workshops and training activities. In addition, the Researcher revisited

the CSO approximately four months after completing the placement in order to review the way in which the Dashboard was utilised. This aspect of the methodology was incorporated into the design in an attempt to mitigate any bias that may have accrued from the Researcher being inextricably linked to the tool, at least in the eyes of the Project Team. This second round of interviews was conducted between 31st March and 2nd April 2004. Five interviews were conducted, which represented a balanced cross-section of the original project team. Table 6.1 documents the initials of staff actually interviewed between these dates. The interviews lasted for a total of four and half hours and were represented by 72 pages of transcript. In addition, two expert interviews were conducted with a Director of a leading Programme Management Consultancy and a Director of a large programme management software organisation.

Name(s)	Job Title	Date	Code
RB & JB	Marketing Coordinators	31/03/2004	CSO/01
DW	Learning Consultant	01/04/2004	CSO/02
AMcM	Principal Consultant	01/04/2004	CSO/03
LW	Central Support Manager	01/04/2004	CSO/04
SJ	Project Manager	02/04/2004	CSO/05

Table 6.1 Case Study Interviewees & relevant data.

The interviews provided an extremely interesting, alternative insight into the longer-term production and maintenance of the Dashboard. In preparation for the interviews, the Researcher prepared an interview guide, informed in-part by the high frequency themes identified in the Pilot Study and in-part by the Researchers experience at the CSO. However, upon arrival to conduct the interviews, the Researcher discovered that the Dashboard was no longer in use. A decision was therefore made to focus on the reasons behind the discontinuation of the tool because the Researcher considered that this would provide a richer data set with which to compliment that data already collected.

Where reference is made to non-interview data collected during the initial case study, such as notes or quotations from the researcher diary, the data source and date is presented. For example, "I like the Dashboard because I can get everything out of my head and on to a piece of paper. It helps me de-stress because I'm not worried about forgetting things so much." Quote by RP, entry into researcher diary, 05/10/2003. Where, more than one person was involved in an interview or data is taken from a workshop, the statement is attributed by including the relevant person's initials.

The data was analysed using a range of techniques proposed by Miles and Huberman (1994) and Strauss & Corbin (1998). The techniques were explained in more detail in Chapter 4, Pilot Study. The data themes presented have again been selected due to their high thematic frequency and the importance bestowed on them by research participants, and were organised using a refined coding structure. Individual quotes were selected based on the insight they provide and/or the expression of the statement. Table 6.2 is an extract from output of this process.

General Theme	Specific Theme	Interview Text
Performance Measurement	Integrity of the data	"the measures on the programme do not indicate success and are not fully aligned to our objectives" (NB, Researcher Diary, 15/05/2003).
Producing the Dashboard	Time	"Getting it up and running took a bit of time and understanding what was needed but once we had all the project info documented it was dead easy, no problem… At the end of each month everybody has 4/5 days to get the info to us. Then we produce it 2 days after that. In terms of central support time it takes 2 hours tops." (CSO/04).
Implementing the Dashboard	Culture	"They [the advocates] went from having no one taking an interest in their performance to a situation which was in no way big brother, but it was a massive change for them." (CSO/05).

Table 6.2 Extract from interview data: coded, themed and tabularised.

6.4 E-LEARN FINDINGS

This part of the chapter is divided into a number of sections, which, for ease of reference and comparison mirror those in the Pilot Study. As such the implementation and production process is documented before a series of general quotes indicate the level of support towards the e-learn Dashboard. The business applications of the Dashboard are then presented before the benefits and drawbacks of the approach in this context are discussed. Finally the benefits and drawbacks are more formally documented before a review of the Critical Success Factors (CSFs) associated with the implementation and maintenance of the approach are identified.

6.4.1 IMPLEMENTATION METHODOLOGY

Given that one of the objectives of this phase of the research was to validate the Dashboard implementation methodology, it seems appropriate that this section is structured by that implementation methodology. As such, this section is split into the following headings:

- Document Current Practices
- Design Static Documents
- Define System Specification
- Collaboratively Identify & Remedy Weaknesses
- Develop New System
- Staff Training & Other Final Preparatory Activities
- Phased Implementation
- Performance Feedback

A more general discussion regarding the utility of the Feedback Gates is included at the

end of this section.

6.4.1.1 Document Current Practices

In May 2003, an analysis of the e-learn project was conducted by the Researcher and Project Manager. This involved reviewing a raft of project documentation from the first two years of the project, ranging from Project Initiation Documents, project reports, minutes from internal and external meetings, Job Descriptions, internal data systems as well as talking to the project team and customer about the project.

The conclusions of this analysis were not positive. Roles and responsibilities were ill-defined. Three team members had the job title of Advocate and were loosely responsible for selling the e-learning material in their respective regions. Having spent some time with Advocates it became clear that they tended to work at a more strategic level, providing guidance on e-learning methods to senior staff at potential organisations. As such there was no official sales position within the team, which was one of the reasons the deliverables for the project were behind target. The sense of an inappropriate structure was heightened upon reviewing the performance measurement system. The Advocates principal measure of performance was the number of meetings they had attended, not the number of sales, known as 'beneficiaries', they had generated. Initial interviews with the project team cemented this perspective, with comments such as "the measures on the programme do not indicate success and are not fully aligned to our objectives" (NB, Researcher Diary, 15/05/2003). One team member was concerned that the measures did not reflect "good performance" (SAB, Researcher Diary, 15/05/2003) and did not indicate when "somebody was doing a superior job" (SAB, Researcher Diary, 15/05/2003). Indeed, further investigation found that there was no formal definition of what constituted a beneficiary. Although e-learn needed to generate 138,000 new beneficiaries over and above normal e-learning numbers for the region, it was not defined whether a beneficiary could be counted upon sale of appropriate e-learning material, registration to learn, completion of a certain percentage of the course, attending or even passing the exam. Discussions with the client did not resolve the situation and the Project Manager and Researcher were left with the feeling that the definition had been left ambiguous to the benefit of all parties involved. Further, critical project management activities had not been completed. For example, no risk management had been conducted whatsoever and there appeared to have been little consideration given to how the project structure would deliver the required objectives.

The data repositories for the programme were also mapped and assessed. The Project Co-ordinator had been creating files and systems as required, in an attempt to meet the changing needs of the programme. This had resulted in a rather fragmented system consisting of over 8 spreadsheets and a range of databases, understood by only a few people within the organisation. The Project Manager commented, "the amount of information required to support such a programme is staggering, and we really do not have a grip on it" (SJ, Researcher Diary, 19/05/2003). Figure 6.2 highlights key data inputs and outputs on e-learn.

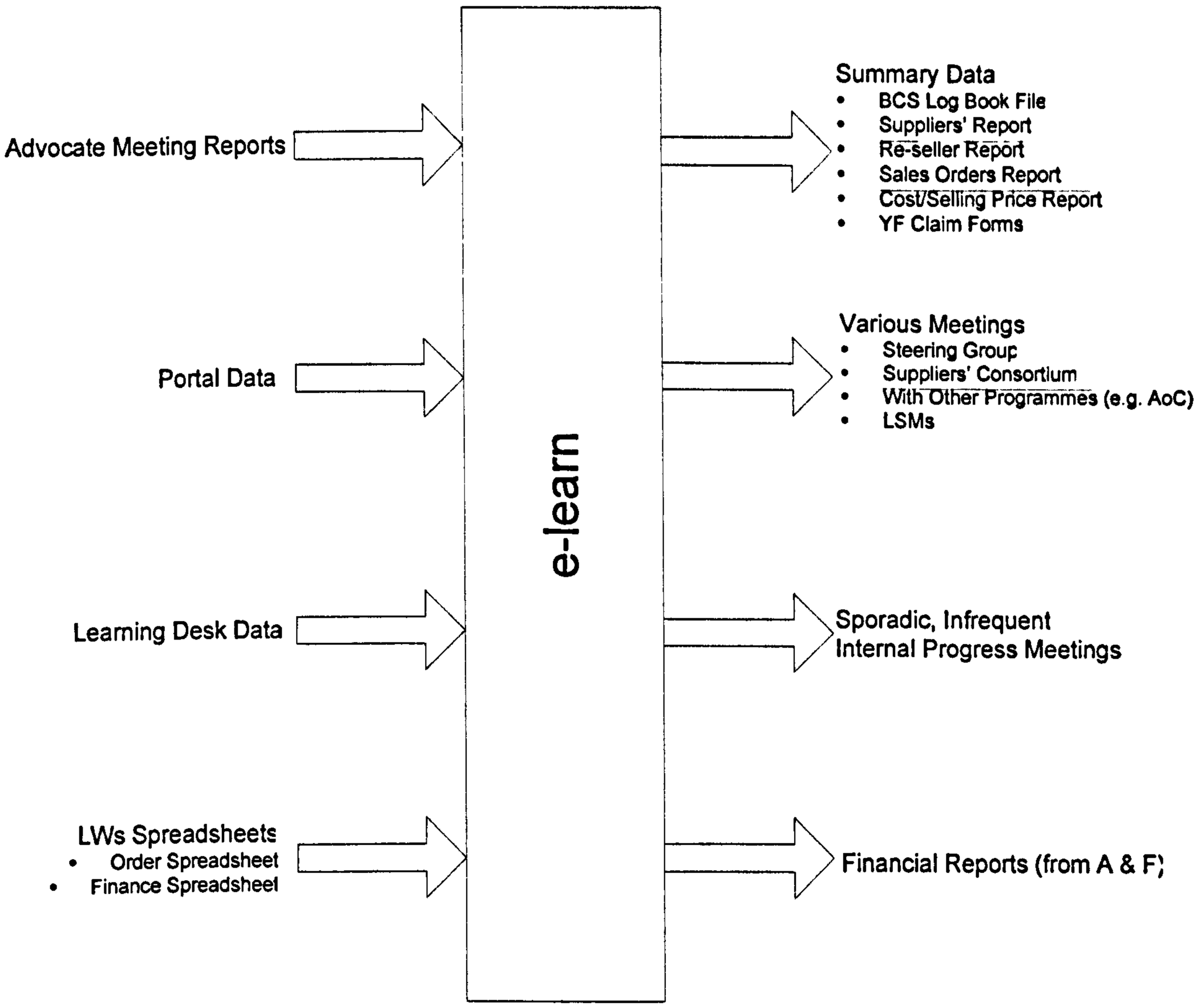


Figure 6.1 Summary of e-learn 'AS-IS' Reporting & Communications Processes.

Further, there was no formal communication strategy for either internal or external purposes and examples were provided by the Project Team where nobody had attended key external meetings and other instances where two people had unexpectedly attended. This was in-part caused by a lack of IT integration following the acquisition of the SBU. The Advocates could not access the SBU network remotely meaning that access to other team members' calendars was not possible. Equally, staff based at the headquarters could not access the Advocates' calendars. The 'AS-IS' communications processes were therefore documented. The core members of the team were remotely-based, operating in different areas of the region and typically working from home. Communication between the remote-workers was surprisingly high, regularly discussing issues, sharing best-practice, and providing each other with the necessary support. This communication however rarely involved the management team and visibility on progress and performance was extremely poor. Of major concern to the team were the monthly meetings, the only time during the year when the whole team came together to discuss the programme. One team member remarked "I dread going to the monthly meetings" (CS, Researcher Diary, 15/05/2003), another commenting that the meetings were "just a talking-shop", "frustrating" and "non productive" (NB, Researcher Diary, 15/05/2003). Outside the monthly meetings, progress and performance was discussed on an ad hoc basis, often during informal one-to-one conversations. In general, there was a lack of visibility, both within and outside the team. There also appeared to be apathy surrounding the project though there did seem to be a

desire to get the project back on track.

The Advocates were supported by two operational functions, namely The Portal and Learning Desk. The Portal was developed as a requirement of the project and was a web site providing information about e-learn services and links to other similar RDA initiatives. Visitors could register their interest in e-learn and request contact from an Advocate but could not purchase e-learning material on-line. The Portal had on average 1,000 visitors per month, which was deemed an acceptable number. The Learning Desk was an independent advice line that potential beneficiaries could use to receive free advice over the telephone on training courses. Questionably the Learning Desk was operated by a major competitor and during the Researcher's time on the project never received more than eight calls in a month.

A cursory investigation into the project's finances revealed that the accounts at project and organisation-level were inconsistent. For example, project finances were reported on a monthly basis by the central finance function but using corporate accounting rules, which were not very accurate for the purpose of the project. Pre-purchased stocks from the Suppliers' Consortium were written off at the end of the financial year, making it appear as though extortionate project profits were being made, which was not the case. Further, there did not appear to be a budget for the project, however, the Project Director held responsibility for this aspect of the project and was protective over the information. Typically requests were made to the Project Director to fund various activities, which were either granted or declined. This was not ideal for the Project Manager who did not know whether she was under or over budget.

One part of the project that did appear to have been well structured was the supply-side. The Project Manager who had recently taken responsibility for the project had had a degree of involvement in the initiation stages and had structured a Suppliers' Consortium. Members of the Consortium had agreed to provide low-cost e-learning material to the project on the basis that high volumes of product would be sold and that the sales process would be impartial. Stock of some products had been purchased as a good will gesture. However, the promise of high sales volumes had not materialised and members of the Consortium were threatening to withdraw from the project. A review of the market illustrated that the range of products available through the Consortium was limited in comparison with key rivals.

6.4.1.2 Design Static Documents

In this case, the process of designing the new reporting system could not begin until significant preparatory work had been completed, with some iterative structural development continuing throughout the project. The Project Manager and Researcher therefore spent a further week developing a project strategy, communications strategy, risk management, the performance measurement framework and other project management basics.

A wide range of tools and techniques were used during this phase to draw out the necessary information and define what was required. As an example, e-learn has a significant number of stakeholders, all of whom need varying degrees of information regarding the status of the programme. Initial meetings with the project team focused on

understanding the major stakeholders, determining their relative importance to the project's success, and identifying effective communication strategies. One tool that the management team found particularly useful was the Strategy Map (Kaplan & Norton, 2001), which plots critical objectives of the project from a number of stakeholder perspectives and then decomposes those objectives to an operational level, showing linkage throughout. As commented by the Project Director, "this technique enables people to clearly identify which work packages are most important, and therefore where our money and resources should be spent" (PB, Researcher Diary, 04/06/2003). Such techniques helped to prioritise what was important to e-learn and determine how the Dashboard should be deployed. The e-learn Strategy Map was then used to structure a number of other facets of the project.

The Advocates were reluctant to modify their Job Descriptions but appeared to accept that some change was necessary if the project was to be a success. They were given a more sales-oriented focus and were each supported by the Marketing Coordinator, who made preparatory and follow-up telephone calls on their behalf in order to initiate and complete the sales process. Performance targets were introduced for the Advocates relating to the number of beneficiaries generated. The Marketing Coordinators were also monitored in terms of Beneficiaries and the number of calls per day. In-house sales training was provided to the Advocates and Marketing Coordinators. Dashboard information components were therefore designed around the performance of these two critical job roles.

A workshop was conducted where the Project Manager explained the role of Work Breakdown Structures. Each team member then identified the activities they needed to complete for the month in order to fulfil their obligation to the project. The output of this workshop formed the basis for the central information component of the e-learn Dashboard. Given the volume of change that was starting to occur (both within e-learn and the SBU more generally), the Project Manager and Researcher were conscious of not reaching and breaching team members' capacity to change. The data from the WBS was therefore reformatted to show the delivery of agreed work packages over time and by project function. This Work Package Delivery Plan is similar in nature to the successful Programme Delivery Plan used on the PSO Dashboards.

Given that the project had been in effect for two years by this stage, an overhaul of the numerous spreadsheets and databases was considered inappropriate. However redundant performance measures and process information was expunged.

In an attempt to integrate the amended team and improve communications between management and Advocates, a weekly meeting was introduced. Given the geographical distance between the Advocates' regions, and their distance from the HQ in Leyland, the Advocates contributed to the meetings via a telephone conference. All other members of the team (with the exception of the Project Director) attended in person. The purpose of this meeting was to review performance for the week and tackle any issues that the team had. The meeting was supported by a one page A4 weekly report, completed by the Marketing Coordinators. In addition a meeting was held once per month in Leyland where all members of the team were physically present to review the content of the Dashboard and to address broader project issues. The Dashboard was used to structure this meeting and Project Actions arsing out of these meetings were represented on the Dashboard for

the previous and forthcoming months. The frequency of one-to-one appraisal meetings was increased from once per year to twice per year with an informal review after three months. Finally, as an interim measure until the project team had access to each other's diaries, staff were asked to provide information regarding their key monthly activities. This was then compiled into a team schedule and represented on the Dashboard.

Control of the project's finances was retained by the Project Director. No tangible increases in visibility were achieved in this area and in any case it would not have been appropriate to include this type of information in an open communications document that would be received by the customer. The Learning Desk advice line was ultimately discontinued, though the portal remained with slightly amended performance measures. Structurally, the Suppliers' Consortium did not change though the range of suppliers and available products was increased. The performance of each of these operations was represented on the Dashboard.

Finally, given the degree of change taking place and the hitherto poor performance of the project, exposure to risk was considered to be high. One further workshop was therefore held where the principles of risk management were explained to the team. They were then asked to brainstorm for risks which were subsequently assessed and managed. These risks were then integrated with the risks previously identified by the Researcher and Project Manager earlier in the process. ROYG status was used to highlight critical issues to make all project stakeholders aware of their potential impact.

In general terms, the purpose of this stage in the process for this project was to attempt to appropriately structure the project, identify the key information requirements and the current status of the project, to improve team members understanding of project management process, to integrate the new parts of the team and improve moral.

Figure 6.2 displays an example of the e-learn Dashboard from January 2004. By this time, the project had been restructured; the Dashboard approach had been in effect for six months and was reasonably well established. The Dashboard contains 11 information components, which are summarised below. It should be noted that e-learn was referred to as a programme in internal and external communications, when in fact, under all definitions, it was actually a project. Apparently this is not uncommon, "Initiatives and 'scopes of work' which are essentially projects are sometimes designated as programmes to enhance the status of managers responsible for them or to get around funding limits." (Pellegrinelli, 1997). For purposes of accuracy, e-learn is referred to as a project in this thesis, however where exemplars are taken from project documentation e-learn may be referred to as a programme.

Strategy Map: illustrates the way in which the project operations link to the overall project objectives; demonstrates the skills and competencies required to perform those operations.

Beneficiary Targets: The over-riding objective of the project was to deliver 138,000 learners (referred to as beneficiaries) in the region by 31/03/2004. This information component presents the monthly beneficiary target, actual monthly beneficiaries, cumulative target and cumulative actual.

Marketing Coordinator Performance: Tracks telesales data for the Marketing

Coordinators.

Work Package Delivery Plan: Similar in nature to the Programme Delivery Plan used in the PSO Dashboards, the Work Package Delivery Plan tracks the activities of the varying project functions and the delivery dates for these activities.

Work Breakdown Structure: Again similar in design to the Change Portfolio section of the PSO Dashboards but applied at the project level and decomposed into work packages.

Team Schedule: Due to a lack of communication between certain members of the team (discussed in section 6.3.3.1), a team schedule was included in the earlier Dashboards.

Actions: As the Dashboard was applied at a more operational project level, actions arising out of team meetings were documented and reviewed at subsequent meetings.

Risk Management: Given the previously poor performance of the project, potential risks were identified, assessed and managed. Critical risks were communicated using the ROYG colour classification.

Learning Desk: Tracks the number of calls to an independent advice line, operated by a direct competitor.

The Portal: Monitors the number of visitors, number of subscribers and the availability of a supporting web site.

Suppliers' Consortium: Tracks the stock levels of pre-purchased e-learning materials from the Suppliers' Consortium.

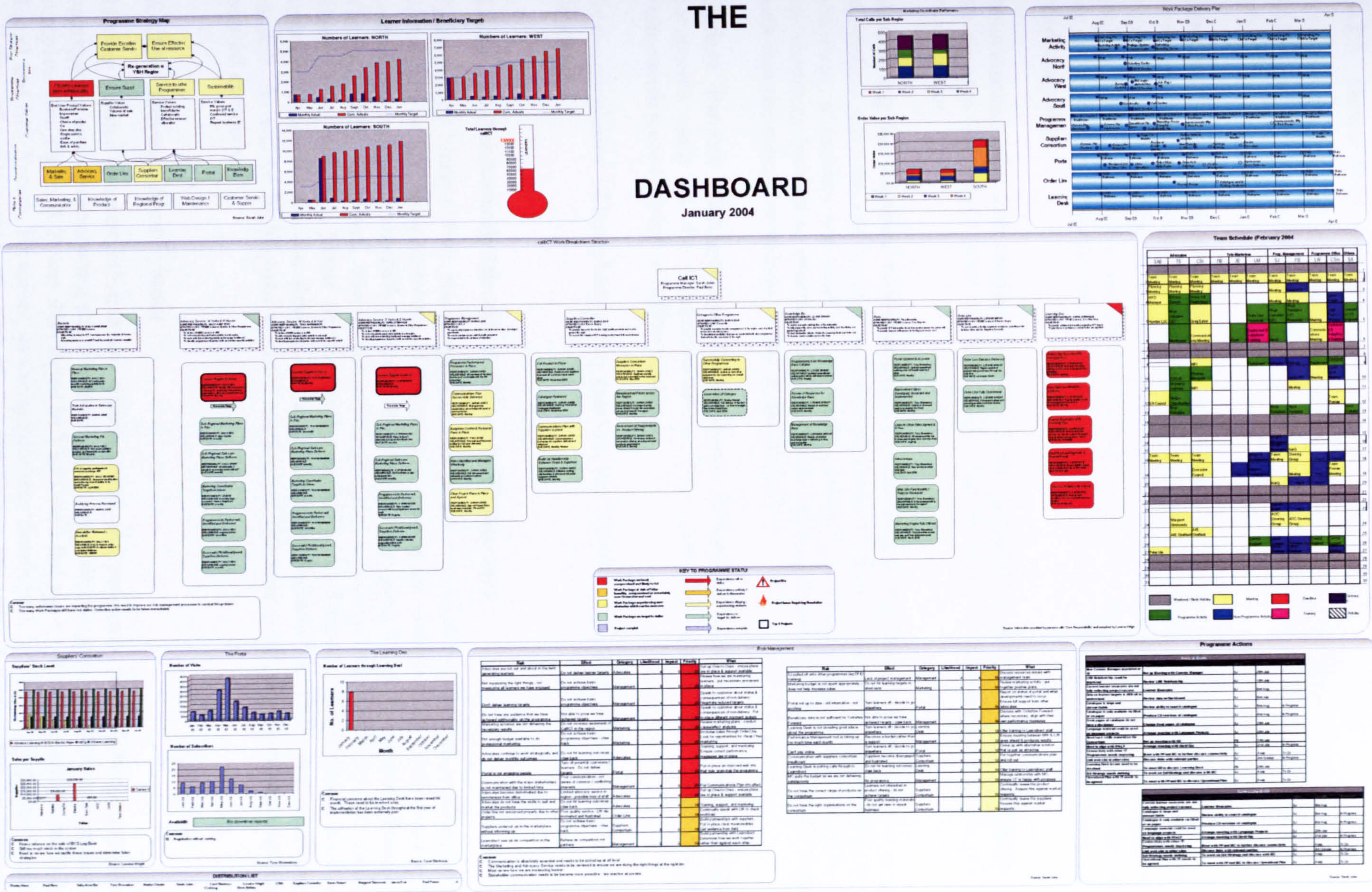


Figure 6.2 An example of the e-learn Dashboard

6.4.1.3 Define System Specification

Having defined the information requirements for the weekly A4 reports and the monthly Dashboard, the next stage in the process was to fully define the system specification. This involved:

Identifying what information was currently available and what needed to be developed. In this instance, most of the information was either available prior to the Researcher commencing the study, or had been developed during the restructuring phases (such as Risk Management and Project Strategy data). Processes for information that was not at that time available were established, such as the Marketing Coordinator and Beneficiary data.

Determining roles and responsibilities for the generation of data and production of the reports. Put simply, who would provide what information, to whom, by when and in what format.

Identifying the required sophistication of enabling technologies. Given that a range of systems were already in place and that in terms of time at least, the project was well underway, a decision was made to leverage existing technologies as much as possible. It was therefore decided to interface the data from MS Excel and MS Access into MS Visio, such that the manual workload would be minimised.

Update Project Management Documents. Where necessary, project management documents such as the Communications Plan and the Performance Measurement Framework were updated to reflect changes.

At the conclusion of this phase of the process, the system was well defined and ready to be developed.

6.4.1.4 Collaboratively Identify & Remedy Weaknesses

Promoted by Neely (1998), the purpose of this phase is to identify potential weaknesses in the system by involving members of the project team in an attempt to not only render the system but mitigate potentially subversive behaviour by those being monitored (Bowey & Thorpe, 1989). However, due to pressures of time, a decision was made by the Project Manager to omit this phase of the implementation. In fairness, this decision was not strongly contested by the Researcher as it is rarely included in PMS implementation models. As will be highlighted in latter sections of the case study, this decision may have proved erroneous.

6.4.1.5 Develop New System

Having defined the new information requirements and processes for collecting, analysing, aggregating and disseminating the information, the new system was developed. A graphical template (see Figure 6.2) was developed in Visio with linkage to draw the data in from MS Excel and MS Access. However, as the system was developed, MS Visio started to became unstable. Though tested on a number of different PCs and laptops, MS Visio would regularly crash and the design of the graphical Dashboard template would not stay constant. This apparent idiosyncrasy of MS Visio was confirmed upon a visit to a

consultancy specialising in the graphical representation of processes and organisational knowledge, who have developed proprietary software to bypass this problem. A decision was therefore reluctantly made by the Researcher and Project Manager to manually update the system on a monthly basis, as per the PSO model. The researcher assumed responsibility for this activity.

6.4.1.6 Staff Training & Other Final Preparatory Activities

Given the degree of change on this project and the turbulence in other areas of the business, a conscious effort had been made by the Researcher and Project Manager to integrate project staff as far as possible into the development of the new structure and systems. As such staff had participated in workshops relating to risk management, elements of PMF development and work breakdown structures. At each of these workshops, Dashboard reports were displayed on the workshop room walls as a way to familiarise staff with the presentation format and potential content. A decision was therefore made by the Researcher and Project Manager to limit training to one half day workshop where the information and required supporting processes were presented to the project team. In addition, MS Visio was projected onto a screen and a tutorial was provided to show the team how to make the necessary updates to the information components that they were responsible for. Paper-based guides were distributed to the team summarising all of the information. The workshop appeared to be successful with team members confident they could update the necessary information.

6.4.1.7 Phased Implementation

The tools were phased in over a period of three months. This was partially due to availability of certain information. Thus, the weekly A4 Marketing Coordinators' Report was introduced first. Then after three weeks, the first Dashboard was produced. This contained the following information components: Project operations (Learning Desk and Portal), the WBS and aggregated Marketing Coordinator data. The remaining information components were subsequently phased in over a two month period.

6.4.1.8 Performance Feedback

Once implemented, the Dashboard approach appeared to be effective. Beneficiary data, though still behind target started to improve. Importantly, the customer was very impressed. "[The customer] love it. They always ask for it. Every month, without fail." (CSO/05). Prior to the Dashboard, customer visibility over project performance was very low. Now they were presented with an honest appraisal of performance. Where work packages or performance targets were turned red, plans were put in place to explain why they were red and what actions were being taken to resolve the issues. The Dashboard presented a high-level view of most aspects of performance that were important to them.

A second positive example can be drawn from the Suppliers' Consortium Meeting, held on 25th March 2003, in the Leyland offices. Representatives from each of the suppliers attended to discuss the issues surrounding the poor performance. The start of the meeting was quite confrontational, with representatives of two organisations threatening to withdraw from the consortium and a general mood of antagonism towards the Project

Manager. The Consortium felt disgruntled as they had agreed to provide e-learning material at a price marginally over cost on the basis that high sales volumes were all but guaranteed. Unfortunately, these volumes had not materialised and without them the project was untenable for certain members of the Consortium. A presentation was made by the Project Manager, where she discussed the reasons for the previously poor performance. She then began talking about development and improvement activities and structured the discussion around the (at that time mock) Dashboard. The Dashboard was again used as the central piece in a discussion about improved levels of communication. Surprisingly, the mood of the Consortium seemed to change and by the end of the meeting, one of the supplier's threatening to withdraw was in a discussion with another supplier about mechanisms to integrate their data with the e-learn data to provide more accurate information regarding stock levels and supply lead times. Much credit should be awarded to the Project Manager for facilitating a constructive discussion but the Dashboard appeared to play an important role in the process.

Over a period of time, beneficiary data slowly improved and within a year the customer changed their position from one of mooting clawback of payment to granting a sustainability award to continue the project. This second phase of the project is valued at £500,000 and will extend the project for a further 12 months. Whilst this turnaround in project fortune cannot be solely attributed to the introduction of the Dashboard approach - for example, appointing a new Project Manager had a hugely positive effect - it seems likely that developing a reporting system that is based on robust project management principles and makes visible both good and bad performance will lead to an overall improvement in performance, as found in this case study.

6.4.1.9 Feedback Gates

Depending on the scale and level of implementation, and the degree of sophistication in the IT solution, the Feedback Gate process will have a varying degree of formality. In this case, the Dashboard was implemented at the project level, on a relatively small project and with a low-tech solution. Further, the Researcher worked very closely with the Project Manager. The formality of the Feedback Gate process was therefore very low, with the Researcher presenting progress against the implementation process to the Project Manager, primarily to provide a view of relative progress.

6.4.1.10 Producing and Maintaining the Dashboard

The e-learn Dashboard was produced on a monthly basis as per the Pilot Study Dashboard. Information was contributed by the Project Manager, Marketing Coordinators, Advocates and some data, such as that for the Portal and Learning Desk being generated by third party organisations. The Dashboard was then compiled by either the Researcher or a member of the Central Support Team. Early productions of the e-learn Dashboard tended to take around one day to update, though as the Central Support Team became more familiar with the information and more experienced in using MS Visio, them time required was cut by half, to only a few hours. "Getting it up and running took a bit of time and understanding what was needed but once we had all the project info documented it was dead easy, no problem... At the end of each month everybody has 4/5 days to get the info to us. Then we produce it 2 days after that. In terms of central support time it takes 2 hours tops." (CSO/04)

With regard to the way in which the e-learn Dashboard was displayed, the reader is reminded that in the PSO, the Dashboard was displayed on Programme Office' walls, the Programme Director's office, in the offices of each of the Board of Directors and in communal project areas, such as the coffee room. Strong anecdotal evidence from this case suggests that this ubiquitous distribution was a key reason for improved levels of communication across a number of dimensions. It was the Researcher's hope and intention that a similar level of distribution be achieved for the e-learn Dashboard. However, due to the level of application (i.e. at project and not programme-level) and the physical environment in which the Project Team were located, dissemination of the dashboard was not as widespread and undertook a different form. Applying the Dashboard at a project level meant that the Board of Directors were not concerned with the breakdown of performance of one relatively small project. The Senior Management Team Meetings could have used the Dashboard approach but the opportunity was rejected by SBU Director. This was arguably mistaken given that "One of the comments in this report was that in these management meetings it's he who shouts loudest that gets heard... Whether it's a confidence thing or a cultural thing they [some members of the Senior Management Team] don't feel they can say the things that they need to say, which is why there needs to be other ways to get that information out and represented." (CSO/05). Further, and perhaps more importantly, the open plan nature of the office with glass external walls and a strict Health and Safety Policy forbidding any displays in the project offices meant that it was not possible to exhibit the Dashboard by the Project Team. Instead, a copy of the Dashboard was kept by the Project Manager and rolled out on a desk whenever necessary. This did not seem to be as effective as having the Dashboard on constant display. The Dashboard was instead distributed to the customer, members of the Suppliers' Consortium and the Project Director who, in similar circumstances to the Project Manager, retained a copy for reference.

6.4.2 FEEDBACK ON THE IMPLEMENTATION, PRODUCTION & MAINTENANCE PROCESS

Given that this was the first time the implementation process had been tested, a great deal of effort was made to gain feedback at various junctures. This section presents data relating to the project team's perception of the strengths and weaknesses of the process. This data was collected at workshops, via e-mail and from a series of follow-up interviews, conducted approximately four months after completing the study.

6.4.2.1 Document Current Practices

The Researcher spent much of this initial phase of the implementation working either alone or with the Project Manager trying to make sense of the wide array of project documentation. As such the number of people available to comment on this activity is limited. However, the Project Manager appeared to be satisfied, "I think when you're new to a project, as we both were, it's just a case of immersing yourself in it until you understand what it's all about. I think we did that pretty well, especially by using all those analysis tools." (CSO/05). From the researcher's perspective, the process could have been improved by conducting more background research prior to starting the implementation.

For example, by asking the collaborating organisation to complete a simple questionnaire, some of the forthcoming challenges may have been highlighted. The questionnaire could cover issues such as the number and type of data repositories (indicating the technical challenge), the size and structure of the project (indicating the level of implementation, challenges relating to the geographical location of team members and the logic behind project activities) and the current performance of the project (indicating the robustness of the PMS and whether the project requires maintenance or remedial action). Though some background research was conducted by the Researcher, the experience of implementing the tool is such that the implications of these answers would be better understood for future implementations. By formalising the process, it is hoped that more attention will be paid to its outcomes, thereby enhancing preparatory activities.

6.4.2.2 Design Static Documents

One key lesson that was learned during this phase was the power of pilots and mock-ups – progress was dramatically accelerated when the management team were shown possible solutions and given the opportunity to provide feedback. Given the wide range of presentation formats available via modern IT, information can be presented in different 'tranches' (Bertin, 1981) to convey different messages. This collaborative, iterative process would appear to save overall cycle time and customises the solution to the subtle nuances of the key customer. In addition, the importance of team inclusion was highlighted; at the end of this stage, team members commented that "It was good to be involved in the process. It didn't feel that it was being forced on to us" (CSO/01). One member of Central Support commented that they would have liked to have been involved earlier (LW, e-mail, 26/10/2003). Unfortunately, due to restructuring it was not possible to speak to any of the Advocates for feedback on the process.

6.4.2.3 Define System Specification

A great deal of conflicting feedback was received from a number of interviewees regarding the frequency of publication. Some interviewees felt that the Dashboard should be produced on a daily basis to ensure that the information provided was up-to-date, whilst others thought that a quarterly publication would be more appropriate. The following statement provides a representative sample:

"One of the things we had with it was that people didn't think it shouldn't be on a monthly basis, it should be on a daily basis. The information was out of date as soon as it hit the Dashboard so we talked about doing it daily but it would mean someone doing it constantly. But to be a true guide to what's going on it needs to be a constantly updated piece of information that everyone can look at." (CSO/01).

"I thought it was the other way round though and that some times things don't change that much and people can almost be embarrassed about it and tried to talk about other issues instead." (CSO/01).

"Having spoken to the Project Team, and this may be a role of the Dashboard in Project as opposed to programmes, the team have said, 'I think this is a really good picture of the project but could we do it on a less frequent basis?', perhaps quarterly? So you can see the developments on the project. On a monthly basis I need more detailed information.

It might be seen as more useful than it is but the benefit isn't having software, it's a feature, but it would definitely help." (CSO/05)

The issue of frequency is related to the degree of sophistication of the IT solution. For example, in a high-technology solution, it would be possible to update the information on a daily basis in a user-friendly manner. But with limited investment, short timescales and a MS Excel / MS Visio integration that proved to be unstable, the degree of sophistication in the IT solution ultimately employed was fairly basic. The system therefore required increased levels of manual intervention, which it appears dampened some team members' enthusiasm towards the Dashboard. Whilst using MS Excel and MS Visio worked well for a low cost solution, future implementations should be clearer in terms of the cost-benefit of different levels of technology support.

6.4.2.4 Collaboratively Identify & Remedy Weaknesses

As this stage of the process was omitted from the implementation process, no feedback was sought on this activity. However, given the feedback discussed previously and in forthcoming sections, this process should be considered as critical. For example, a workshop may have given rise to discussions around a range of concerns. For example, time required to update the Dashboard, how the information would be leveraged, implications for working practices, etc. It is the Researcher's perception that these issues were addressed on a number of occasions but perhaps given the underlying culture of the organisation, another opportunity to converse around these topics would have fortified the implementation.

6.4.2.5 Develop New System

Several issues were encountered during this phase of the implementation and mostly relate to the Researcher's experiences in developing the new system. Specifically, the following challenges were encountered:

Consolidating data repositories on an existing project: As the e-learn project had been underway for two years, a range of spreadsheets and databases had been developed by the Project Coordinator on an ad hoc basis. This represented a further level of complexity in terms of linking MS Visio to each of these repositories but more generally meant that project information was difficult to locate and challenging to comprehend. It is therefore recommended that regardless of whether a Dashboard system is used, that project data structures are strategically developed in a considered manner. "I do still think there was an issue around how long it took to update. It would have been nice to have had some software that could auto-update the Dashboard from the spreadsheets. That would have been really nice but if you look at e-learn and the way that it was setup, because it was so *ad hoc* in the way that the systems were put in place and because when we both came on to the project we were in a position where the systems were already in place, people were already using them. There wasn't that much time left on the project to make that all change and put new systems in place. So we were working with a system that wasn't ideal. To match it all up would have been a nightmare." (CSO/05)

Gaining access to certain organisation-level data systems: Certain information, such

as financial data was stored in organisation-level data systems with access in the end being denied. The benefit of conducting more detailed research prior to starting the implementation has been discussed. It is hoped that in the future, such a situation would be prevented by identifying potential access issues and resolving them at an earlier stage.

Integrating MS Excel and MS Visio: Perhaps the greatest challenge was represented by linking the information in MS Excel and MS Visio, so that the Dashboard automatically updates. Though theoretically possible, the Researcher found that the systems would regularly crash, making it an untenable solution. For future implementations it is recommended that a decision is made to either accept a relatively manual process or to invest in the appropriate technologies.

Printing: Further minor issues were caused regarding access to the plotter. As an expensive printer, access was limited and those with access were perceived as having kudos. Again, it is hoped that by asking relevant questions at a pre-implementation stage that such issues could be avoided.

6.4.2.6 Staff Training & Other Final Preparatory Activities

Significant feedback has been collated regarding the volume of training activity prior to the launch of the Dashboard. As previously discussed, training occurred informally throughout the implementation and more formally via a half day workshop where the Dashboard was explained and MS Visio training provided. The following comments are representative of the feedback:

"There are some parts of the Dashboard that people just don't understand. I think there are very, very few people that understand all the sections of the Dashboard. There are quite a few controllers, behaviourally in EBS, myself included, who tend to shy away from things that they don't understand." (CSO/03)

"The training needs to be more detailed. What people have said to me is that when they first see the Dashboard, they've been really scared by it because they've gone 'wow, what's that?' They can't decipher all that information because unless you know what that's showing you, it can be hard to understand. But when you explain it to people, they go 'oh god yes, I can see that now. That's ace'." (CSO/05)

Whilst training levels would be increased in future implementations, the type and level of training may depend on the maturity of project and programme management processes, and the staff competencies in them. For example, in the PSO, there was a much higher level of programme management maturity and staff appeared to be more knowledgeable about how programme management structures should be leveraged. As such, the level of training required seemed to be lower as staff were more able to interpret and apply the information on the Dashboard. In the CSO, this was not so true and in retrospect the training requirements were higher.

Further, where educational needs are greater, it is recommended that the training be conducted on a one-to-one basis. In this case study the team were trained together, which was probably a mistake given their project management experience.

6.4.2.7 Phased Implementation

Key lessons learned at this stage were the importance of a staged roll-out. In the future, a slower roll-out will be recommended with increased levels of one-to-one training to ensure that all staff are confident in using the tool. One member of staff commented, "the first time I saw it [the Dashboard] it was mind-boggling. It's taken me until now [three months] to get used to it" (CS, Researcher Diary, 20/06/2003). Others felt that the lack of appropriate technology hindered this phase of the process as some members of staff, for reasons of bureaucracy, struggled to get MS Visio installed onto their PCs (LW, e-mail, 26/10/2003).

Alternatively, where resources permit, the new system could be implemented in one step. 'Shotgun' implementations typically cause a greater degree of confusion but over a shorter period of time but may be preferable where there is sufficient resource to manage the confusion, i.e. where there are enough people with Dashboard or similar experience to resolve the issues as they arise.

6.4.2.8 Performance Feedback

In terms of issue resolution, the Dashboard approach seems to have been effective at a team and customer level. However feedback was received from several team members regarding the frequency of assessing the content of the tool. For example, "You never get it completely right 1st time so you have be prepared to change the content of the Dashboard. We should have sat down once per quarter or once per 6 months and say what needs changing? That might relate to the style or data or the process for generating it." (CSO/05).

6.4.2.9 Feedback Gates

Feedback from the Project Manager was generally positive regarding the use of Feedback Gates but it was acknowledged that the degree of formality required for each of these Gates was a function of the size of the project, the value of technology investment and the degree to which the Project Manager and implementer were able to work together.

6.4.2.10 Producing and Maintaining the Dashboard

Though unaware upon arriving at the CSO offices to conduct a series of follow-up interviews, it subsequently transpired that the e-learn Dashboard was no longer being used. Though naturally disappointed, this provided an excellent opportunity for the Researcher to collect data in an attempt to understand the reasons why.

Firstly, in terms of producing the Dashboard, the role that the Project Coordinator had played in compiling the Dashboard had changed. After the Researcher left the organisation, she was transferred to another project and was not replaced. Further, there appears to be a degree of conflict in the data collected regarding the ease of contribution. For example, for the members of the team brought in following the restructuring there does not seem to have been a problem:

Interviewee 1: "We keep the information up to date all the time because of the

spreadsheets we use."

Researcher: "So for you it wasn't the amount of time it was taking to produce?"

Interviewee 2: "No, no, no." (CSO/01)

Similarly, the Project Manager understood that a degree of planning and reporting was a necessary part of the job. However, for the remote workers who had previously had to provide very little information regarding their activities, there seems to have been more of an issue. "With regard to the changing and updating at the Advocates' level, I think they thought it was a burden. It was something that they had to do in addition to everything else. There were 2 reasons for that: 1, they didn't see the importance of it even though we talked about it in meetings and even though we addressed issues and 2, they didn't see the relevance of it to their particular roles or activities." (CSO/05). This is perhaps not surprising and is an issue identified in previous research, where change had occurred. "In particular, contributing functions were often slow to input relevant data, resisting project attempts to control them in this way." (Lord, 1993). Further, in a Dashboard Feasibility study conducted by the Researcher while at the CSO for a North West Regional Development Agency, the majority of Project Managers interviewed demonstrated their resistance to an implementation in no uncertain terms. So a degree of opposition in such situations is perhaps normal, particularly given that some members of staff had witnessed massive change on the project "They [the Advocates] went from having no one taking an interest in their performance to a situation which was in no way big brother, but it was a massive change for them." (CSO/05).

Secondly, the impact that the Dashboard had originally made appeared to have dwindled, with one interviewee commenting that "when we first started we had no visibility of what was going on. So the initial setup created a big impact. It was a way of recording and showing what was going on but the enthusiasm waned as it went on." (CSO/01/RB). Another interviewee stated that "When it [the project] becomes a process, it [the perceived value of the Dashboard] seems to lessen too." (CSO/02).

Thirdly, the content of the Dashboard was not updated and became less relevant to project requirements. "I think e-learn Dashboard actually became obsolete because people weren't bought into updating it in the way that they should and I didn't have the time to oversee that they were doing it properly. There might have been a training issue that the people who were collecting the information weren't asking the right questions, saying 'Is this exactly what you want to see on the Dashboard?' ...My feeling is that if we had reviewed the content on the Dashboard, probably about 3 months after we had put it together we would have changed a lot of what was on there. I think that's a good thing that you can update the content." (CSO/05) A second interviewee observed that "...we should have developed it. Bits of it weren't relevant and we should have changed them. Instead of progressing the Dashboard we just left it the same and I think that's where we went a bit wrong." (CSO/04).

Fourthly, and of critical importance was the culture of the organisation. While the Researcher was located at the organisation, having an open, friendly and participative culture was regularly discussed and promoted by the SBU's senior management. Indeed, during the Researcher's time at the company, the Director published a series of values

which were identified as being core to all aspects of business activity and appeared to support the cultural requirements of the Dashboard approach. Based around three core tenets of Recognition, Achievement and Honesty & Integrity, the values are represented in Table 6.2.

Tenet	Value
Recognition	Thankyous
	Feeling Valued
	Sharing Success
	Being Supportive
	Investing in People
	Constructive Feedback
Achievement	Dynamic
	Learning
	Innovation
	Pioneering
	Challenging
	Striving for Success
Honesty & Integrity	Trust
	Accountable
	Showing Respect
	Communicating Openly
	Considerate to Others
	Constructively sharing issues

Table 6.3 Core Cultural Values of the SBU.

Some of these values, such as communicating openly, constructively sharing issues, trust, being supportive and providing constructive feedback, appeared to directly support the type of environment necessary for a smooth Dashboard implementation. However, whilst such a culture was identified as being desirable for the SBU, it was not fully supported by the actions of the business unit Director. For example, the Senior Management Team, the Researcher and a handful of other staff were asked to participate in the development of the business unit strategy. Having spent a day identifying and discussing strategic directions, the output of the day was completely re-written by the business unit Director. This controlling nature was commented on in the interviews, "There is a cultural thing here. It's a fear factor. The way we manage the business at the moment, PB sees the finances, PB has control. PB loves control. He's very controlling, very good at keeping everything under his wing making sure that every i is dotted and every t crossed. I wonder in some ways if he saw it [the Dashboard] as a lack of control whereas for me it gave me more control." (CSO/05). Another interviewee stated that "One of our problems is that we don't have a strategic lead at all. PB is very operational and stays at that level all the time, or at least at an account management level. Consequently, we're not doing all the good things we tell our clients to do like initiation process for projects, how do you decide which projects to go for, how do you determine their priority, how do you decide what's valuable to take on... We're struggling to manage them because we don't have the resources because there has been insufficient planning. So it amazes me that a strategic tool like this [the Dashboard] is not being applied." (CSO/03). Over a period of time, this continuing commitment to working at a very visible operational level and in a style that did not support the cultural values sought, appears to have contributed to the decline of the Dashboard. Nearly all interviewees made comment on this subject, with the following quotes providing the most insight:

"We also I think have a culture, which has come out quite strongly from people talking about a fair amount of fear around people like PB and RP, so there's not the openness that there ought to be. It means that things like the Dashboard which have data gathering requirements are not being addressed." (CSO/03).

"Well, interestingly there's another cultural thing. A lot of people say that we have "a small company attitude though we're trying to be a big organisation" (CSO/03). Indeed this was supported by another interviewee, "I think it's got loads of potential. It's a shame that having been bought by a large corporate we still don't get the support that we need to grow." (CSO/04).

This cultural deficiency seems to have been transmitted on to the e-learn project, with a range of comments along the following lines. "I'll give you another example, PB came to one of our project meetings and SAB had put everything down on North Yorkshire as being red – we had quite a lot of issues in North Yorkshire at the time. There was stuff on there that I thought SAB had control over, that she could have sorted out herself, but I recognised that there were other things that she had no control over and SAB used it as a means to highlight to me that there was a problem. PB saw the Dashboard and went off his head and called SAB in. We were in a hotel in Yorkshire and he went off his head. I knew he'd gone off his head, so everybody else did too. He got really angry with her about it and I think that kind of behaviour is breeding a level of fear in people... With e-learn the cultural issue was going from no visibility to in some ways complete visibility and no matter how many times you told people that they weren't going to get told off, PB coming in and giving someone an absolute roasting for something doesn't send the right message out. All the previous hard work is wasted." (CSO/05).

"It's very much about trust. People will trust you to a degree and it only takes one incident to take everything back to step 1. That's what happened with e-learn and it's very sad because we'd built a lot of trust and the fact that someone gets roasted for turning a work package red means we'll lose all that without any shadow of a doubt. That comes back to cultural issues – do people really understand what it is all about?" (CSO/05).

A Fifth possible reason for the Dashboard not being adopted in the longer-term, despite being widely regarded as successful, relates to the project or programme management maturity and the skills within the team. The implementation at the PSO was in a department that had reasonably mature processes, with qualified, skilled personnel. That did not appear to be the case at the CSO. One interview stated that "...there is a distinct lack of Programme Management practices...We are not skilled in project and programme management at all. Partly we are lacking skills and partly because of all the fire-fighting, the skills that there are, are not being utilised properly. And there is no internal training." (CSO/03). Relating this concept more closely to the unit of study, "The other thing is that the team we had in Yorkshire were very bad at planning. I think that's quite common, people don't tend to like planning. It's one of those things that you have to do rather than you really want to. So for me to get that information out was difficult. They found it difficult as well. But that's probably a skills issue and also a motivation issue." (CSO/05). Another quote is taken from a discussion with a senior consultant, who showed an example of a Dashboard to a Programme Manager in Lincoln City Council. "The reaction was, in Lincoln, and he's a pretty switched on character, he was impressed with it but

basically said 'we're not ready for this'. He wants the project management skills and processes in place before they take the next step. But his reaction was 'very impressive and lovely to have but no where near ready for it yet.'" (CSO/03).

One final reason relates to CSO's propensity to change. As previously discussed, the business unit that the Researcher worked for had recently been acquired and there was a reasonable degree of uncertainty and change within the unit. As one interviewee stated, "Another issue is trying to implement a Dashboard when there's a lot of change going on. We are part of a new company and we don't quite yet know our place in it. There's a lot of change going on and I think that's scared a few people off." (CSO/03). Arguably the Work Package Delivery Plan information component should have helped mitigate this situation, at least from a project view point. However, given the largely unplanned post-acquisition integration strategy, there was no visibility over forthcoming activity. Future implementations though may benefit from integrating change initiatives at an SBU and organisation level into the component.

6.4.3 SUPPORT FOR THE DASHBOARD

There were a lot of positive comments made about the Dashboard and the approach in general, from staff at all levels. The following quotes are representative and are taken from interviews, the Researcher's diary, e-mails and workshop feedback.

"I hope the Dashboard continues, it certainly very important for people at my level I will continue to do a Dashboard for every project that I do." (CSO/05).

"People see the Dashboard and ask questions, which helps us to develop relationships and that's what we're good at – making and developing relationships." PB, Researcher Diary, 11/06/2003).

I really like it actually. I think it's a brilliant tool to use for presenting projects to customers. I also liked it myself for seeing the information, what order we'd had, what stock was left...(CSO/04).

"It's so easy to read and remember that it's treated as gospel. You don't question it and that's because it's so good." (RP, Researcher Diary, 05/11/2003)

"The customer, YF really liked it and every time we see them they ask for it and they put it up by their desk each month." (CSO/04).

"From a business point of view and representing it to the outside world, I don't think we've got anything else that can beat the dashboard." (CSO/05).

"I think from the hierarchy's point of view, if you don't know all the ins and outs it's a good way to document it. Especially in the early stages, like with Northumberland. The customer there was very impressed with it. (RB, CSO/01).

"[The customer] love it. They always ask for it every month, without fail." (CSO/05).

"It depends on the level of application but it can show the balance between the strategic and operational, the performance of an individual project and it relates to other factors. For me a diagram is worth 50,000 words let alone a thousand." (CSO/03).

"I think the Dashboard is absolutely fantastic..." (CSO/02).

6.4.4 APPLICATIONS OF THE DASHBOARD

A range of applications for the Dashboard were identified in Chapter 4, Pilot Study. One principal further application has been identified and that is as a sales tool, to be included in bid tenders. During the six months that the Researcher was based at the CSO offices, six static Dashboards containing dummy information were developed to this end. They were also used to structure presentations to the customer as the bid progressed. The Bids Manager thought it was particularly useful because "in the audience's mind it moved from being a sales pitch to 'this is what you'll get when we deliver this project.'" (NB, Researcher Diary, 15/10/2003). Another Project Manager commented, "Every tender presentation I've gone to where we've taken the Dashboard, people have gone 'Oh my god, that's fantastic'. So for presenting and promoting our business I think the Dashboard is fantastic. What we did for the el@nd project was we took a static version of the Dashboard and used that as our presentation and presented the Dashboard. The people just loved it because it is so impressive. You can see the benefit straight away if you've ever worked on a project." (CSO/05). Further, the Central Support Manager observed, "We still use it [the Dashboard] on Northumberland and we think that's a major reason why we won the contract." (CSO/04).

6.4.5 BENEFITS & DRAWBACKS OF THE DASHBOARD APPROACH

As per the previous Dashboard Applications section, a range of benefits and drawbacks were identified in the Pilot Study. The purpose of this section is to present a series of quotes identifying new benefits and supporting those already established.

6.4.5.1 Benefits

"I think the reason it worked before is because the information was so visible so you can go in and straight away and see who's doing what." (RB/CSO/01).

"...I think that the communication side is just as important [as the control aspect]. In fact that's where it's very good indeed." (CSO/03).

"...people think it takes ages to develop. They say things like, 'you don't want to be doing that every month!' even though it doesn't take that long and for me it's probably harder to write a report than it is to change a graph. People love it. From a business point of view and representing it to the outside world, I don't think we've got anything else that can beat the dashboard." (CSO/05).

"It made people think about what they were going to do and how they were going to do it.

That doesn't always necessarily happen." (RB/CSO/01).

"I think it's something that people are very impressed with. I think it's a fantastic way to show people information and for me personally, I think it taught me an awful lot about how to represent project information and it taught me a lot about how to see the bigger picture." (CSO/05).

"I think it motivated them because they had to put down what they were doing for the month. They had to produce because they knew it was visible." (JB/CSO/01)

"I also think, and you ask about resources, every business needs to see progress, every business needs to see performance, every business needs to see if they're using their resources correctly. They need to know if they've got the right resources in the right place and I think the Dashboard does all of those things. It is a fantastic way of representing that information." (CSO/05).

"For me the main benefit is the visibility of the key success factors. It depends on the level of application but can show the balance of strategic and operation, the performance of individual project and how they relate to other factors. For me a diagram is worth 50,000 words let alone a 1000." (CSO/03).

"To me the dashboard was very important because I didn't know that status of the project when I took it over. I knew we were in trouble but I didn't know where and I didn't know how I was going to find my way out of the problems we were having. I found it very good to represent all that information." (CSO/05).

One interviewee mentioned on several occasions that the Dashboard helped him to relax as he could '"download" all the information in his head onto one piece of paper.

6.4.5.2 Drawbacks

Where drawbacks were identified, they primarily related to the ease of updating the system; the technology supporting the Dashboard approach. For example, "It was also shown to St. Helens but they didn't like the how it was updated so I think PB is having some major doubts about it." (CSO/02).

Another drawback, previously discussed relates to the longevity of the tool and keeping staff interested in its contents.

6.4.6 CRITICAL SUCCESS FACTORS TO THE IMPLEMENTATION AND MAINTENANCE OF THE DASHBOARD APPROACH

Daniels first introduced the concept of "critical success factors (CSFs)", stating that "there are usually three to six factors that determine success: these key jobs must be done exceedingly well for a company to be successful" (Daniels, 1961, p.116). The concept has been applied to project environments to refer to "those inputs to the management system that lead directly or indirectly to the success of the project" (Cooke-Davies, 2002, p.185).

During this case, the Researcher identified five CSFs in terms of implementing the Dashboard approach. They are: open communications, "no blame" culture, participative solution development, securing long-term executive support and having appropriate IT integration. The factors have been identified based on interviewee data, a workshop conducted with the Project Manager, Project Director and two principal consultants on 19th November 2003 with the senior management team and ongoing discussions thereafter. The workshop focused on trying to distinguish between factors that were important to the success of the process and those that were critical. Critical factors were considered to be those that were they were not present, it would be highly unlikely or impossible for the implementation to succeed. Each CSF is now discussed with supporting examples and literature referenes.

6.4.6.1 CSF #1. Open Communications

As discussed previously, effective communications in programme management environments are critical to success (Ancona and Caldwell, 1992; Jassawalla and Sashittal, 2000; Michalski, 2000). To develop a sense of trust and empowerment, which contributes to the development of a participative environment, 'opening up' communications can be effective. Open communications can be expressed as a commitment by the organisation to provide unrestricted access to information, for all staff. This concept is an important ingredient in effective team-working (Cahoon and Rowney, 1995) and to the overall success of the project (Pinto & Slevin, 1998). The reader is asked to consider the following questions:

- How can individuals be expected to contribute to the execution of organisational strategy, if they do not know what it is?
- When management are not available, how can staff be expected to make decisions that will benefit the organisation in the long-term if they cannot see the bigger picture?
- How can management expect salient knowledge to be transferred across project teams if team members do not know what other project work is live within the department?

It is the Researcher's perception that the Dashboard approach would have been more effective had the Dashboard been displayed more openly around the office, particularly when contrasted with the PSO's experiences. If open communications are not realised the knowledge transfer potential of the tool will not be achieved, inhibiting one of the main benefits of the tool. Introducing open communications, particularly around contentious issues such as staff performance, which is implied through the use of the ROYG states, can involve significant cultural change. As such the introduction of such a policy must be co-ordinated with CSF #2, a "No Blame" Culture.

6.4.6.2 CSF #2. A "No Blame" Culture

The concept of organisation culture is long established in the management literature as referring to the collection of beliefs, values and assumptions held by members of an organization (Pettigrew, 1979; Whipp et al, 1989). The aim in this context is to develop a participative, debate-friendly environment where high performance visibility is embraced by staff at all levels, in the recognition that such systems are the most effective way to maximise development of the individual, department and organisation. Previous research has identified the importance of a blame- free culture in project success (McLendon

& Weinburg, 1996). However, realising this vision has a degree of difficulty that varies considerably. In the Researcher's experience staff are quite often positive about the system providing they can see the benefits to them personally; they are encouraged by a system that enables a meritocracy. However, one of the risks of introducing a system that makes the performance of every project member highly visible, is that team members may feel anxious about it and could conceivably attempt to block its introduction. One example from this case was an attempt to implement the tool in an IT department, the manager of which refused to interact with the researcher and made it clear in no uncertain terms that he would not become involved in setting up a system that would be used to punish him. As such, from a very early stage and ideally before the start of the implementation process, it is important to communicate the way in which this enhanced visibility will be leveraged. It is stressed again that if the tools are used as a mechanism to increase authoritarian rule by punishing poor performance, the tools and underlying processes will not receive buy-in. As has been demonstrated throughout this Chapter, without a No Blame or supportive culture, the Dashboard is highly unlikely to succeed.

6.4.6.3 CSF #3. Participative Solution Development

Bowey and Thorpe (1989) have observed how a company's strategic policy can be modified or subverted by lower levels of management pursuing other goals and objectives. Neely (1998) cites one example where staff in a call centre were measured according to the speed with which they dealt with customers - the target time was 60 seconds. After a time, staff began to hang up on customers just before 60 seconds to ensure they met their targets and received optimised financial remuneration. The net result was very poor customer service - the antithesis of the overriding aim of any customer call centre.

One method of mitigating this hazard is to develop the solution with the programme team and then attempt to destruct the system with them by anticipating ways in which the measures could be violated (Neely et al., 1995). If buy-in can be gained at this stage, it will result in a much smoother implementation process. Further, if the system is to be the subject of continuous improvement, it requires the on-going support of those persons using it. In this case, it was not possible to gain the participation of one key project team member at the start of the project due to their absence as a result of illness. When they returned and started work on the project it was difficult to overcome the fact that they had not participated in the development of the tools. Throughout they were uncommitted to use of the tool and they did not sign up to the overall project goal of the group. Where a participative approach is not pursued, the number of stakeholders who are not aligned with the goals of the approach will eventually reach a critical mass and will force premature termination of the implementation.

6.4.6.4 CSF #4. Long-term Executive Support

Securing top-level support is now a widely accepted CSF in programme/project environments (Pinto and Slevin, 1987; Pinto & Slevin, 1989; Tishler et al, 1996; Jang and Lee, 1998; Black et al, 2000; Procacinno et al, 2002) and in the wider performance management literature (Cooper, 1999; Bourne et al, 2000;). Implementing a high-visibility performance tool is no exception to this rule. If senior managers use the visual reporting system to berate project managers who have used the red status, instead of offering them

the support to get the project back on track, this can undo months of cultural development.

6.4.6.5 CSF#5. Appropriate IT Integration

As previously discussed, one of the major drawbacks identified by users and potential users of the tool is the lack of appropriate supporting IT software. Whilst the Dashboard approach has been shown to work without such software, there seems little doubt that if process efficiency could be improved, the longevity of the tool would be increased and the number of potential implementations amplified. Yet the introduction of such software would need to be carefully managed. Adherents of the view that new technology will act as a panacea to the problems of communication and control should bear in mind Project Managers' reservations about their computer based planning and control systems. (Lord, 1993). Having appropriate IT integration is therefore identified as CSF#5 because without correctly positioned software, in terms of functionality, ease of use, scalability, return on investment, and so on, it may be difficult to engage stakeholders in the medium to long-term and the probability of successfully maintaining a Dashboard system will be diminished.

6.5 REVIEW OF CSO OBJECTIVES

This section reviews the objectives identified earlier in the chapter to establish whether they were achieved. Given the then recent acquisition of the Strategic Business Unit (SBU), a degree of turbulence within the organisation was not unexpected, though was arguably worsened as a consequence of a flawed post-acquisition integration strategy, as characterised through a number of examples. The organisation structure changed on a regular basis and during the 12 months that the researcher worked and liaised with the business unit, staff were relocated no less than five times within the company's headquarters. Further, staff roles and responsibilities frequently changed, contributing to a general feeling of uncertainty amongst staff. Finally, there did not appear to be a strategic vision for the business unit and where strategic messages were imparted, they appeared to be inconsistent and were not supported by appropriate actions. This contextualisation of the case study organisation is not meant to paint a disparaging picture, rather it is included to provide a backdrop to the implementation of the Dashboard tools and the challenge faced by the Project Manager and Researcher in implementing the tools.

The first objective was to determine whether the Dashboard could provide an effective view of performance for a newly appointed Project Manager. It would appear that the approach did provide the desired levels of visibility during the initial stages of the new Project Manager's tenancy because it facilitated the restructuring of many facets of the project so that, for example, staff roles, the PMS, project operations and the communications strategy, were consistent with the objectives of the project. Ultimately, desired levels of project performance were realised and the project was extended by the customer; the introduction of the Dashboard was recognised as a key contributing factor in achieving this. The approach is considered to have represented value at the project-level even though the cost of implementing the tool is much higher than at the programme-

level, relative to the overall value of the unit of work. The overwhelming feeling amongst project staff was that the approach delivered value because it contributed to a turnaround in project fortunes but that to be truly effective process efficiency should be improved through the development of appropriate supporting technologies.

The second objective was to compare the utility of the tool at a project, as opposed to programme-level. Although not a direct consequence of implementing the Dashboard at a project-level, the unit of study provided important evidence regarding the necessary cultural requirements for successful implementation. It could be argued that at a programme-level, the production of the Dashboard involves a greater degree of (automated) data aggregation and therefore less primary data generation. As such, there should be greater emphasis placed on cultural development at the project-level because there is an increased opportunity for stakeholders to subvert the measurement process. In terms of a project/programme applications comparison, on one level the tool was used in very similar ways and with comparable applications. For example, it provided performance visibility, formalised communications processes and was used to structure meetings. At a more detailed level, subtle distinctions have been drawn in this Chapter regarding the operational nature of using a tool in an environment where the frequency of change is greater, for example in relation to achieving weekly as opposed to six-monthly targets and the impact of this in managing team meetings and overall progress.

With reference to testing the implementation model, many lessons have been learned and documented, for example the level of training required and the importance of participative development. The study was certainly effective in this regard and the implementation process must be stronger for it.

Finally, regarding the variation in information requirements between the project and programme level, it would appear that due to the more operational nature of the project level management, information components relating to Actions, Team Action Plans, operational performance and the nature of the Work Breakdown Study represent key distinguishing features.

6.6 CHAPTER CONCLUSIONS

This Chapter has presented the findings from the main case study, which was executed using an action research approach. Data was collected from project documentation, organisation documentation, semi-structured interviews, informal conversations, project meetings, workshops and training activities. A Researcher Diary was also maintained to record initial thoughts relating to all aspects of the implementation. The data was analysed using the coding and memoing techniques prescribed by Miles and Huberman (1994) and Strauss and Corbin (1998).

The Dashboard was implemented on a poorly performing project, referred to in this Chapter as e-learn, which aimed to train 138,000 new people in ICT skills between April 2001 and March 2004. The tool was used as a centre piece to restructure the delivery of the project outputs and contributed to a turnaround in project fortunes. Feedback was sought and has been documented regarding the implementation, production and

maintenance process. The Dashboard approach was largely supported and regarded as a valuable addition to project management processes. Key learning points relate to the importance of tailoring training to individual and organisational requirements and in regularly reviewing the content of the Dashboard with project stakeholders. Based on this feedback and other data, five critical success factors have been identified. They are: open communications, "no blame" culture, participative solution development, securing long-term executive support and having appropriate IT integration.

The following Chapter will now present a discussion around the key emergent themes identified in the thesis hitherto.

7 DISCUSSION

In this chapter the findings of the Pilot Study, the Beta Model and Validation Case Studies are discussed and expanded upon. Useful insights on substantive literatures and current thinking within the research domain are also presented.

7.1 INTRODUCTION

In this Chapter, three key emergent themes are discussed in more detail and contextualised within their broader research domains. They are the role of the Dashboard as a knowledge transfer mechanism, the way in which drivers of trust can be leveraged through the Dashboard and the impact of a blame-free culture on the success of the Dashboard. These themes have been selected due to a combination of factors: the frequency of data collected around each theme, the importance accorded to the themes by interviewees, academics and other research stakeholders, and finally the personal interests of the researcher. Each discussion strand is introduced via a succinct review of extant literatures before the impact of the research is framed. A series of less dominant themes are then briefly discussed before the Chapter is concluded.

7.2 DISCUSSION

As previously mentioned, this section presents a discussion around three key emergent themes: the role of the Dashboard as a knowledge transfer mechanism, leveraging the Dashboard for enhanced stakeholder management in terms of expedited relationship development and the challenge of developing a Dashboard culture. In terms of the relationship between these themes, improved communications and knowledge transfer is considered to be the principal benefit of using the tool, with expedited relationship development being a function of these improved channels of communication and the Dashboard approach as a whole. However, the major barrier to a successful implementation lies at the heart of the culture of the project management environment and depending on the organisation, may represent a significant challenge.

7.2.1 THE ROLE OF THE DASHBOARD AS A KNOWLEDGE TRANSFER MECHANISM

Throughout the research, all those involved in designing, implementing, producing and using the Dashboard have commented on the power of the tool as a communications device and knowledge transfer mechanism. This is due to the contrasting nature of ubiquitous project reporting tools compared with the relatively novel Dashboard approach.

Statements such as the following were typical:

[In reference to the Dashboard] "...a critical part of the job of leadership is about communicating. Be it communicating the vision, communicating progress, communicating the culture, communicating what your expectations are. Whatever it is, management is all about somebody getting a group of people to want to do what they want them to do and then for them then to do it. If communication is one of those mechanisms then you have to find many different ways of doing it and if you can supplement big visual images with inspirational speeches with a tightly written document and you can hit people with many different communications with the same basic point then you'll get it in." (PSO/08)

"Every tender presentation I've gone to where we've taken the Dashboard, people have gone 'Oh my god, that's fantastic'. So for presenting and promoting our business I think the Dashboard is fantastic. What we did for [Project N] was we took a static version of the Dashboard and used that as our presentation and presented the Dashboard. The people just loved it because it is so impressive. You can see the benefit straight away if you've ever worked on a project." (CSO/05).

Indeed, one of the challenges of creating a project management environment that is effective at communicating information and transferring knowledge is in moving away from the archetypal project tools and presentation methods so commonly used. Although this thesis reports in depth on the experiences of two organisations' experiences in using Dashboard tools, the Researcher has spent time with a further two FTSE100 organisations, both of whom were considered to be mature in their level of project and programme management capabilities. Even for organisations such as these, and the PSO, a major challenge is represented in improving the level and quality of communications. For example, during this research the following barriers to communication and knowledge transfer caused by inappropriate tool selection and poor presentation style have been identified:

- Reporting information as spreadsheets, which typically contain a great deal of information that is either redundant or irrelevant. Even in cases where all the information is relevant, to the casual or time-pressured reader, it can be very difficult to extrapolate meaning from the data and transfer it into action. This was characteristic of the CSO, which suffered from very poor information flows. At the PSO, most of the supporting Dashboard reports were in A4 format, presented in colour and were largely graphics-based. This provided for a much more succinct overview of relevant information, though slightly lacked balance due to an over-emphasis on technical issues over project/programme management issues.
- Formatting data to present it, for example, as a Gantt chart, which is unwieldy when used to breakdown project activity to any meaningful level. Such charts are then typically printed across a number of A4 pages, rendering it almost useless as a communications device as users have to juggle the various pages before the diagram makes sense. In situations where the organisation has access to a plotter, and can print the chart on one page (such as at the PSO), it is still very hard to read as the time scales of two hundred or more project activities are represented by lines only a millimetre or two thick.
- Presenting information in formats that require project management training, such as Critical Path Analysis (CPA) or Program (sic) Evaluation and Review Technique

(PERT). Such diagrams are difficult to comprehend for those project members who are not project management-oriented and again become cumbersome as the project is decomposed to its constituent elements. This occurred at both collaborating organisations and is typically caused by failing to distinguish between project planning diagrams and project communication devices.

- Data being stored in a number of different data structures, which creates an added level of complexity for project workers in terms of knowing where to locate and how to access certain information. This was certainly the case at the CSO where the majority of project information was stored across a range of spreadsheets and databases. Though the data structures were more consolidated at the PSO, a great deal of information was stored on spreadsheets in personal computers, with limited access.
- Data displays containing technical language and/or organisation specific acronyms reduce the value of the display as the potential audience will be limited. This was again encountered at both participating organisations and though arguably increases vocabulary specificity can make the organisation difficult to penetrate for new members of staff, suppliers and customers.

Having critiqued a range of displays it is important to note that all presentation formats are useful in a given context. For example, Gantt Charts and CPA diagrams are useful for technical planning but to be able to read them effectively, project management knowledge is required along with an intimate understanding of the project and a reasonable period of time to comprehend and interpret the data. As such they are not particularly effective as communications devices. This viewpoint is consistent with Knowledge Management literature (for example, Scarbrough, et al., 1999), which identifies an over emphasis on a resource-based view of knowledge, leading to production of tools to leverage knowledge rather than on the learning organisation which focused on people.

Project communication tools, as opposed to project planning tools should therefore attempt to leverage the Community Model of knowledge management (Nonaka and Takeuchi, 1995; Blackler, 1995) which suggests that knowledge is "embedded in and constructed from and through social relationships and interactions" and "achieved through shared understandings and attitudes" (Scarbrough and Swan 1999). Indeed, the power of socially constructed information should not be underestimated. Rather than attempting to hide information via inappropriate presentation formats, where communication is the overriding objective of the display, regard should be given to ways in which the display can initiate and structure conversations around appropriate themes and the way that the reader or converser is directed towards further information repositories. Three core elements of information design have been identified that may encourage social interaction: presentation format, information content and production and distribution. These factors are now discussed in more detail.

The presentation format

- Is it engaging; does it catch the eye? A largely textual presentation of data with long paragraphs is unlikely to intrigue a potential reader. A good test is to consider whether staff would stop and look if the information was presented in the corridor or an office wall. The Dashboard achieves this through the use of graphics and colour. Further, due to a lack of wall displays in typical office environments, the Dashboard has a degree of novelty.
- How long will it take to read? For example, the Researcher would suggest that if a

project report looks as though it will take more than a few minutes to read summarily and more than 20 minutes to read in depth then the presentation format should be reviewed. Text-rich documents, particularly those with lots of acronyms, long sentences and/or complex language will give the impression of requiring much greater attention over a longer period of time than information presented graphically with a title explaining the core message of the chart and simple analysis / actions underneath. The Dashboard realises this by presenting information on a number of levels: by looking at the Dashboard for only a few seconds it is possible to ascertain the number of projects with serious issues yet it is possible to spend up to an hour analysing the data and considering potential scenarios.

- Does it target and prioritise the key issues? In some ways, a continuation of the previous point but where a document is sufficiently long to disengage a potential reader, mechanisms should be sought that target and prioritise key issues. In the Dashboard, this is achieved via extensive use of the traffic light colours to direct attention.
- Does the design accurately represent the data? With modern software it is very easy to present information in such a way that distorts the information that it represents (Wyatt, 1999; Zelazny, 1991). The Dashboard approach promotes the accurate representation of data to facilitate open and honest communications.

Information Content

- Does the information satisfy a wide range of stakeholders? With regard to the Dashboard, at a strategic level Directors can visualise the breadth of the change plan, map future scenarios, understand resource utilisation, delivery bottlenecks, and so on. At a more operational level, individuals can see how their project fits into the broader programme of work, projects currently in evaluation that they may be seconded to and the performance of their colleagues' projects. Further the customer can see the performance and progress of the work they have commissioned and suppliers can monitor their engagement in the project and how it might develop or be improved in the future.
- Will the information satisfy the user's requirements? In many regards, hopefully not! It is arguably impossible to include all the potential information demands of a variety of users and yet maintain a document that is engaging and with an appropriate degree of detail. The challenge in terms of information design is therefore to create a document that initiates further demand for information and promotes social interaction, as per the Community Model of knowledge management (Nonaka and Takeuchi, 1995; Blackler, 1995). In each information component of the Dashboard, contact details of the most relevant person to provide more information are listed.
- Does it require project-specific knowledge or technical project management learning? Where this is the case, the display will be less engaging and take longer to read than is necessary, decreasing its value as a communications tool.
- Is the information interpreted and analysed? As previously mentioned, it is very difficult to design a document with all relevant project information in it, given the differing information requirements of the plethora of project stakeholders. A logical progression of this argument is that without comprehensive project knowledge it is extremely difficult to analyse project data, identify and prioritise project actions. Analysis must not therefore be left to the reader and must be conducted by someone with that degree of visibility.
- Is the information actionable? Too often analysis is conducted but is not thought

through to the point where appropriate actions are identified and commissioned, increasing the likelihood of dissonance between analysis and the actions ultimately taken. This analysis and action identification should be done by the same person and at the same time in an effective project/programme management environment to ensure consistency of decision-making. On the Dashboard, a management comment box is provided in every information component to provide for the qualitative analysis and interpretation of the quantitative data.

Production & Distribution

- Is the correct technology available to support the design requirements? There is little point in designing a poster-size display in colour if the available IT dictates that it must be printed on A4 paper in black and white. In terms of distribution, some users may prefer to have the file electronically while others will prefer a hard copy or an oral presentation. In general terms, it is recommended that the same information is leveraged across a number of media channels to improve comprehension rates as it is prudent to assume that that those targeted will not receive the communication, i.e.:
  - e-mails and reports are deleted without being read, or are skim read without the information being absorbed.
  - People's concentration has lapsed when they are told about something in a presentation.
  - Not everyone has attended the meeting, workshop, communications day, staff outing, etc
  - Some staff members will not have read the internet / intranet site
  - Employees will not practice what they have been told in a training session and subsequently forget.

  As a note of caution, it is important not to overload staff with too many messages. Developing a communications strategy is therefore essential to manage the overall communications workload and is an important facet of Dashboard implementation.
- Is the information published in a timely fashion? There is little point in communicating information that has past its sell by date, as this may only serve to confuse matters further. It is therefore important to develop an efficient method of translating data into usable information, whether this is achieved through the use of IT or is more processed-based.
- Where is the information displayed? Where the information is presented as a poster-size display, it is important to ensure that it is displayed on walls and where appropriate in communal areas. Open-plan offices are not always conducive to this aim and may require a revision to the production and distribution plan.

A large programme of project work will require many different project teams and associated disciplines to integrate their knowledge in order to continue the development of new products, services and systems. This integration of knowledge could both help exploit existing knowledge, thereby saving time and create an environment to explore opportunities for new knowledge creation. Typically the solution to programme management has been to supply all parties with vast amounts of data so they have all the facts at their fingertips; however the interrelationship between projects has often been lost in information overload.

Using a matrix organisational structure to create cross functional project teams and adopting a community network model of knowledge management processing

encourages knowledge sharing through networking. The cross functional style of working enables an overlap of skills and previous experience, creating redundancy, which is regarded as necessary by Nonaka (1995) as some knowledge is needed by all individuals, even if not used regularly because it allows them to interact or 'sense make' (Weick 1990). The community network model, as its name indicates, requires active participation in a project management process which is unpredictable and requires continuous interaction. Networking, for example through communities of practice, offers the opportunity to communicate both inside and outside of the organisation to draw in information to add or amend to the shared system of meaning.

The Dashboard approach brings together many of the facets of the community network model. By displaying the diagram in coffee rooms, corridors and other communal areas, the organisation encourages the cross functional team to network within and across teams and communities of practice. It is proposed here that such discussions occur as a result of human's inherent interest in other people's performance and typically involves the use of story telling (Snowden, 1999) and metaphor to facilitate organisational understanding (Morgan, 1986).

The use of the Dashboard as a focus of attention, facilitates multidiscipline and cross functionality networking of the teams, generating a Mode 2 style of working, which Gibbons (1994) sees as necessary for knowledge production for innovation; this overlapping in turn generates the ability to create a 'redundant representation' (Hutchins 1990). This 'redundant representation' enables the group to envisage 'a social system of joint actions' (Swan et al 1999), literally working together through the diagram to identify potential risks and changes of approach from a kaleidoscopic range of opportunities.

The graphical presentation of the organisation's key data creates a shared system of meaning and associated shared metaphors, such as the traffic light coding of red, amber and green. These metaphors help to facilitate organisational understanding (Morgan, 1986). The community networking models emphasise developing a common language spoken by all project team members to challenge the typical problems of competitive project team knowledge silos and barriers as it highlights relationships, shared attitudes and understanding (Spender, 1996) and provides a cumulative feedback loop (Castells 1996). This is again consistent with more mature project and programme management environments.

Swan et al (1999) identify an aim 'to develop systems that allow experts to engage in active networking through creating environments that are media-rich enough to encourage knowledge sharing and organisational learning'. The one page big picture creates a demand driven approach to knowledge processing, with direction on each information component towards more detailed information. This reduces individual overload, and encourages sharing of knowledge through formal (project review meetings) and informal (coffee room) networking.

Quintas (2002) identifies the challenges of sharing knowledge across disciplinary and functional boundaries 'since different communities and disciplines may have little common ground for sharing understandings'. Indeed working in project teams competing for resources may create a competitive environment which creates barriers to knowledge sharing, as per the PSO. "It is only through the process of sharing and assimilating

information, often determined in large part by high levels of reciprocal trust, that organisations can move from collections of individuals to a more collective culture" (Lemon and Sahota, 2002). By promoting management theories, such as a no-blame culture and open communications, organisations can encourage a trusting environment. Organisations are cognitive enterprises that learn and develop knowledge (Argyris and Schon, 1978). Such a capability could involve a tool and an organisational or cultural ethos that supported its use.

Wharton (1998) reasons that organisations must develop ways of ensuring that the culture is conducive to knowledge sharing. One way of supporting this culture is to facilitate and encourage socialisation as a platform for knowledge dissemination. Senge (1990) promotes the use of dialogue promoting mutual understanding between individuals. The individuals engaged in knowledge transfer are known as boundary spanners because they facilitate the transfer of information and bridge the communication gap created by functional areas or competitive teams, thereby reducing distortion and bias. (Wilensky 1967, Myers and Marquis, 1969, Tushman, 1977).

7.2.2 LEVERAGING THE DASHBOARD FOR ENHANCED STAKEHOLDER MANAGEMENT: EXPEDITED TRUST DEVELOPMENT

Having explored in more detail the impact of the Dashboard on communication and knowledge transfer processes in project and programme management environments, this section will discuss one of the ways in which this improved communication can be leveraged to improve stakeholder relations. Specifically, where communications are open, accurate, accessible, relevant and timely, there exists an opportunity to expedite the development of trusting relationships. One CSO interviewee commented that, "People see the Dashboard and ask questions, which helps us to develop relationships and that's what we're good at – making and developing relationships." PB, Researcher Diary, 11/06/2003). It will be demonstrated later that the Dashboard can be an effective tool in developing a wide range of project relationships.

"Trust is a complex, psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another." (Rosseau et al, 1998, p.395) and is generally accepted to be a component factor of organisational climate and a sub-domain of research in its own right. The importance of developing trusting intra and inter-project stakeholder relationships has been documented in the literature across a number of dimensions. For example with regard to industry, in IS projects (Lander et al, 2004; Sabherwal, 1999), construction (Huemer, 2004; Kadefors, 2004; Black et al, 2000; Genus, 1997; Munns, 1995), government agencies (Davenport et al, 1998), academia (Irvine, 2003) and healthcare (Sheerin, 2003). In terms of relationship type, prior research has investigated outsourcing (Lander et al, 2004; Sabherwal, 1999), sub-contracting (Kadefors, 2004) collaborative research (Davenport et al, 1998), partnering (Black et al, 2000) and virtual teams (Jarvenpaa, 1998) covering the effect of trust in several countries: UK (Black et al, 2000; Genus, 1997; Munns, 1995), Sweden (Kadefors, 2004), Norway (Huemer, 2004), America (Lander et al, 2004; Sheerin, 2003; Loehr, 1991), Canada (Herzog, 2001), Australia (Irvine, 2003), New Zealand (Davenport et al, 1999) and Singapore (Wong, et al, 2000). All commentators identify, either implicitly or

explicitly, a positive correlation between the degree of trust among project stakeholders and the successful outcomes of the project.

Specific examples include Wicks et al (1999), who argue that there is an optimal level of trust in a given situation and that the greater the interdependency between characters, the more trust is required so as to achieve efficiency and not to miss opportunities for improvement. Trust may lead to improved efficiency in knowledge transfer mechanisms aimed at the bi-directional sharing of relevant knowledge. (Nelson and Cooprider, 1996). Hartman (2002), based on a review of prior research, identifies three elements to the phenomenon of trust in project environments: 'Can you do the job?', 'Will you take care of my interests in a predictable way?' and a more volatile 'Does this relationship feel right?'. Where relationship development time is restricted (Munns, 1995) or where fast track development process are employed (Genus, 1997), expedited trust development becomes increasingly important (Zaheer et al, 1998). As project durations continue to decrease to ensure better strategic alignment, reduced risk, greater certainty over costs and in general improved performance, the ability of organisations to quickly develop trusting relationships with key project stakeholders will, in part, determine their overall performance. Hartman (2002) identifies a number of project situations where the role of trust has an impact on the effectiveness of the project process:

- Effective communication is easier and more likely to be complete between people who trust each other.
- Contract relationships, and as a result, contract administration, are easier if we can trust the contractor and the contractor can trust its client.
- Discovering and implementing cost-saving ideas will occur more readily if the participants can expect fair compensation and can be sure that their interests are being taken care of in the process.
- Teams work better together if the people in them can trust each other.
- Identifying client needs (the REAL ones) is easier if we have open communication, which is dependent on a high level of trust between the client and supplier.
- Schedules and estimates are more likely to be accurate if the contributors feel that their honest opinion will be considered and valued (trusted).
- Progress reporting is more honest in a trust-based environment.
- We are more likely to be successful project managers if our team trusts us, and if our clients and suppliers do also.
- We are more likely to be accepted as manager of a project (and have the resulting authority and influence on stakeholders) if others can trust us to do our jobs well.

A range of case data appears to support the notion of the Dashboard being effective in expediting trusting relationships across six dimensions:

Between the project manager and project team: In the CSO, a number of project workers worked as service evangelists. As such they worked remotely and were geographically disparate from the project office and each other. Whilst informal communication between these workers was high, there appeared to be little communication with the previous project manager, either formal or informal. Project performance was poor and these team members were poorly motivated. The introduction of the visual tools (including a restructuring of their performance objectives) provided a mechanism for two-way communication. This communication was formal (on the report) but also provided the

basis for more informal discussions, whether on a one-to-one or group basis.

Between the programme manager and project managers: In the PSO, the Dashboard was used to structure programme meetings. Project Managers would occasionally change the status of their projects so as to appear performing less well than in reality. This demonstrates clear faith in the way that the Dashboard system was implemented as there was no fear of recrimination; rather it was used to attract the attention of the Programme Manager and/or Programme Director in situations where a higher authority was required to resolve a project issue.

Between the project director and project manager: In the CSO, the Project Director became heavily involved with the project, once the initial assessment had been conducted. This was principally to assist the new Project Manager in liaising with the customer. However, once the graphical reporting system had been implemented, the Project Director turned his attention to other projects, confident that the project was structured properly, had appropriate performance measures in place and that inter and intra-project communication satisfied key project stakeholders.

Between project team members: In the CSO, a project team member was seconded onto the project mid-way through to cover for an unforeseen absence of another key team member. The graphical reporting tool allowed the new team member to quickly understand what the key drivers of the project were and became their main point of reference for understanding the importance of their own work to achieving the overall project aims. It helped them to trust the relevance and validity of their own contribution, but also, due to the fact that the tool facilitated the sharing of information between the team, to trust that the other team members were similarly focused.

Between the project organisation and customer: In the CSO, the customer had become frustrated at the poor levels of communication and lack of visibility towards targets. Claw back of payment had been mooted. However, once the reporting tools had been introduced and an honest assessment of the situation presented, with a series of corrective strategies, the customer felt much more in control. In the PSO, the Dashboard was distributed to the Board of Directors. In effect the Dashboard communicated that change that was being executed in the Directors' area of responsibility – operations, finance, etc. Although Programme Managers were concerned about the level of visibility that the Board would have, the honest overview of performance provided meant that the Board were able to provide project aid when required but were otherwise minimally involved.

Between the Project Manager and Project Suppliers: In the CSO, a Suppliers' Consortium had been established but was severely strained due to poor project performance. However, once the tool was introduced, members of the consortium had much greater visibility over project activities and performance. Indeed, in the meeting in which the tool was introduced discussion moved from one of frustration and possible withdrawal to how processes might be integrated between supplier and CSO to more effectively measure performance.

7.2.2.1 Identification of Trust Drivers and their Application through the Dashboard Approach

The creation and development of trusting relationships is built on many facets however and it would be extraneous to claim that the Dashboard satisfies all of them. Lander et al

(2004), in a review of salient literatures identify a broad range of mechanisms and strategies for building trust, as presented in Figure 7.3.

With regard to initial interactions, the Dashboard approach may contribute to developing familiarity amongst stakeholders and early team building exercises. For example, during the project scoping and initiation phases, the project manager would liaise with a variety of stakeholders to develop the static Dashboard. This may involve the customer, the project director, suppliers, the project team and any other relevant stakeholders with the Dashboard being used to structure discussions around projects requirements. Secondly, during the early phases of the project, project team members will participate in a series of workshops to populate areas of the Dashboard, such as the Strategy Map, Project Status and Risk & Issue Management. Team members may also be involved in the development of project performance measures.

With reference to the concept of integrity, the Dashboard can be used extremely effectively. By developing the static version of the tool and determining processes to capture the data with relevant stakeholders in a participative manner, the project manager should be seen as being forthright and honest in his/her interactions with others. This style of working should then be continued throughout the life of the project because when issues do arise, they will be communicated in an honest fashion through the Dashboard, along with corrective actions. Similarly, by documenting key project information in this way, stakeholder expectations will be managed and providing the relevant parties fulfil their obligations the project will progress in a timely manner. By communicating expectations and performance in this visible style, the Researcher noticed a greater commitment from project team members in the CSO as they did not want to be the weak link in an otherwise strong chain. In this way, team members and other stakeholders tended to fulfil their promises.

Although projects and programmes tend to be unpredictable largely due to systemic reasons, predictability at an individual level can promote trustworthiness. By strategically developing a reporting system that is highly visible and openly communicated, all stakeholders should be aware of what is required of them and what they can expect in return. The Researcher's perception is that a Dashboard approach, based on sound project management principles, contributes to a better managed project that is less prone to fluctuations in performance, promoting a more predictable environment at both the team and individual level.

The principal benefit of the Dashboard approach is enhanced communication across a range of project dimensions. The nature of these communications and the associated benefits have been discussed at length and appear to satisfy the mechanisms and strategies for building trust, identified by Lander et al (2004).

Initial Interactions
- Consideration of reputation
- Developing familiarity amongst stakeholders well prior to project initiation
- Using early team building efforts

Integrity
- Being forthright and truthful in interactions with others
- Fulfilling promises

Predictability
- Individual consistency
- Individual dependability
- Holding individuals accountable
- Appropriate use of motivators

Communication
- Encouragement of communication
- Sharing of relevant information and knowledge
- Provision of timely feedback
- Creation of a common language
- Creation of a shared vision
- Offering of explanations for decisions
- Creation of an open communications environment
- Presence of receptive actors

Sharing Control
- Delegation of obligations and responsibilities across team members
- Sharing and delegating of control across team members

Concern for Others
- Displaying overt respect for team members
- When appropriate, quickly and genuinely apologising for unpleasant events or consequences
- Demonstrating concern for specific stakeholder interests

Joint Identification
- Co-location of group members
- The ready availability of group members to participate in activities
- Degree of attachment to the group, structural and psychological
- Meaningful participation in group activities
- Frequency and duration of group interactions

Commitment
- Individual loyalty
- Individual job satisfaction
- Focus on long-term interests of individual participants

Potential for Success
- Competence of participants
- Achievement of significant pre-established milestones

Managerial Decisions
- Provision of training and personal growth opportunities
- Commitment of appropriate project resources
- Effective supplier/collaborator selection process
- Effective contract negotiation process
- Use of change management sessions

Figure 7.1 Mechanisms and Strategies for Building Trust (Adapted from Lander et al, 2004).

With regard to the sharing of control, the participative nature of designing and populating the Dashboard necessarily means that the traditional notion of the project / programme manager being the control hub of the project is somewhat dissipated. By jointly developing various information components, such as the work breakdown structure, individuals are assigned and are more likely to accept responsibility for achieving certain tasks. Further, by collaboratively developing the reporting systems, control moves from being a top-down process to one of bottom-up, as it is the team members that are responsible for providing performance data.

As the CSO highlighted, implementing a Dashboard does not ensure that the Dashboard approach is also adopted. However, the development of a culture that is blame-free, participative and constructive would appear to support the type of environment where respect and concern for the well-being of others is considered an important attribute among team members.

Similarly, implementing the Dashboard approach does not ensure co-location of team members and the associated benefits that that brings. Indeed, there was some suggestion by interviewees that it is within virtual team environments that the Dashboard would excel. However, where co-location does occur, it should be accompanied by the participative style of working, previously discussed.

It is proposed that where the Dashboard is implemented as a high visibility performance tool, supported by a participative, blame-free culture, that commitment by individuals is more likely to occur.

The extent to which project participants believe that the project has potential for success may be related to the degree of trust among those participants. Where team members have been involved in the design of the Dashboard, and therefore of key project planning activities it is likely that their commitment and belief in the project will increase. Where these conditions are satisfied and are supported by a positive cultural environment, the greater the chances of achieving milestones and project success are likely to be. Having said that, if individual incompetencies are rife throughout the project, no amount of positive re-enforcement is likely to deliver a successful project.

Finally, key managerial decisions are, in the main, likely to be determined by organisational constraints such as budgets, level of bureaucracy, organisational policies and so on. However, where decisions are made based on credible, timely and visible data, they are more likely to be accepted as the logic and reason for those decisions will be clear.

It seems feasible then, that where Dashboards are implemented via a collaborative approach and are supported by appropriate environmental factors, that many of the mechanisms and strategies for building trust will have been satisfied, expediting relationship development. Although the Dashboard is not a requirement in leveraging these drivers, it seems to be an effective method of consolidating a range of aims. In turn, extant research suggests that if trust can be established between project stakeholders, there is a greater probability of project success.

One explanation for these improved relationships may be in the nature of the presentation. Research by Mayer (2001) found that by adding visuals to words, learning improved by

23%. In another group of studies, adding visuals to words improved transfer of learning by 89%. By presenting project status graphically, stakeholders may understand and be able to recall information more easily than if the information were presented textually. This is supported by Maltz's (2000) study of Perceived Information Quality (PIQ), which is based on measures of information credibility, comprehensibility, relevance and timeliness, and found that communication supported with tables and graphs improves PIQ. So by restructuring the content, presentation format and frequency of reporting, customers of the tool may have put more credence in it. It is proposed here that there is a positive correlation between PIQ and expedited trust development; that as PIQ increases, the perceived extra effort made by the designer of the document sub-consciously communicates to the receiver of the information that they are organised, thorough, transparent and professional in their application to the task at hand and that ultimately they are a trustworthy individual. These factors are supported by the unambiguous approach to the way in which the project's structure and performance system was assessed and developed. Based on this data and the researchers' intimate understanding of the units of analysis, it is proposed that graphical tools based on credible, structured underlying processes can improve communication and in some cases expedite the development of relationships as described in the aforementioned contexts.

It has been proposed that the development of trusting relationships is a necessary precursor to the exchange of high quality information: "...project managers believe that building some kind of a trusting relationship can be the best way to improve the quality of information" (Sims, 1993 p.21). In the two cases presented in thesis however, a reciprocal relationship seemed to exist whereby the offering of high quality information was the precursor to the improved relationship. This finding could impact the way in which project managers structure the start-up of a project because rather than focus on developing relationships with stakeholders before setting up the reporting framework, the two activities could be conducted in parallel.

7.2.3 THE IMPACT OF A BLAME-FREE CULTURE ON THE SUCCESS OF THE DASHBOARD

In this research, the impact of culture on the successful implementation of the Dashboard approach has been discussed, particularly with reference to the e-learn project. In fact, culture is not only important to the success of the Dashboard but to the successful outcomes of the project as a whole (Palmer, 2002). In a study of IS projects, Guindon, et al., (1987) found that projects were more likely to fail for behavioural reasons than due to technical difficulties. Dagwell & Webster (1983) found that software development failures were less a problem of requirements definition than of intercultural problems between stakeholders.

Despite the benefits associated with a positive culture, a major challenge is represented in fostering the kind of values that the data collected as part of this study, would indicate is an important pre-requisite to a successful Dashboard implementation. Corporate culture is defined as "the system of ... publicly and collectively accepted meanings operating for a group at a given time." (Trice & Beyer, 1984, p. 654) whilst project management culture can be more specifically defined as "a complex whole that includes knowledge, belief, skills, attitudes, and other capabilities and habits acquired by people who are members of some project society." (Cleland, 1982). Project Management culture is a concept that is

often referred to in the literature but is a somewhat under-researched area, lacking a substantive, theoretical base (Wang, 2001).

Models of culture (Dubinskas, 1993) vary and comprise a range of constituent elements. Gray (2001) interviewed 44 project management professionals from 17 nationally-recognised UK organisations with a view to determining the impact of the organisational climate on project success. He used the backdrop of McGregor's Theory X, Theory Y to managing employees, to characterise the varying corporate climates. He found that 82% of project teams appeared to have cultures which were very similar to that of the parent organisation. McLendon & Weinburg (1996) refer to the concept of having a positive, constructive culture as congruence, which describes "the human experience of alignment between the internal and external – what is thought and felt (the internal) and what is said and how it is said (the external)" (p.34). They go on to discuss that these two factors must be tempered by the context of reality which one faces. The degree of congruence appears to have an impact on the level of trust, the quality of communications and ultimately the success of the project.

> "Congruence is integrity at the most basic level and thus has immense value to a project and each individual in it. Without integrity we cannot build trust; without trust we do not feel safe; without safety we have a hard time being congruent. Thus congruence reinforces congruence in a powerful loop that improves the chances of producing a quality product on time and within budget. On the other hand, the same loop causes incongruence to reinforce incongruence. If a project is allowed to ride such a downward spiral, the integrity of information is destroyed. Soon it becomes impossible to know what is really happening. Such projects invariably fail, and when they fail, they are invariably found to have been keeping two sets of "books." Their external picture is not congruent with their internal picture, and they die. Or worse yet, live forever – the living dead."

This model of congruence seems to be representative of the e-learn project at the CSO, where miscommunications at a strategic level rocked the cultural foundations of the project. Over a period of time project members became less participative and ultimately began to protect their performance by subverting the performance-reporting process. Other research has focused on the culture of project management as a profession. Wang (2001) proposes a model specifically relating to the culture of project management professionals. The model comprises of four key dimensions (and ten sub-dimensions): professional commitment, project team integration, work flexibility and work performance. Other commentators have listed work-related values and beliefs to represent the various dimensions of project management culture, for example (Firth & Crut, 1991; Graham, 1993 and Hobbs & Menard, 1993):

- Project Management is preoccupied with the integration of various efforts and disciplines
- Project management is horizontal management
- Project management is results oriented
- Temporary situations and relationships are normal
- Uncertainties and changes are routine
- People's status comes from what they do rather than who they are
- Speed, flexibility and lateral communication are emphasised
- Teamwork is highly valued

- People are results oriented rather than authority oriented
- Indefinite and inadequate governance is not uncommon.

For the purpose of this discussion the focus will be on a sub-dimension of culture - the impact of a blame-free environment. Gray (2001), asserts that project success will decline as the level of personal and environmental threat perceived by project staff increases. He identifies other factors, such as free expression, questioning, participation in the definition of goals, innovation, and intrinsic satisfaction from the work itself, as being positively associated with successful project outcomes, "clear negative correlations were found between levels of purposive threat and project success, and between levels of environmental threat and project success, [indicating] that the reduction of threat should be a primary management objective." (Gray, 2001, p.108). Other research has concluded that fear impairs performance by inhibiting both the acquisition and retrieval of information (Eysenck, 1983), hampering innovation (Vartia, 1996), constraining questioning, the expression of ideas (Deming, 1986) and experimentation (Handy, 1990). McLendon & Weinburg (1996) argue that when blaming occurs, problem solving is less likely because the facts of the case become a minor issue in favour of allocating blame. They identify six major ways that a blaming culture negatively impacts the performance of projects:

- People commit to plans they know they cannot achieve, at least to delay blame.
- People hide facts that the managers need to control the project.
- When problems are finally revealed, people avoid coming forth with creative solution ideas, for fear they will be blamed if the ideas won't work or the ideas will be considered poor.
- In day-to-day operations, a major portion of people's effort is devoted to positioning themselves so they will not be accused when the time of reckoning arrives
- Those people who feel safe enough to focus on the job at hand find themselves spending large amounts of time checking up on the reliability of others' communications.
- People have negative feelings most of the time and spend a lot of time fiddling with unproductive tasks or simply staring at the walls.

During the research, positive and negative blame-related cultural examples have been identified. For example, at the PSO, a positive cultural illustration is represented by the way in which programme-level meetings were conducted. The Dashboard was used to structure the meeting with the most pressing issues (as highlighted by ROYG status) discussed first. Project managers were encouraged to resolve each others' problems with the Programme Manager able to take on the role of facilitator. Not only did this promote knowledge transfer but also a participative environment where ideas could be discussed without fear of peer group disapproval. In addition, anecdotal evidence also suggests that this approach helped to reduce meeting time from around two hours to 40 minutes, depending on the number of issues requiring resolution. By using the tool as a centre piece around which to guide discussion in this way, communication becomes a two-way process. Lee (2001) states that "Because clear messages address the concerns and needs of the listeners, they naturally take the form of a conversation more than a lecture or announcement." Maltz (2000) found that while scheduled meetings have some very positive characteristics, such as that they are high in richness (the degree to which instantaneous feedback is possible and the number of cues available – body language, tone of voice, etc.), too many meetings will erode the value associated with nonspontaneity. "Managers are under tremendous time

pressure; thus, they have to make choices as to the use of their time. If scheduled meetings become too frequent, managers will have to choose between preparing for all of their meetings or doing other tasks associated with their position. This is likely to lead to less preparation time devoted to meetings; as a consequence, information will be presented unclearly. In addition, with limited preparation time, inaccurate information is likely to be presented. Thus, information overload becomes a problem, and PIQ will be reduced." (Maltz, 2000). By focussing the meetings on participative problem solving, meeting times appear to have been reduced whilst maintaining PIQ.

Another positive example based in group dynamics relates to the design of the performance measurement system in the e-learn project. The Advocates, arguably having bonded as a consequence of their shared frustration at the previous performance measurement framework, refused to be financially remunerated based on individual performance. They felt the system would be much fairer if they were rewarded based on their aggregated performance. This demonstrates several positive attributes, including participating in system design, identifying potential flaws in the system and demonstrating faith in each other to perform as required.

A further positive example, from both cases, is associated with the way in which users of the reporting process leverage the system for their own gain. Rather than concealing the performance of their respective projects or work packages by reporting their status as being better than it actually was, staff in both organisations felt comfortable registering a red status (i.e. that the piece of work was seriously compromised and unlikely to deliver) when strictly speaking the unit of work was only marginally under-performing. Whilst this might be considered as an attempt to subvert the measurement process and therefore negative, certain types of subversion may be encouraged. In these instances, the project manager and team member both used the system to say, 'I've got a problem looming and need some help to resolve it', thereby encouraging interaction with superiors. However, when such subversions are not well understood, they can be misinterpreted with catastrophic consequences. One example relates to the SBU Director at the CSO reprimanding a member of staff for reporting poor performance. In fact, the member of staff was using the system to flag an issue that required the aid of the Project Manager to resolve and was not a serious issue at all. Recent interviews revealed that some staff now attempt to subvert the measurement process in a negative way – by reporting work package status as green when it is, in reality, performing below accepted tolerances.

A number of other negative cultural examples also seem to have contributed to the development of a blaming culture in the CSO. Much staff time was spent fire fighting, attending to critical issues requiring immediate resolution. This in turn, tended to mean that as one project was brought back on track, another would go off the rails as it had been deficient of resource. Consequently, a self-perpetuating cycle of fire fighting emerged that eventually became very frustrating for staff. Both types of blame-orientation impacted the organisation negatively and were probably caused by systemic / policy frailties. In fact, a lot of frustrations at staff level were caused by a lack of visibility over the decision making process. When policy decisions were provided from Director level, it was not necessarily obvious why that was the chosen course of action, which was considered by some stakeholders to be more frustrating than the decision itself. This tended to mean that blame was imparted if the decision was not regarded as effective.

Indeed these frailties manifested themselves in other ways too. For example, an 'Us and Them' relationship seemed to develop between some members of the senior management team and the rest of the staff, to the detriment of the project.

In conclusion, having a blame-free project management culture should be more than just a vague desire for the organisation. By implementing a highly visible tool, such as the dashboard, the culture of the organisation will be tested. It would appear that if a positive, supportive culture already exists it is likely to be re-enforced through the introduction of the Dashboard but if it there are undercurrents of a blaming culture, they are likely to surface and may begin a downward spiral, as per Mclendon & Weinberg's (1996) congruence model.

7.2.4 MINOR DISCUSSION POINTS

In this section, a series of discussion themes are briefly raised. Whilst they are considered to be interesting and salient by the Researcher, they were not as prominent in the data collected due to either having lower frequencies or having a lower level of importance placed on them by interviewees.

7.2.4.1 Dashboard Training Requirements

One key variable between implementations at the PSO and CSO was the degree of training provided. Although the Researcher was not present when the Dashboard was implemented at the PSO, discussions with both trainers and trainees suggests that only minimal guidance was required. Much more time was spent with project team members at the CSO, educating them in principles of project management, showing them how to use the required software, how to read and interpret the Dashboard and general support on an on-going basis and yet some members felt that the training was insufficient. There appear to be two possible reasons for this: firstly, that the quality of the training imparted by the researcher was not to the required standard and/or secondly, that the base-level of project management knowledge of team members was significantly below that at the PSO. Whilst the Researcher gained an invaluable experience and would amend the style of training to be more formalised, on a one-to-one basis and driven by the demands of the learner those members of the SBU who had formal project management training needed little guidance to interpret the display. As the Dashboard was applied at a programme-level at the PSO, all contributors to and users of the display were formally trained, experienced project or programme managers compared with staff who were much more operational in nature at the CSO. As such, it seems possible that the training requirements for staff involved in Dashboard implementations will be determined by skill base and level of organisational project/programme management maturity.

7.2.4.2 Positioning the Dashboard – who is it useful for?

Based on interviewee data, discussions with practitioners and academics and the Researcher's project-related experiences, a range of scenarios have been identified where the Dashboard would be an effective addition to the Project Manager's toolkit.

Emergency Project & Programme Management: In CSO there was a definite requirement to

provide visibility over the performance of the unit of work and to identify development activities based, in part, on this data. In the PSO, the requirement was less urgent as the programme of work was considered to be performing satisfactorily. Nonetheless, a new Programme Director had been appointed and needed to know the consolidated performance of the various programmes in a timely manner. The Dashboard achieved its objective in both scenarios due to its flexible nature and relatively simple process. In emergency situations, time is of the essence and even if there had been a desire in the collaborating organisations to implement more sophisticated software, it is unlikely that the available timescales would have permitted such an undertaking. Programme management software, for example, is typically an enterprise-wide application and can take several months to specify and implement before any real benefits are returned. As such, the Dashboard displays using MS Visio appear to be an appropriate mechanism for providing performance visibility in the short-term.

Whether or not the Dashboard approach, i.e. a participative, blame free culture, will be successfully adopted is not as clear. It is proposed that where culture is inconsistent with Dashboard values at an organisational level, that an attempt to introduce said values is likely only to succeed in the short-term. Over a period of time, it is probable that the cultural status quo will return. It also seems likely that it is the senior project management that will disrupt any new found values as they are the staff that will have greater contact with the organisation outside of the project. This was certainly the case at the CSO. However, where organisational culture is consistent with the Dashboard approach but there is dissonance at the project level – probably due to the poor performance of the project – it is proposed that the cultural values could be re-instated with less difficulty.

Longer-term Project/Programme Management: In the longer-term, it seems possible that the Dashboard will be more effective at a programme-level and on larger projects than on smaller projects. The argument for this is that the cost of producing the tool at a programme-level is much less as a proportion of the overall budget. However, if transferable technologies were developed to more efficiently produce the Dashboard, then the approach could be effective on small-scale projects too.

To bridge the gap between basic project management systems and enterprise-wide programme management software: As previously mentioned, implementing enterprise-wide programme management software is a major undertaking. Available software is based on industry-recognised best practice; while this is desirable many organisations will recognise a wide performance gap between their current and required levels of maturity. As such, the Dashboard, when supported by appropriate assessment and development tools may be effective in bridging this gap. For example, over a period of months, Dashboard data could be aggregated and analysed for trends to determine, for example, the number of unforeseen risks impacting projects or the efficiency of the project evaluation process. This performance data, coupled with the output of a maturity assessment exercise to determine consistency of process and vocabulary across projects, the maturity of those process and efficacy of underlying project structures can be used to develop structured multi-stage development plans, enhancing maturity incrementally in targeted organisation-specific areas. In this context, the Dashboard approach could be leveraged to aid the transition of organisations from being relatively immature with ineffective support systems to cutting-edge in all facets of strategy execution.

7.2.4.3 Longevity of the Dashboard

Within the CSO, a number of interviewees commented on the longevity of the tool. This may be, in part, due to the nature of the implementation. When the tool was introduced, the project was performing below acceptable tolerances and due to a lack of structure, processes were non-repetitive. Following significant change and a turnaround in project fortunes, the degree of unpredictability was reduced and many project activities started to solidify to the point where they became reminiscent of normal business operations but with a recognised termination date. As such, the perceived requirement of the tool may have dwindled among team members. An unresolved question remains – would the project have continued to perform as well if the Dashboard had been withdrawn or would performance have returned to its previously unacceptable level? It seems unlikely that performance would have returned to its previous level given that there was a new project manager involved and that the project's structure had been redesigned to more closely reflect project objectives. However, the researcher believes that on-going visibility is required to ensure that monthly targets and objectives are realised and that issue resolution is effectively managed.

The content of the Dashboard should be reviewed on a quarterly basis to ensure on-going relevance of the information components. This is likely to be particularly important when the Dashboard is applied at project-level where information requirements will vary as the project progresses through its life cycle.

7.3 CHAPTER CONCLUSIONS

In this Chapter, three inter-related discussion themes have been explored. Firstly, the Dashboard was applied to the Community Network Model (Nonaka and Takeuchi, 1995; Blackler, 1995) to highlight the way in which the natural socialisation process associated with the Dashboard can be leveraged to promote knowledge transfer. Too often, technical planning tools are used as communications documents and fail to satisfy the reader as they lack a Community Model perspective (Nonaka and Takeuchi, 1995; Blackler, 1995). High-level guidance was provided around the presentation format, the content of the report and its production and distribution. Secondly, the way in which drivers of trust can be leveraged through the Dashboard has been discussed. This is important as because unless trust exists between the project or programme manager and those that contribute to the Dashboard, it is unlikely that the value of the approach will be realised. By developing the Dashboard with stakeholders using an iterative approach and using this process as a mechanism to develop interpersonal relationships, it is likely to satisfy other drivers of trust. Thirdly, the impact of a blame-free culture has been discussed. In circumstances where a blaming culture prevails, not only will staff contributing to the Dashboard be more likely to withhold information, but the way in which that information is used may not be as constructive as it could be, limiting organisational, team and individual development opportunities. Finally a series of minor discussion points have been raised.

The following Chapter, Conclusions, will demonstrate how the research objectives have been satisfied and will explicitly document the contribution to knowledge made in this thesis and outline areas for further research.

8 CONCLUSIONS

This chapter presents the conclusions of the study. It shows that the research aim and objectives have been met and reflects upon the research process. The contribution to knowledge made by this study is shown and areas for future research are identified.

8.1 REVIEWING THE AIMS, OBJECTIVES & RESEARCH QUESTIONS

In chapter 1 the aims and objectives of this research were detailed. These were:

Research aim

The overall aim of the research was to explore the design and use of visual reporting systems in project and programme environments.

Research objectives

Having defined the aim of the research a number of lower-level objectives were developed to support the research aim:

- To critically review substantive literatures, useful theoretic literatures and other necessary secondary sources in relation to:
  - Areas of knowledge within the disciplines of Project and Programme Management, in order to provide robust contextualisation.
  - Performance Measurement Systems (PMS) and processes for their implementation.
  - VL and other communication media.
- To develop a typology of VL information components that can provide project / programme stakeholders with performance feedback and other mission critical information, which other companies may find useful.
- To develop and validate an implementation roadmap, for use by the business community.
- To identify key environmental factors that affect the implementation of the tools.

Both the aim and objectives of the research have been met. The Literature Review critically reviewed the three core research domains and positioned the research as interdisciplinary, touching on all three domains but exclusive to none. In doing so, the first research objective was met. It was found that the use of graphical reporting tools is not commonplace in industry or academia, particularly in project and programme environments.

A typology of common project and programme level information components based on extant literatures and primary research data from the Pilot Study were presented in Chapter 5, Beta Model. Given the flexibility of the solution, the list presented was not exhaustive but is considered to be an effective foundation for application to most project/programme management-based organisational contexts. A Roadmap for implementing Dashboard-style tools, also based on primary and secondary data was presented. These two key aspects of the research were then validated in an action research, longitudinal case study which was conducted over a six month period. The results of this study were presented in Chapter 6, which also included a series of lessons learned and opportunities for tool development. These outputs therefore satisfy objectives two and three.

In addition, the validation case study provided an opportunity to detail environmental factors, affecting the likelihood of a successful implementation. They were developing open communications, a no blame culture, encouraging participative solution development, securing long-term executive support and having appropriate IT integration. By identifying these factors, the final objective has been achieved.

To further clarify, the research questions identified in 1.3.3 are now represented with page references to the section of the thesis where they were answered:

RQ Ref	Research Question	Page (Section) Ref
RQ1a	What is Programme Management?	33-34 (S3.4)
RQ1b	What is Visual Language?	55-56 (S3.6.3 – S3.6.3.1)
RQ1c	What is Performance Measurement?	43 (S.3.5.1)
RQ2a	What are the information requirements of project / programme stakeholders?	68-71 (S4.4), 88 – 102 (S5.3.2), 131-135 (S6.4.1.2)
RQ2b	What are the business requirements for such a reporting system?	74-83 (S4.5.5 – S4.5.7)
RQ2c	What are the benefits and drawbacks of using such a system?	81-83 (S4.5.7), 148-149 (S6.4.5)
RQ3a	What lessons have been learned by academics and practitioners when implementing reporting systems?	50-51 (S3.5.3 – 3.5.4), 128-147 (S6.4.1 – S6.4.2)
RQ3b	What process should be followed when implementing this system?	107-112 (S5.5) 128 – 143 (S6.4.1 – S6.4.2)
RQ4a	What environmental factors affect the implementation of the tool?	149-152 (S6.4.6)
RQ4b	To what degree do these factors inhibit the implementation?	149-152 (S6.4.6), 155-171 (S7.2.1 – S7.2.3)

Table 8.1. Reviewing the Research Questions.

8.2 REVIEW OF THE RESEARCH DESIGN

Three tests of the research design were identified in section 2.4 as being relevant to this research. They were: construct validity, external validity and reliability (Kidder & Judd, 1986). Table 8.2 reviews these tests to highlight whether or not the research design has met its quality criteria.

Tests	Case study tactic
Construct validity	**Use multiple sources of evidence:** A range of evidence was used, for example interviews, document review, workshops, observation and a research diary. **Establish chain of evidence:** the data was triangulated wherever possible in order to corroborate initial findings / emergent themes. **Have key informants review draft case study report:** Case study reports reviewed by research sponsors at both collaborating organisations.
External validity	**Do pattern matching:** pattern matching aims to identify commonalities between multiple cases in order to increase confidence in the robustness of a theory. This is difficult to achieve with only two data sets however, where there were similar issues across the cases, they were extracted and discussed in Chapter 7. **Do explanation-building:** As this research is exploratory it has not focussed on explaining relationships or understanding causal links. Where appropriate though, insight into root causes has been offered. **Do time-series analysis:** Due to the differing organisation types, size of implementation, level of implementation (i.e. programme versus project level) and research strategies, time series analysis was not considered to be appropriate.
Reliability	**Use case study protocol:** The methodology and approach for each case study was written prior to the start of the data collection phase. This was used as a terms of reference by both parties. **Develop case study database:** a case study database was not maintained due to there only being two cases.

Table 8.2. Reviewing the Research Design

Table 8.2 identifies that the key tests of case study quality have been met in relation to construct validity and reliability. However, due to the characteristics of the research and the design of the study, the normal tests for external validity were not appropriate. This is an area that should be rendered for future research in this area.

8.3 LIMITATIONS OF THE RESEARCH

As noted above, the findings from the review of substantive literatures and the analysis of data collected in the Pilot Study were used to develop a range of graphical information

components, suitable for inclusion in a Dashboard style report. An implementation model and range of factors critical to the long-term success of the tool were also identified. These aspects of the approach were then evaluated in the Validation case study and a deeper understanding of the known features and elements was obtained, further refining the model.

8.3.1 LIMITATIONS OF THE DASHBOARD APPROACH

Although the design of the Dashboard met the requirements identified in the literature, this research has identified five limitations of the approach:

1. The Dashboard approach may be more suitable to programme management.
2. The approach may be better suited to emergency management.
3. The model does not prescribe inputs and outputs.
4. Successful long-term implementation requires an appropriate culture.
5. The tool may be expensive to develop into more sophisticated software.

The data collected suggests the Dashboard approach may be more suitable to programme management than project management environments. In such contexts the value of resources required as a function of the overall budget is likely to be much less than at project-level. A dichotomous perspective however, would be that the information required to populate the Dashboard should already have been produced as part of normal project management practices and that spending "a couple of hours tops" (CSO/04) is a worthwhile investment to produce an effective project communications document. On the other hand, another argument in favour of positioning the tool at programme-level reporting relates to the frequency of reporting. At the programme-level, project performance is less likely to change on a weekly basis whereas when applied to the project-level, work package status could potentially change on an almost daily basis. This limits the efficacy of the Dashboard at the project-level because the tool would need to be produced on a more frequent basis which would, in turn, place greater demands on those who contribute and produce it. If the process for producing the Dashboard was automated however, such as through a stand alone application, the issue of production time would not be salient and the Dashboard could be applied to the project level.

Secondly, the approach may be better suited to emergency management situations. One aspect that the two cases had in common was the urgent requirement for visibility to be provided over a quantity of work. In such situations, the orientation of staff members appears to more concentrated on improving performance and correcting earlier mistakes than on cultural deficiencies. As such, the impact of an inappropriate culture is almost suspended until such time that the project or programme is granted a stay of execution.

Thirdly, the model does not prescribe inputs and outputs. The approach detailed in this thesis has been designed to be flexible. As such, whilst there are fairly generic inputs into project or programme management (e.g. risk management, work breakdown structure, resource allocation, etc), there is a multitude of ways for achieving this. Similarly, having attained the desired levels of visibility, there are many ways in which the data can be analysed and actions taken thereupon. Though this flexibility was an intention of the design, it could be critiqued for not providing a more prescriptive approach.

Fourthly, successful long-term implementation of the tool appears to require an appropriate culture. The experience of implementing the tool in the CSO would suggest that the culture of the parent organisation will play a strong role in determining how the dashboard is used and how effective it will be in terms of issue resolution. Where an inappropriate culture is prevalent, the probability of long-term success is diminished.

Finally, the Dashboard model could be critiqued due to a lack of IT development. Although the solution presented here is fairly low-tech, the tool could be enhanced through development into standalone software (Interview with Geoff Reiss, 13/11/2003), though such activity was extraneous to the scope of this research.

In summary, the Dashboard model provides a robust foundation of knowledge which can be used by those wishing to enhance the degree of visibility over the performance of project and programme management activities. However, the approach has certain limitations and subsequent research will need to be undertaken to address these limitations. The limitations above were not addressed in this thesis as they were not within the scope of the research.

8.3.2 LIMITATIONS OF THE METHODOLOGY

Further, four limitations of the research methodology have been identified:

1. Limited number of case inquiries.
2. First case study retrospective in nature.
3. Researcher bias inherent in the AR methodology.
4. Exploratory nature of the research results in a wider spectrum of findings compared with a more focused approach.

The major limitation of this research is that only two cases have been conducted, limiting the generality of the findings. This was necessary however, given that the implementation for the second case took over six months. The findings of the research were therefore further validated to increase generality through presentation at six refereed conferences, two trade forums and discussions with six academics and four practitioners with experience in salient fields. Further, due to the non-prescriptive and highly flexible nature of the solution developed, the typology of information components, implementation model and CSFs are considered to be of sufficient level of abstraction to generalise to other project and programme management environments.

A second limitation of the methodological approach is that the first case study was retrospective in nature. This tactic was also necessitated because in the interim period between gaining commitment from the collaborator and funding proposal approval, the organisation developed and implemented an early version of the tool. In some ways, this benefited the research because processes for data collection and production of the tool were already in place enabling the researcher to concentrate on tool development. It did mean though that discussions regarding the design and implementation of the tool were retrospective in nature and subject to the vagaries of the human mind. As this case study yielded a large volume of data regarding the composition of the tool and its longer term benefits, the second phase of the research focused on the implementation and design

of the tool. A decision was made to conduct the second case study using an Action Research approach so that a richness of data could be collected during the early stages of an implementation that would otherwise not have been possible, thereby complimenting the Pilot Study findings.

A third limitation relates to this action research approach. Being physically located in the same office as the project team and being a lead member in the implementation, the bias imparted by the researcher was difficult to measure but almost certainly present. This is likely to have manifested in two ways: firstly that feedback from discussions and interviews with implementation stakeholders may not have been as objective and forthright as may have been the case if the Researcher was external to the environment being studied. Secondly, the objectivity of the Researcher may have been hindered due to the level of involvement in the implementation. However, given the requirement to collect a rich set of data for the reasons discussed above, these trade offs were recognised and mitigated, and the methodology accepted. In order to minimise the effect of interviewee bias, the Researcher returned to the CSO three months after completing the initial study to collect a further round of data. To moderate researcher bias, the researcher stayed in close contact with his supervisor to discuss the findings, and with other relevant academics and practitioners (for example in co-authoring conference and journal papers, and to validate research findings) and by reviewing extant literatures to ground the data.

Finally, the methodology could be critiqued due the fairly broad nature of the research inquiry. However, following a review of the literature which identified a lack of research in this interdisciplinary domain, it was considered that exploratory research would provide the strongest platform from which to continue the research. As such, a broadly scoped research problem seemed appropriate.

8.4 CONTRIBUTION TO KNOWLEDGE

The academic contribution to knowledge made by this thesis has been to explore the design and use of graphical reporting mechanisms in project and programme management environments. Four areas are of particular importance.

Firstly, this study makes a significant contribution to knowledge by developing a tool which is effective as a communications and knowledge transfer mechanism in project and programme management environments. The Dashboard is effective for both intra and inter-project/programme communications and for knowledge transfer to external stakeholders. This contribution is significant because prior research has demonstrated that effective communications in such environments contribute to overall success. A typology of information components was presented, with information design an important factor in the development of each. A performance measurement framework, based on extant literatures was developed and can be used to theoretically underpin parts of the Dashboard. An implementation map has also been developed to aid practitioners in future implementations. This empirical research therefore goes beyond what to measure and monitor and addresses how to communicate in project and programme management environments and how to develop and interpret multiple data sets.

Secondly, the Dashboard approach can leverage mechanisms for developing trusting relationships between internal and external project/programme stakeholders. For example, by developing the Dashboard (and associated project/programme management planning activities) in a participative way or by using the Dashboard to facilitate meetings so that team members help resolve each other's issues, a greater degree of engagement and trust will accrue. Again, this is an important and valid contribution to knowledge because a lack of trust has been shown in prior research to be a major inhibitor to the achievement of project objectives.

Thirdly, the research has identified five environmental, or critical success factors, pertinent during the implementation and life of the Dashboard. They are: open communications, "no blame" culture, participative solution development, securing long-term executive support and having appropriate IT integration. The type of organisational culture is considered to be the most important of these environmental factors as it appears to have a significant impact in the longer-term success of the Dashboard. Where there is a culture of blame, of protecting information or where participative management practices are not embraced, the Dashboard approach is unlikely to be successful beyond providing performance visibility and remedying actions in the short-term.

Finally, the research has identified three distinct types of interaction regarding the way recipients of the tool utilise it. The interaction types are: scanning the Dashboard from distance to identify key issues (such as projects performing to a level warranting a red status), reading the information from approximately one metre away and typically in groups, and analysing the information in close proximity to the Dashboard. In this final example, recipients used their hands to trace across the page to help establish linkages between the different components of information. Using these three types of interaction as basis, the Dashboard has been designed using VL, taking into account layout and design so that users of the tool can retrieve the information they require efficiently and effectively.

8.5 RECOMMENDATIONS FOR FUTURE RESEARCH

Due to its exploratory nature, this study raises many further questions. The main effort of this study focused on exploring the concept of Dashboard style reporting systems in project and programme management environments. During the course of this research a number of areas which should be the concern of future research have been identified:

- The most obvious future research would be to undertake work that addresses the limitations of the Dashboard model:
  - Firstly, research could be commissioned that focused exclusively on either project, programme or multi-programme management. Or, the research could collaborate with one large organisation and study the utility of the tool at project, programme and multi-programme within the same organisation. This would enable further understanding regarding the most appropriate level of application in an organisation.

- Secondly, the tool could be customised to focus on its potential application as an emergency management tool. Again, this would further clarify the utility of the tool and could be operationalised in a similar fashion to this research, with investigator being based at the collaborating organisation.
- Thirdly, in response to feedback from a range of practitioners and academics, research could be commissioned to develop the tool into a piece of software. This would enable a much greater number of implementations because the tool would require much less manual intervention to implement and maintain. In practice, this may be incorporated into another research project, such as that outlined below.
    - Future research could also address some of the methodological issues previously identified:
        - By developing the tool into a piece of simple software, the Dashboard could be implemented in a plethora of organisations in parallel. The organisations would be responsible for the implementation having been trained in the approach and would be given support by the researcher. This would eliminate the requirement for the researcher to be based on-site full-time, further mitigating the potential for bias as per the action research approach, whilst allowing the researcher to collect data with minimum lag between event occurrence and documentation. It would also contribute massively to understanding the contexts in which the tool is effective due to the high number of implementations possible.
        - Future research could also focus on and develop a deeper understanding in the areas in which a contribution to knowledge has been made. For example, research could be undertaken to further understand drivers of trust and the way in which the Dashboard can be used to facilitate the development of trusting relationships. The research could focus on trust drivers along pre-specified dimensions, such as between the project manager and the customer or between the project manager and the project team. Further, the importance of having an appropriate culture has been discussed in this thesis. Appropriate, in this research has been contextualised via a polarisation of cultures based on the experiences of the two collaborating organisations and supported by relevant literature. However, further research is needed in this area in relation to the Dashboard and visual communication tools, and within the broader domain of project and programme management.
    - Finally, further research could focus on the contribution that graphical reporting systems can make in other prominent management research areas:
        - Corporate Governance is a popular topic in the business press following high profile collapses of major institutions such as Bearings Bank and Enron. Investigations to determine the causes focused on a lack of governance emanating at board level and subsequently led to the Sarbanes-Oxley Act in 2002. Though this may be American legislation, British companies listed on American stock exchanges will be affected by the Act, which requires formalisation and visibility over key corporate controls, some of which relate to the execution of strategy (programme management), where Dashboard style reports might prove extremely valuable. Research in this area to determine the applicability of the Dashboard approach would therefore prove to be extremely timely and relevant.

- The benefit of developing project management environments where there is a high degree of maturity have been recognised for some time. However, there appears to be a dearth of literature in this area relating to programme management maturity development, possibly due to the emergent nature of the domain. Coupled with a maturity assessment tool, the Dashboard approach could be developed to monitor the impact and lead times of development activities on programme-level efficiency and efficacy, in a similar manner to the EFQM model, which is used for operational processes. Research in this area would also be exceptionally timely.

In addition, due to the practical constraints imposed by the PhD process, it has not been possible to research and review all of the areas with potential relevance to the research aim. Figure 8.1 represents the scope diagram first introduced in 1.4. Future research could therefore address similar issues but within the context of Executive Information Systems or Decision Support Systems, for example. Alternatively, the same tools and research approach could be used but with a focus on developing organisational maturity in project and programme management environments or on specific aspects of governance, such as delegation and work flow management.

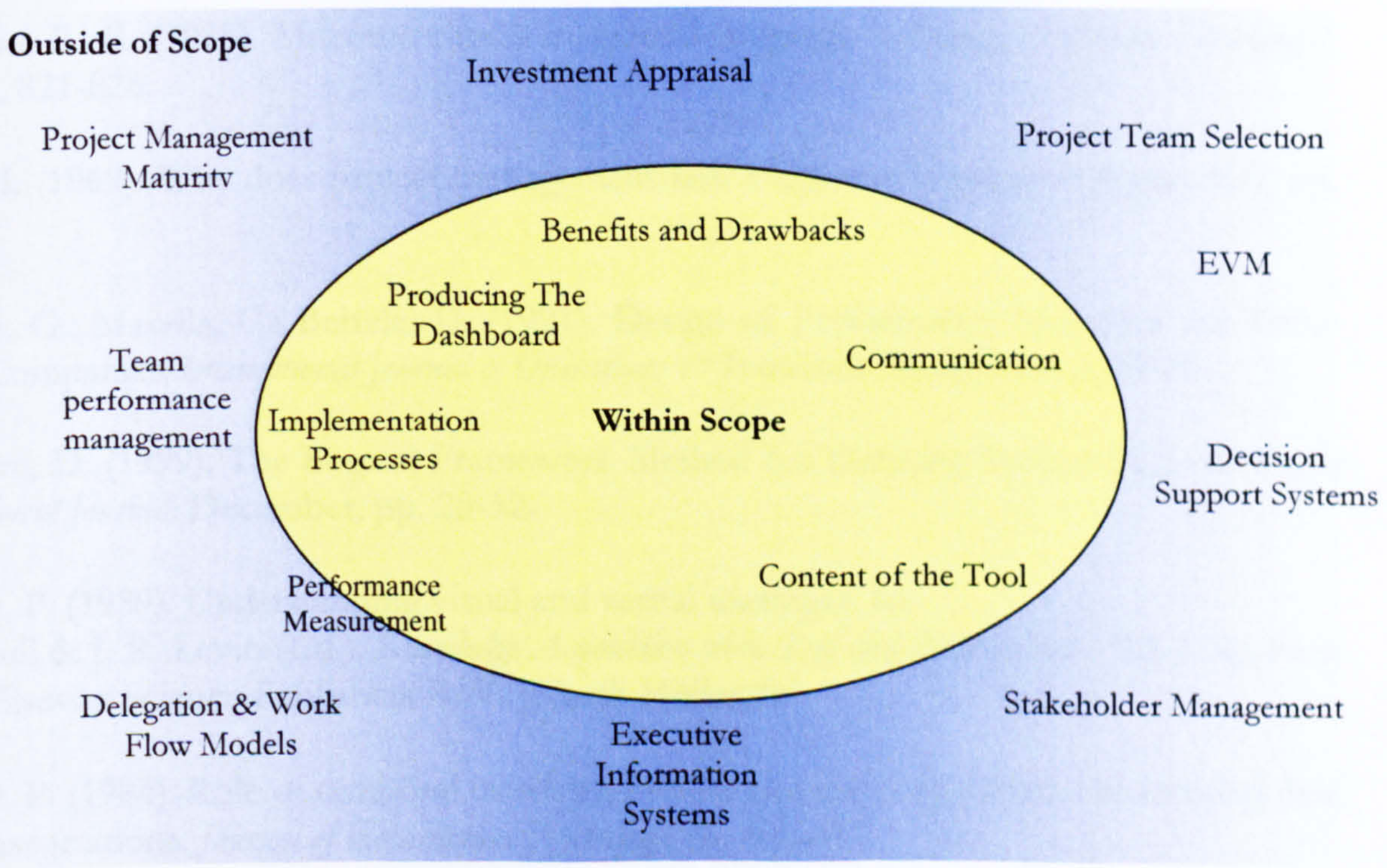


Figure 8.1 Scope of the Thesis.

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Appendix I

Project Critical Success / Failure Factors

No.	Critical Success Factor / Critical Failure Factor	Reference
1	Establishing and maintaining executive commitment	Avots, 1969 Boddy, 1993 Cleland & King, 1983 Hammer, 1996 Heygate, 1993 Klein, 1994 Locke, 1984 Martin, 1976 Pinto & Slevin, 1987 Pinto & Slevin, 1989 Tukel & Rom, 1995 Youker, 1999
2	Having skilled project management / project management performing to the required level	Avots, 1969 Cleland & King, 1983 Hammer, 1996 Locke, 1984 Pinto & Kharbanda, 1996 Pinto & Kharbanda, 1995 Pinto & Slevin, 1989 Sayles & Chandler, 1971; Tukel & Rom, 1995
3	Having clearly defined and communicated project objective(s)	Baker, Murphy & Fisher, 1983 Hammer, 1996 Hughes, 1986 Klein, 1994 Lidow, 1999 Lynn & Akgün, 2001 Martin, 1976 Morris & Hough, 1987 Pinto & Kharbanda, 1995 Pinto & Slevin, 1987 Wateridge, 1995 Youker, 1999
4	Effectively managing the matrix structure	Van Der Merwe, 2002
5	Not being techno-centric (obsessed with technology)	Klein, 1994
6	Having inadequate resources	Baker, Murphy & Fisher, 1983 Cleland & King, 1983 Klein, 1994 Lidow, 1999 Martin, 1976 Tukel & Rom, 1995 Youker, 1999
7	Accurately defining project dependencies and integrating the project accordingly	Boddy, 1993 Heygate, 1993 Levene & Braganza, 1996 Neill, 1994 Pinto & Slevin, 1987
8	Using an appropriate methodology	Coulson-Thomas, 1994 Hughes, 1986 Klein, 1994 Martin, 1976
9	Poorly scoping the project	Coulson-Thomas, 1994

		Klein, 1994
10	Poorly implementing the project	Avots, 1969 Coulson-Thomas, 1994 Morris & Hough, 1987
11	Change management process poorly controlled	Boddy, 1993 Cooke-Davies, 2002
12	Inadequate / weak training of staff who are affected by the change	Neill, 1994 Pinto & Slevin, 1987
13	Poor stakeholder management	Levene & Braganza, 1996 Pinto & Kharbanda, 1996 Pinto & Kharbanda, 1995 Pinto & Slevin, 1987
14	Weak project management culture	Levene & Braganza, 1996
15	Poor delegation model (staff over-loaded)	Levene & Braganza, 1996
16	Poor Configuration management	Levene & Braganza, 1996
17	Poor planning	Baker, Murphy & Fisher, 1983 Cleland & King, 1983 Cooke-Davies, 2002 Locke, 1984 Pinto & Kharbanda, 1995 Pinto & Slevin, 1987 Sayles & Chandler, 1971 Wateridge, 1995 Tukel & Rom, 1995 Youker, 1999
18	Poor recruitment & selection of team / lack of skills within the team	Baker, Murphy & Fisher, 1983 Lidow, 1999 Martin, 1976 Pinto & Slevin, 1987 Pinto & Slevin, 1989
19	Insufficient technology support	Pinto & Slevin, 1987
20	Client is not consulted	Cleland & King, 1983 Pinto & Slevin, 1987 Pinto & Slevin, 1989 Tukel & Rom, 1995
21	Monitoring and feedback mechanisms are not effective	Cleland, 1986 Locke, 1984 Martin, 1976 Pinto & Slevin, 1987 Pinto & Slevin, 1989 Sayles & Chandler, 1971 Wateridge, 1995 Youker, 1999
22	Success criteria poorly defined (this area is expanded upon in section 3.5.2, specifically Table 3.6).	Pinto & Kharbanda, 1995 Wateridge, 1995
23	Lack of stakeholder involvement	Morris & Hough, 1987 Wateridge, 1995
24	Project team is motivated to succeed / lack of urgency	Baker, Murphy & Fisher, 1983 Morris & Hough, 1987 Lidow, 1999 Pinto & Kharbanda, 1995 Pinto & Slevin, 1989 Youker, 1999
25	Lack of 'fallback' options	Pinto & Kharbanda, 1996

26	Project Managers employ McGregor's (1960) Theory X (stick) approach when problems arise	Pinto & Kharbanda, 1996
27	New ideas are starved to death through inertia	Pinto & Kharbanda, 1996
28	Feasibility studies are not conducted into new ideas	Pinto & Kharbanda, 1996
29	Project trade-offs are not understood	Pinto & Kharbanda, 1996
30	Political expediency and infighting dictate crucial project decisions	Morris & Hough, 1987 Pinto & Kharbanda, 1996 Pinto & Kharbanda, 1995 Pinto & Slevin, 1989
31	Lines of responsibility are not clear	Cooke-Davies, 2002 Locke, 1984 Martin, 1976 Sayles & Chandler, 1971 Youker, 1999
32	Risk management is poor	Cooke-Davies, 2002 Pinto & Kharbanda, 1995 Youker, 1999
33	Delays caused by bureaucratic administrative systems	Baker, Murphy & Fisher, 1983 Youker, 1999
34	Conflict between team and support organisations	Youker, 1999
35	Project Manager lacks experience in managing projects of a similar or larger size	Rubin & Seeling, 1967
36	Project managers reward the wrong actions	Hughes, 1986
37	Trouble shooting / issue resolution is poor	Pinto & Slevin, 1989
38	Environmental events	Pinto & Slevin, 1989
39	Project manager is not on-site to manage the project	Baker, Murphy & Fisher, 1983
40	Project Manager is not involved throughout the project lifecycle	Sayles & Chandler, 1971;
41	No project reviews	Cleland & King, 1983 Cooke-Davies, 2002 Pinto & Kharbanda, 1996
42	Weak benefits management process	Cooke-Davies, 2002

Critical Success Factors / Critical Failure Factors on Projects

Appendix II

Functional Requirements of a Performance Measurement System

No	Functional requirements	Reference
1	The system and measures are aligned with the mission, vision, goals and strategies of the user organisation	Maskell, 1989 and Maskell, 1991 Neely et al., 1995; Neely et al., 1996 and Kennerley and Neely, 2000 Kaplan and Norton, 1996a Kaplan and Atkinson, 1998 Kerssens-van Drongelen, 1999; Kerssens-van Drongelen and Cook, 1997 and Kerssens-van Drongelen and Bilderbeek, 1999 Emmanuel et al., 1990 Brown and Svenson, 1988 Klingebiel, 1999 Goold, 1991 and Goold and Quinn, 1990 Lynch and Cross, 1995 Fitzgerald et al., 1991 and Fitzgerald and Moon, 1996 Griffin and Page, 1993 and Griffin and Page, 1996 Lim, 1998 Martins, 2000 Beaumont, 1996
2	The system provides a balanced, well-selected and customised set of measures, which reflects all relevant aspects and dimensions of performance over time which are presented in user-oriented formats (visualisation, reporting, operations, etc.)	Maskell, 1989 and Maskell, 1991 Pritchard, 1990 Neely et al., 1995; Neely et al., 1996 as well as Kennerley and Neely, 2000 Kaplan and Norton, 1996a Kaplan and Atkinson, 1998 Kerssens-van Drongelen, 1999; Kerssens-van Drongelen and Cook, 1997 and Kerssens-van Drongelen and Bilderbeek, 1999 Meyer, 1994 Lander et al., 1995 Emmanuel et al., 1990 Klingebiel, 1999 Anthony and Govindarajan, 1998 Lynch and Cross, 1995 Hauser and Zettelmeyer, 1997 Griffin and Page, 1993 and Griffin and Page, 1996 Voss, 1992 Dimancescu and Dwenger, 1996 Lim, 1998 Schneiderman, 2001 Pawar and Driva, 1999 Hultnik and Robben, 1996
3	Measures are effective, actionable, flexible and qualified over time, locations, hierarchies and different users	Maskell, 1989 and Maskell, 1991 Neely et al., 1995; Neely et al., 1996 and Kennerley and Neely, 2000 Bittici et al., 2000 Meyer, 1994 Brown and Svenson, 1988 Klingebiel, 1999 Dixon et al., 1990 Lynch and Cross, 1995 Packer, 1983 Ward, 1996 Lim, 1998 Pawar and Driva, 1999
4	The system is simple, comprehensible and	Maskell, 1989 and Maskell, 1991 Emmanuel et al., 1990

No	Functional requirements	Reference
	transparent for all users	Muckler and Seven, 1992 Klingebiel, 1999 Dixon et al., 1990 Turney and Anderson, 1989 Packer, 1983 Pawar and Driva, 1999
5	The system is reliable, stable and valid over time and locations	Packer, 1983
6	The system provides timely, efficient and effective feedback and signals in a positive, but attentive manner	Maskell, 1989 and Maskell, 1991 Pritchard, 1990 Kaydos, 1991 Kaplan and Norton, 1996a Bonnet and Krens, 1994 Emmanuel et al., 1990 Anthony and Govindarajan, 1998 Flamholtz, 1996
7	The system integrates with existing management-, control- and information systems and techniques supporting an effective and efficient data and information flow; i.e. acquisition, collation, filtering, analysis and dissemination	Ballantine and Brignall, 1994 Clarke, 1994 Klingebiel, 1999 Kennerley and Neely, 2000
8	The system is cost-effective with respect to design, build, implementation and maintenance	Azzone et al., 1991 Packer, 1983
9	Measures are process-oriented and aligned with cycle-time of activities	Pritchard, 1990 Kaplan and Atkinson, 1998 Lander et al., 1995 Emmanuel et al., 1990 Klingebiel, 1999 Fortuin, 1994 Lynch and Cross, 1995 Griffin and Page, 1993 and Griffin and Page, 1996 Voss, 1992
10	The system is accepted, considered fair and used as an instructive tool in day-to-day operations	Pritchard, 1990 Kaplan and Atkinson, 1998 Meyer, 1994 Bonnet and Krens, 1994 Emmanuel et al., 1990 Anthony and Govindarajan, 1998 Ward, 1996
11	Users and measurement subjects are actively involved in system design, implementation and use	Pritchard, 1990 Meyer, 1994 Emmanuel et al., 1990 Anthony and Govindarajan, 1998 Goold, 1991 and Goold and Quinn, 1990
12	The design and implementation pursues a systematic and consistent approach	Kerssens-van Drongelen, 1999; Kerssens-van Drongelen and Cook, 1997 and Kerssens-van Drongelen and Bilderbeek, 1999 Ward, 1996
13	Measured factors are controllable by the	Pritchard, 1990 Neely et al., 1995; Neely et al., 1996 and Kennerley and Neely,

No	Functional requirements	Reference
	measurement subject	2000 Bonnet and Krens, 1994 Anthony and Govindarajan, 1998
14	The system minimises data- and information processing efforts	Pritchard, 1990 Neely et al., 1995; Neely et al., 1996 and Kennerley and Neely, 2000 Kaplan and Atkinson, 1998 Kerssens-van Drongelen, 1999; Kerssens-van Drongelen and Cook, 1997 and Kerssens-van Drongelen and Bilderbeek, 1999 Meyer, 1994 Anthony and Govindarajan, 1998 Pawar and Driva, 1999
15	The system supplies key measures for aggregation and combination for example on management or corporate level	Pritchard, 1990 Neely et al., 1995; Neely et al., 1996 and Kennerley and Neely, 2000 Kaplan and Norton, 1996a Kaplan and Atkinson, 1998 Bonnet and Krens, 1994 Emmanuel et al., 1990 Anthony and Govindarajan, 1998 Pawar and Driva, 1999
16	The system and measures communicate targets (demanding, but achievable), achievement, contribution and agreements	Kaydos, 1991 Kerssens-van Drongelen, 1999; Kerssens-van Drongelen and Cook, 1997 and Kerssens-van Drongelen and Bilderbeek, 1999 Emmanuel et al., 1990 Anthony and Govindarajan, 1998 Goold, 1991 and Goold and Quinn, 1990
17	The system and measures focus on significant cause-and-effect relationships	Neely et al., 1995; Neely et al., 1996 Kennerley and Neely, 2000 Brown, 1996 Kaplan and Norton, 1996a Meyer, 1994 Lynch and Cross, 1995 Fitzgerald et al., 1991 and Fitzgerald and Moon, 1996 Kennerley, 2000
18	The system supports and facilitates strategic / ex-ante learning and continuous improvement	Kaplan and Norton, 1996a Tumey and Anderson, 1989
19	The system provides norms, standard methods and units of counting and documentation and reference values and benchmarks	Kerssens-van Drongelen, 1999; Kerssens-van Drongelen and Cook, 1997 and Kerssens-van Drongelen and Bilderbeek, 1999 Lim, 1998
20	The system includes measurement structures and – techniques	Kerssens-van Drongelen, 1999; Kerssens-van Drongelen and Cook, 1997 and Kerssens-van Drongelen and Bilderbeek, 1999
21	Measures distinguish R&D project levels from R&D program levels	Hauser and Zettelmeyer, 1997 Griffin and Page, 1993 and Griffin and Page, 1996 Kerssens-van Drongelen, 1999
22	The system captures and reports external and internal R&D contributions	Hauser and Zettelmeyer, 1997
23	The system establishes clear standards of measurement and counting	Lim, 1998 Hultnik and Robben, 1996

No	Functional requirements	Reference
24	The system provides a commonly agreed baseline	Lim, 1998

Functional Requirements of a PMS (Roth, 2002)