AN INSIGHT INTO STRATEGIC INVESTMENT APPRAISAL: PROJECT RISK ASSESSMENT

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ABSTRACT

One of the practical problems faced by managers when appraising strategic investment opportunities, is how to deal with the uncertainty of the outcome(s). They often make subjective judgements about the riskiness of prospective projects, but these are rarely formalised into their strategic decision-making processes. Little attention is paid to this qualitative side of investment appraisal in the corporate finance literature. This thesis reports on a field-based study carried out in the logistics industry, which followed an innovative action research approach. It involved the analysis of 25 strategic investment projects, assessed by 57 participants in 8 management teams, discussed at 12 focus group meetings, held in 5 European countries.

Using a repertory grid technique, constructs were elicited, which managers used to explain the riskiness of a particular project, compared to other projects of a similar type that they had knowledge of from past investment appraisals. The results of the study include a set of twelve project risk attributes, a project typology which defines three types of project, each with a set of weightings reflecting the relative importance of the attributes to the participants. These provide a useful insight into managers' perceptions of the risk attached to strategic investment projects in a large divisionalised organisation.

In addition to the context-specific results, a new process model has been developed through this study, which provides a framework for utilising this risk assessment technique in other organisational settings. It is designed to enhance strategic decision-making, by capturing managers cognitive evaluation of the strategic factors and risk profile of projects, in a structured group decision process, and balancing the results with those of the primary financial appraisal techniques in a decision support matrix. As a result of this developmental research programme the new process model is now embedded in the investment appraisal procedures across the European Group of companies which participated in the study.

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1. INTRODUCTION

1.1 Rationale for the Study

Business organisations have grown into large divisional and often diversified enterprises, where mechanisms for ensuring that corporate goals are achieved have become a major concern of management. The view often expressed by business managers about the investment appraisal techniques typically taught on MBA programmes is that whilst they might be applied by their accountants, they do not actually drive the investment decisions in their organisations. Strategic and other non-financial considerations are talked about by these managers as being equally or even more important than the financial returns predicted for potential business projects.

One of the practical problems faced by managers when choosing between alternatives (including whether to invest in a particular project or not), is how to deal with the uncertainty of the outcome(s). In their discussions about strategic investment decisions (SIDs) managers often use the word risk, and make subjective judgements about the riskiness of an investment opportunity, but these are rarely formalised into their strategic decision-making processes in the way that corporate finance theory would suggest (see section 2.1).

This study was prompted by a desire to unpick the rhetoric about capital budgeting practice and learn more about what really goes on in organisational decision-making. A particular interest or focus of attention was risk in relation to SIDs, as the financial management literature deals with this from a theoretical perspective, but rarely from an empirical managerial perspective. This study set out to gain an insight into managers' perceptions of risk and explore their cognitive evaluations of the risk profile of strategic business projects.

In the interest of good corporate governance, there has also been an increase in the attention paid to risk analysis and management in large companies, with a proposal for the financial reporting of risk currently under consideration (ICAEW, 1998).

The proposal requires an audit of the sources of business risk and a statement of management responses, in terms of analysis methods and actions taken. This will not be easy for companies to comply with initially, and many will be seeking help in addressing the issues. Alternative approaches to risk evaluation are therefore timely.

The main aim of this study is:
To provide a useful insight into managers' perceptions of the risk attached to strategic investment projects, and to develop a new process model for risk assessment which will enhance strategic decision-making.

The term '*insight*' indicates an in-depth investigation which will illuminate how '*risk*' (the object of the investigation) is understood by '*managers*' (the subjects of the investigation), within the context of the strategic planning '*process*' (the set of techniques used to define and follow corporate goals). The new process model to be developed may be seen as a sub-process of strategic planning, which focuses upon the techniques of investment appraisal designed to aid strategic decision-making.

1.2 Theoretical Background

Strategic investment appraisal (SIA) may be viewed as the evaluation of strategic options in the strategic planning process (Dyson, 1990). It may also be viewed as the process by which financial resources are allocated to major projects in organisations in anticipation of future gains (Butler et al., 1993). It is assumed that many potential projects compete for a share of the organisation's capital, such that a range of analytical techniques is required to help management decide upon which alternatives to accept in pursuance of corporate goals (Levy and Sarnat, 1994; Lumby, 1994). From this perspective investment decisions may be viewed as part of management control (Emmanuel and Otley, 1990; Zanibbi and Pike, 1996).

The theory of investment decision making as part of financial management was developed as a normative theory by economists (for example Hirshleifer, 1958). The practice of investment decision making has been researched by survey methods, with a

traditional financial perspective (Drury and Tayles, 1996; Pike, 1982; Pike, 1996), and by case study methods, with a broader organisational perspective (Bower, 1986; Marsh et al., 1988). Some academics have viewed both theory and practice from a managerial perspective, linking financial and strategic considerations (Mills, 1994; Tomkins, 1991).

From field based studies, it is recognised that organisational life is bound up with politics (Bower, 1986), where individuals may pursue their own interests, and decision making may be seen as a social process (Northcott, 1991). That managers may not always behave in an economically rational way, has long been recognised (Hargreaves-Heap, 1989; Simon, 1957).

Whilst financial modelling and appraisal techniques may be employed, which are often based on probability theory (see for example Hertz, 1964), the decision usually involves an element of subjective judgement (Butler et al., 1993). How this subjective judgement may be made, has been investigated by psychologists (Hall, 1971; Holloman, 1992). The results of experimental research (for example Kahneman and Tversky, 1979; Slovic, 1972; Tversky and Kahneman, 1974; Tversky and Kahneman, 1986; Tversky and Kahneman, 1991) have suggested that the assumptions of economic theory do not lead to a valid description of how decisions are actually made.

Thus prior research into the practice of capital budgeting has revealed what some academics might describe as sub-optimal decision-making. In other words the observed behaviour of business managers did not adhere to prescribed theory. Economic models designed to lead to profit or shareholder wealth maximisation were either not applied at all or were over-ridden by politically-motivated or simply biased human intervention. A term used to describe this situation is the 'theory practice gap'.

There is general acceptance by academics in the financial management domain that such a gap may exist between theory and practice in the area of capital budgeting, but no agreement about why or what should be done about it. Opinion is divided more or less into two camps. One seems to be that the theory is robust and that practitioners

needed enlightening, and that practice will follow theory eventually. The opposing view perhaps credits practitioners with more sense. After all, many organisations have been recognised as successful, even world class, without necessarily applying the techniques as prescribed by corporate finance theory. Subscribers to this view are more likely to seek practice based theory to overcome the gap.

The conclusions drawn here are that normative theory is not being taken up by practitioners as prescribed and descriptive theory is so far inadequate in terms of generalisability, and still at an early stage of development. There have been several calls over the last ten to twelve years for more fieldwork to investigate the behaviour of managers and how they make use of both financial techniques and informal decision processes (Bower, 1986; Butler et al., 1993; Grundy and Johnson, 1993; Jones and Dugdale, 1994; Marsh et al., 1988; Northcott, 1998; Otley and Berry, 1994; Scapens, 1991; Tomkins et al., 1996).

1.3 Research Questions

With the purpose of exploring how managers conceptualise risk when making SIDs, this thesis addresses three key questions in relation to SIA. These are:

1. How is project risk perceived by managers ?
2. How can project risk be assessed in a way that managers understand ?
3. How can project risk assessment be combined with financial techniques to support the strategic decision-making process?

These 'how?' type questions call for the co-operation of managers in the research, who may seek some benefit from participation. When academics present their research to practitioners, it is often not well received. One legitimate complaint they may have about case study and other types of descriptive research is that it is merely holding a mirror up to them for the practitioners to see their own image, instead of showing them how to improve. Action research overcomes this possible weakness and offers the potential of dual benefits for the researcher and the participating organisation.

1.4 Philosophical Position

Before setting out the proposed contribution of this study, the philosophical stance is identified, in order to guide the reader as to the assumptions about knowledge and its discovery inherent in the thesis. The school of thought which most closely defines the paradigm within which this study was undertaken is that of 'pragmatism', which may be seen as a derivative of Kantian thought (Laughlin, 1995, p75), in that it sits mainly within the subjectivist domain, where reality is reliant upon man's cognition of the world, but also allows an objective dimension, where the situation is seen to demand it.

Laughlin positions research (Laughlin, 1995, p70) according to the 'level of prior theorization', the level of formality in the 'methodological choice', and desire to 'change the status quo'. The 'level of prior theorization' is difficult to gauge where a study draws on more than one theory (the eclectic manifestation of 'pragmatism'). Identifying the dominant prior theory as the psychology of personal constructs (Kelly, 1955), which is used as a 'skeletal' theory, it has a sufficient track record in non-clinical psychology settings to be approaching the 'middle ground'.

Using Kelly's own analysis, he states "our emphasis upon the testing of constructs implies our reliance upon the principles of *empiricism* and, more particularly, *pragmatic logic*" (Kelly, 1955, p17). The use of construct theory in this study positions it at five on the six point scale of ontological assumptions adopted by Tomkins and Groves (Tomkins and Groves, 1983, p367), and within the epistemological domain of 'constructivism'.

The level of formality in discovery methods overall is quite low, but not as low as in ethnography or in grounded theory[1]. The role of the observer as part of the process of discovery in this study, is more active than in an ethnomethodology. The action research approach is more critical of the status quo. Change is firmly on the agenda, but not the radical change of a Marxist, more the continuous improvement of *Kaizen*.

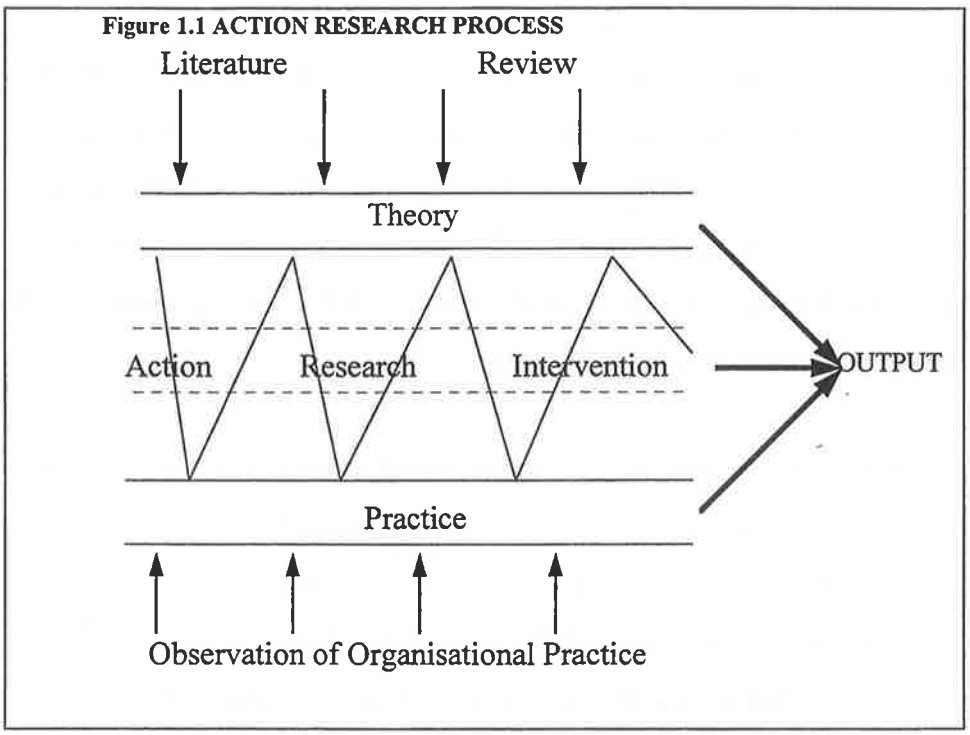
[1] Taking the early version of (Glaser and Strauss, 1967), which was less structured than (Strauss and Corbin, 1990).

The methodological approach of action research taken in this study is broadly informal, but it is operationalised by a combination of focus group discussions (relatively informal), and repertory grid techniques (more structured). It is bound by the corollaries of the underlying personal construct theory (Kelly, 1955, see appendix 1), which arguably positions it as approaching the middle ground.

1.5 Action Research Approach

To explore managers' perceptions and develop and test a process model for project risk assessment in a dynamic business environment calls for a dynamic research design. Action research is ideally suited to solving interdisciplinary problems of this type (see figure 1.1). It enables the researcher to make multiple observations of organisational practice, and to 'drip-feed' theory into the research process as and when relevant literature can be identified. Where a new theory is part of the output of the process, it will not emerge until the study is well underway. The dynamic nature of action research requires a confidence in the research partnership between the researcher and the organisational participants that useful output will emerge.

Figure 1.1 ACTION RESEARCH PROCESS



1.6 Contributions of this Study

The output from action research, where there is a strong organisational development agenda, is by design, twofold. The beneficiaries may be seen as the business and academic communities, so that both a practical and a theoretical output is expected. To the extent that practitioners are interested in learning, especially if it adds to their competitive advantage, and academics are keen to gain insights into 'management in action', the distinctions blur. However, the main contributions are:

1. An insight into managers' perceptions of risk in a natural organisational setting.

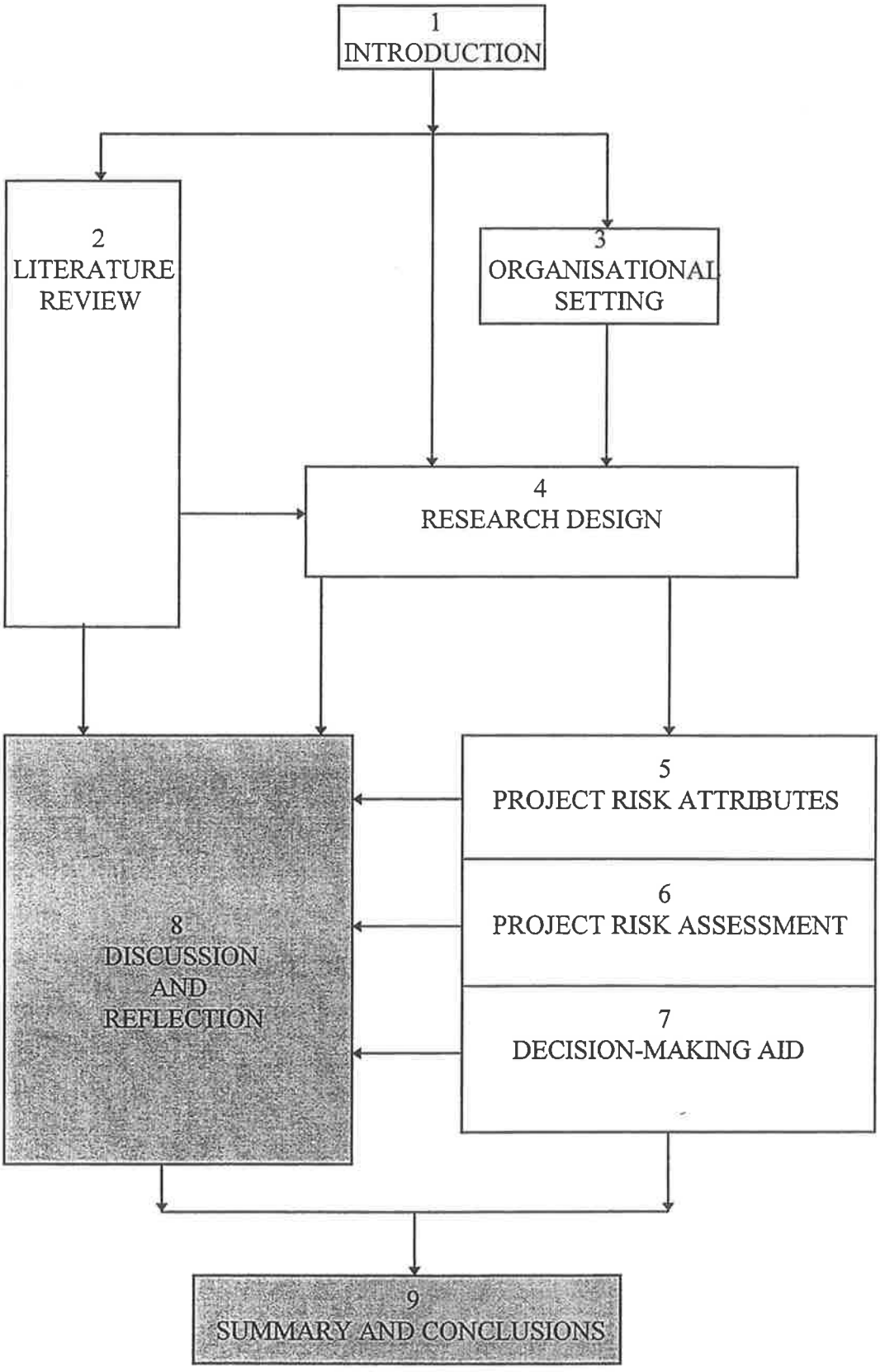
2. A process model for project risk assessment which is consistent with managerial perception and adds to the financial techniques used in strategic decision-making.

1.7 Outline of the Thesis

The research process may be seen as innovative in the field of Accounting and Finance, where the positivist paradigm still dominates much research. One of the many reasons may be the messy nature of this style of fieldwork, already alluded to above. This makes it difficult to write up in a neat sequence, as events do not occur that way. To follow the course of events, in terms of the literature reviewed before the research started, and the journeys backwards and forwards into both the organisational setting and the literature may confuse the reader. Therefore, whilst the executive reports and research notes were produced in a time sequence, a different approach has been taken in structuring the thesis.

A map of the thesis is provided in figure 1.2 to show the structure in diagrammatic form. Part one (chapters 1 to 4, unshaded) deals with the inputs to the research process. Chapter 2 deals with the substantial body of literature deemed to be relevant. Chapters 3 and 4 give a brief description of the organisational setting which provided the context for the study, and the research design for the planned intervention.

Figure 1.2 - Map Of Thesis



Part two of the thesis (chapters 5, 6 and 7, lightly shaded in figure 1.2) reports the findings from the field study, in relation to the three research questions, by presenting the results of the enquiry, with a focus on the practitioners' interpretations. The researcher's interpretation is in the last substantive chapter (chapter 8), which discusses the output of the study, relating it to the inputs from extant literature, the context of the organisation and its sector. It provides a reflective view, in terms of the methods used, and implications for both practitioners and academics. It sets out the contributions made by the study, and the limitations and recommendations.

Finally, chapter 9 summarises the outcomes of the study and draws conclusions from the literature as well as from the field work and research methods employed. It also makes suggestions for future research. Together with chapter 8, this forms part three of the thesis (chapters 8 and 9, shaded dark grey in figure 1.2).

2. LITERATURE REVIEW

There is no single, discrete body of literature which covers the theory relevant to this study. The theory of investment appraisal has largely grown from its economic foundations within Corporate Finance, where it is generally referred to as *capital budgeting*. Resource allocation is an alternative term sometimes used to describe the process of appraisal and selection of strategic investment opportunities within an organisation. The latter term does not imply the inclusion of a control element which is implied in budgeting. In some literature, capital budgeting is seen as part of an overall system of budgetary control, which is part of Management Accounting. The Chartered Institute of Management Accountants defines *capital investment appraisal* (CIMA, 1996, p94) as:

> "An evaluation of the costs and benefits of a proposed investment in operating assets. Capital investment appraisal techniques generally involve comparisons between projected cash outflows and inflows from projects, and may involve discounting cash flows to recognise changes in the time value of money, or may be based on unadjusted cash flows."

When linked to Corporate Strategy this is considered as part of *strategic financial management*, which is defined (CIMA, 1996, p101) as:

> "The identification of the possible strategies capable of maximising an organisation's net present value, the allocation of scarce capital resources among the competing opportunities and the implementation and monitoring of the chosen strategy so as to achieve stated objectives."

The focus of this study is how risk is taken into account within the *capital investment appraisal* process, which calls for a definition of *risk* in this context:

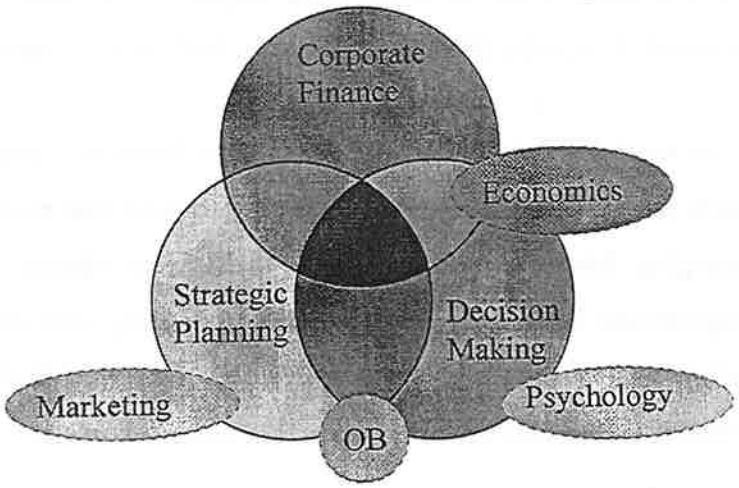
> "A condition in which there exists a quantifiable dispersion in the possible outcomes from any activity." (CIMA, 1996 p101)

This definition is brief and does not distinguish risk from uncertainty, but states that risky activities may have a range of possible measured outcomes, rather than assured or certain outcomes. It assumes that outcomes can be measured. The terms uncertainty and risk are used interchangeably in much of the literature, but the main distinction, where one is made, is that uncertainty includes all manner of unpredictable events.

Risk may only deal with outcomes which are known to be possible where the chance of occurrence may be estimated. Kaye distinguishes risk from uncertainty by suggesting that risk can be identified and measured, whereas uncertainty is unpredictable and cannot be estimated in terms of probabilities (Kaye, 1994, p118). Whilst this is a recognised theoretical distinction, it is not necessarily expected to match managerial perceptions derived from this study, therefore the term *risk* will be used in its broader sense, covering both risk and uncertainty, in this thesis.

In choosing between a number of risky alternatives in business, there are theoretical approaches which managers may take to analyse the risk, but a clear indication from the surveys and field-based studies that they are not extensively employed in practice. In any study which explores 'how ?' type questions in organisations, where human processes are involved, it is helpful to appreciate the behavioural aspects of the phenomena being studied. In this case, there is a wealth of literature within the behavioural sciences which deals with the human aspects of decision making.

Figure 2.1 Literature review



Key: OB = Organisational Behaviour

This chapter reviews contributions to the existing knowledge about how strategic investment decisions may be made by managers in organisations and how risk may be taken into account. It is organised into the two broad areas of Corporate Finance and Strategy and The Behavioural Aspects of Decision-making, whilst recognising contributions from related fields. Figure 2.1 shows how the various disciplines have contributed to this area in a Venn diagram of the literature.

Starting with Corporate Finance at the top, as the researcher's principal domain, the literature, with its foundations in Economics is reviewed, with the main contribution identified as financial appraisal *techniques*. Moving anti-clockwise around the diagram, Strategic Planning adds a *process* dimension. Here, investment opportunities are first identified in relation to defined strategies, closely linked with Marketing, and evaluated using the financial appraisal techniques. Moving further round to focus on Decision Making, the behavioural sciences, especially Psychology, add the complexities of individual and group *behaviour* under conditions of uncertainty into the decision-making process. Organisational Behaviour also adds a business context.

Models of rationality which help to explain why behaviour in decision-making does not always comply with the optimal solutions achievable according to the techniques prescribed in Corporate Finance, have been explored by both economists and behaviourists, which brings the literature full-circle, back to its economic roots.

The literature review takes the route mapped out above. However, this does not follow the path actually taken in this study, which (see figure 1.1) was more determined by what was emerging from observations in the field. This chapter is structured to provide an appropriate theoretical background to the study, and includes literature identified before and during the field study, by the 'drip-feed' process. The conclusions drawn at the end of this chapter are revisited in the reflective section (chapter 8).

2.1 Corporate Finance Theory

In reviewing the literature on strategic investment decision making and the financial and risk analysis techniques which may be used, this section begins with a brief introduction to the early economic theory which underpins the techniques prescribed in most texts on Corporate Finance. It then considers more recent research which has contributed to what we know about the practice of strategic investment appraisal.

It also encompasses some literature which links the fields of Corporate Finance and Corporate Strategy, which is seen as relevant, as there is not such a discipline boundary in the lives of practitioners. Financial appraisal techniques can be seen as sitting at the intersection of these fields.

2.1.1 The economic foundations of capital budgeting theory

The application of economic theory in capital budgeting is articulated by Michael Bromwich of the London School of Economics(LSE), in his classic UK text, still cited today (Bromwich, 1976). Another UK author who deals with capital budgeting in similar vein is Stephen Lumby, also formerly at the LSE (Lumby, 1994). Whilst there are numerous other texts in this area, these provide a good base from which to identify the normative theory.

Early economic measures used in business such as *profit* were used primarily to report past results of a business enterprise, and according to normative theory should not be used as a basis of appraising future business opportunities (Lumby, 1994, p6-7). However, it does form the basis of one of the two most traditional methods of appraisal. The accounting rate of return (ARR), calculated as the average profit over a project's life as a percentage of the capital invested in the project, is based on the single period measure, return on capital employed (ROCE), which most academics consider as unsuitable for appraising long term (multiple period) projects. This is because it does not take account of the timing of returns, and is adversely affected by the calculation of depreciation (a financial accounting concept).

Measuring the economic outcome of an investment by its net cash flow (profit before depreciation) is the basis of most other recognised financial appraisal techniques. The second of the two traditional methods, the *payback* method is based on cash flow. In its early form this was a simple measure, to show the length of time taken for a project to return sufficient net cash flow to recover the initial sum invested.

The major criticism here is that a certain sum of money expected to be received in the future is treated as having the same value as if the same sum was received now. The second significant weakness is its failure to take account of cash flows after the payback period, thereby ignoring the total value of the project. However, it could be seen as a crude form of risk reduction device, in that less reliance is placed on cash flows estimated to occur later in the project's life, where the level of uncertainty is greater.

Economic theory developed to overcome the major criticisms of these traditional methods in the 1950s with the net present value (NPV) theory (Hirshleifer, 1958; Tobin, 1958). NPV soon became part of accepted finance theory, appearing widely in the textbooks of the 1970s, and still appears several editions later (Brealey and Myers, 1996; Levy and Sarnat, 1994; Samuels et al., 1990; Van-Horne, 1992; Weston and Copeland, 1988).

NPV is calculated as the sum of the discounted future cash flows, net of the initial sum invested. The discounting of future cash flows takes account of the time value of money by converting future sums receivable into their present time equivalent sums. The additional information required besides the annual cash flows is a suitable discount rate. In arguing the superiority of the NPV method it is usually compared and contrasted with the payback and ARR methods. The strength of the NPV method over these alternatives lies in its recognition of the time value of money, and the fact that it is a multi-period model. The NPV model also includes all of the cash flows in the evaluation, not just those necessary to pay back the initial outlay, and links project evaluation with the value of the firm.

The internal rate of return (IRR) or discounted cash flow yield is a variation on the NPV method. It is the rate at which the net present value of a project's cash flows is zero - a similar concept to a break even point, where the additional project would not add to or reduce the net value of the firm. Calculating the IRR used to involve more calculations, often using a best guess rate to discount the cashflows, and repeating the calculation until at or close to an NPV of zero (trial and error method). These days the iterative calculations are performed quickly by a simple spreadsheet command, so this criticism is no longer an issue.

IRR does not require the estimation of the company's cost of capital, so may be easier to use than NPV. However, unless choosing between a number of mutually exclusive projects, some sort of hurdle rate or target return is needed to use IRR as a decision rule. The NPV rule and the IRR are both capable of giving optimal decisions (in financial economics terms) where cash flows are assumed to be easily predictable sums. However the IRR may fail to give optimal decisions where projects are mutually exclusive (whereas NPV succeeds), and both are questionable under conditions of uncertainty (see section 2.1.2). Another difficulty with IRR is that it may not always be possible to find one, for example when evaluating lease or buy options in financing decisions.

Another problem with the IRR is that it assumes that cash inflows are reinvested at the project's IRR, which may be far in excess of the cost of capital, and therefore unrealistic (Bromwich, 1976, p97). NPV also assumes that cash inflows from a project are reinvested at the discount rate, but so long as a realistic discount rate is used, it is not a problem. NPV has, for these reasons been judged by academics as superior to IRR (Levy and Sarnat, 1994, p101). Recently, there has been growing support for an extension of the IRR method, the modified internal rate of return (MIRR), which deals with the problem of reinvestment, by discounting the interim cash flows at the cost of capital (Pike and Neale, 1996, p134-135).

An important contribution to what may be described as formal decision theory, was made by Von Neumann and Morgenstern, with their game theory (Von-Neumann and Morgenstern, 1953). This was very closely linked to the economic notion of *utility*, where the decision makers were supposed to select the option which maximised their utility. This relied upon them being able to state their preferences in order to determine their utility function. This was then used to predict the outcome of their future decisions.

Some theorists combined this form of utility theory (described as cardinal utility theory by Swalm, 1966) with subjective probability, which requires decision makers to define their utility or decision criteria and measure the outcome of each option in those terms, and then assign probabilities to each outcome (adopted in texts such as Huber, 1980).

As Swalm acknowledges, the evidence is inconclusive on which form of utility theory is superior. He also concludes that:

> "cardinal utility theory is not a completely satisfactory predictor of executive behavior when decisions involving risks must be made, nor is it a completely satisfactory method of describing such behavior" (Swalm, 1966, p135).

Most early theorists were preoccupied with the outcomes or consequences of choice and their measurement rather than the role, attitude and context of the decision-maker. Managers were presumed to behave in a manner conducive to the corporate goals of profit and shareholder wealth maximisation, such that the outcomes of decisions were measured in this way.

The main criticism of modern utility theory is that whilst it may adopt the objective approach of cardinal utility theory, it creates the practical difficulties of subjective probability estimation. Later in this chapter, the theory of bounded rationality and the psychology of prospect theory will be seen to challenge utility theory and its neo-classical economics foundations (sections 2.2.1 and 2.2.2).

2.1.2 Theoretical approaches to project risk analysis

In calculating the NPV, there is often considerable uncertainty in the prediction of cash flows, which the economists deal with by applying probability theory to achieve an expected or mean value from the range of possible values. Indeed probability theory and the normal distribution have figured highly in most aspects of Corporate Finance theory. It underlies stock market models and portfolio theory, which like the NPV rule dates back to the late 1950s. In fact the 1950s and 1960s could be viewed as the 'age of the mathematician' with the development of finance theory being dominated by economists, typified by Brian Carsberg (Carsberg, 1969).

The seminal work on portfolio theory by Harry Markowitz (Markowitz, 1959) influenced the development of the capital asset pricing model (CAPM) by Sharpe and Lintner in the 1960s (Lintner, 1965; Sharpe, 1964). Thus the concept of systematic and unsystematic risk emerged, with the latter assumed to be diversifiable by investors holding balanced portfolios of stock, and the former assumed to be undiversifiable and applicable across the whole market. Mullins gives a good discussion of CAPM and illustrates systematic and unsystematic risk sources (Mullins, 1982).

Thus a typology of investment risk has influenced Corporate Finance theory, which assumes systematic or market risk to be non-diversifiable and outside the individual firm's control. Corporate risk (unsystematic) may be viewed as comprising operating risk and financial risk, which may be influenced by cost structure and capital structure decisions as well as by project selection. Project risk may be seen as a subset of operating risk, which may be isolated for analysis as part of the investment decision making process.

Most early work assumed that managers should use a similar basis for making investment decisions within the firm as external investors making stock market decisions. This would entail using a CAPM model to determine the rate of return which firms ought to use in discounting the cash flows of their projects, which accounts for systematic risk only.

The seminal work on the treatment of risk in capital budgeting was by Hertz, around the same time as the early work on CAPM. It utilised the same sort of mathematical methods, based on probability theory, but combined with the use of a random number generator (Hertz, 1964). This harnessed early computer power to perform iterative calculations in a simulation which modelled cash flows under uncertainty.

The theory of cash flow modelling with probabilistic risk analysis relies on two key assumptions. Firstly that there is sufficient information available to input to a cash flow model, both in terms of the cash flow drivers or variables, and in terms of the estimation of the probability or range of possible values of those variables. Secondly that the information can be processed in a systematic way. The second assumption has been helped by the development of information technology and the widespread use of spreadsheets. However, the availability of sufficient and reliable information to input to the model is more of an ongoing practical problem, involving the formation of a set of assumptions and derivation of subjective probabilities (Bromwich, 1976, p257).

Simulation techniques can be broadly defined to include any model of a real world activity which enables the decision maker to test out possible states and decisions in a safe environment. A well known non-investment example would be a flight simulator by which novice pilots can learn to react to alternative flying conditions without risking the loss or damage to passengers or planes which may occur if a bad decision were made in a live situation. In investment decisions where the consequence of a bad decision may be loss of earnings, assets, or even a whole business, the principle is the same. The computer model is designed to show what may happen to the projected return depending on the state of the world and any decisions within the firm's control.

Where the outcomes are not controllable, the variation in states may be too difficult to predict, which is where a computer model can come into its own by applying a random number generator to the input variables. This form of simulation, referred to as the Monte Carlo technique, is an operational research technique which has many possible applications in business (Hertz, 1964). It can be used to model a complex project, but can be laborious to set up (Tomkins, 1991, p45).

Hertz tested this approach in a case where a chemical company was evaluating a major expansion project in the US, so involving practitioners in a field experiment (Hertz, 1964). His work obviously influenced many authors in Corporate Finance (Dyson and Berry, 1984, for example), though few case studies have been published since using this approach.

Roland Kaye, in developing computer aided financial modelling more recently, explains how risk can be built into financial models, and how the decision makers' attitude to risk should be dealt with at the judgement stage, not in the design of the model (Kaye, 1994). Kaye deals with three main approaches to risk conditions, simulation, decision trees, and sensitivity analysis (see also Hull, 1980).

Most techniques offered in this and other texts are based on probability theory, with the exception of sensitivity analysis. Sensitivity analysis is a technique for measuring the impact on the net present value of a variation of one input variable at a time, to identify which variables the investment is most sensitive to. It is sometimes referred to as 'what if ?' analysis, as the questioning of the model involves asking a series of what if x (an input variable) changes?

This technique appears to have found its way into modern finance theory by gradual recognition of its use in practice (positive rather than normative theory). A variation on the sensitivity analysis theme is the 'goal seeking' technique developed as a business planning computer application, whereby a target project return or minimum acceptable IRR is set as a fixed parameter, and the model is questioned on the basis of how much each variable can change by in order to meet the set target return (Tomkins, 1991, p37). The advantage this has over basic sensitivity analysis is that the computer software performs the multiple iterations required to replace a trial and error approach. The disadvantage from a practical perspective may be that by identifying the change required in a variable to achieve the target, the model may encourage more massaging of the assumptions by managers to achieve the hurdle rate.

A similar concept is the break-even style of sensitivity analysis, which seeks to identify the change in an input variable which reduces the NPV of the project to zero. It identifies the maximum change in each key variable which the project could stand for it to still be financially worthwhile (Pike and Neale, 1996, p228).

Another technique is scenario analysis, which examines the impact on the net present value of changes in a number of variables, which constitutes a repackaging of the assumptions into alternative possible scenarios. The range of possible scenarios may be endless, but the extremes, as in the 'worst case' and the 'best case' scenarios are sought (Pike and Neale, 1996, p230) in addition to the 'base case' or expected scenario. This has the advantage over basic sensitivity analysis in that single variables do not often vary from their expected values in isolation, so recognising the interdependency of variables by packaging assumptions makes this technique more realistic.

The concept of a number of scenarios or possible outcomes for a single project can be taken a step further, with the addition of probabilities. If the chance or probability of each possible outcome can be estimated, then a weighted average or expected value can be calculated (Pike and Neale, 1996, p219).

The expected net present value (ENPV) method is a relatively simple way of incorporating probability into a model, which, if extended could also provide a range measure as well as an expected or mean value. The standard deviation of returns may be calculated to measure the risk in terms of the variability inherent in the expected net present value. However, the ENPV breaks down if cash flows in different periods are not independent.

Another technique which incorporates probability theory is the decision tree. In its simple form it uses the concept of alternative scenarios or 'states of the world', and analyses the expected values which may occur as a result of project decisions (Kaye, 1994, p120). Its strength is in modelling projects which have multiple decision points, for example research and development projects (Tomkins, 1991, p40).

So far, the main theoretical techniques for identifying and analysing project risk have been reviewed, but there are further techniques such as the 'certainty equivalent' method, described briefly below. Alternative approaches to be found in the literature for dealing with project risk may be viewed as a measured response rather than a measure of the risk itself. Such techniques include the adjustment of the discounted cash flow (DCF) hurdle rate and adjustment of the payback period. Again these appear to have migrated from practice into theory, and are therefore not part of the normative theory of Corporate Finance.

The certainty equivalent method (Pike and Neale, 1996, p232; Weston and Copeland, 1988) takes account of decision makers' attitudes to risk, which is an approach clearly not advocated by Kaye (Kaye, 1994,p118). This method modifies the NPV calculation by incorporating a certainty equivalent coefficient, which is found by dividing whatever certain sum of money management would be willing to accept in place of the project cash flow in a period by the expected project cash flow.

This factor, between zero and one, may be determined where projects are of normal risk for the business and the risk free rate of return and cost of capital are known. If managers are risk averse, then the coefficient would be closer to one, thus reducing the NPV significantly and making a risky project seem less attractive. It has not been a popular method with academics in the UK, let alone practitioners, perhaps due to its complexity. The effect of the next two 'naive' methods, in making the risky investment seem less attractive is similar.

Adjusting the hurdle rate used in DCF by adding a project or divisional risk premium where senior management perceive a higher than normal level of risk has been the subject of much academic debate over recent years. One flaw in this method is that it assumes that the higher risk level continues over the life of the project, by compounding the interest penalty. The main argument put forward against adding any sort of risk premium to the market based cost of capital in DCF is the diversifiability of business specific risk by investors (Eynon, 1988; Reimann, 1990).

However, that proposition, as put forward over thirty years ago, (see 2.1.1 above) relies on the key assumptions about investor behaviour and economic rationality, which have been questioned, particularly by the behaviourist researchers (see 2.2).

The last method in this category is that of reducing the target payback period, which does not necessarily involve DCF at all. The payback method of project appraisal, seeks to minimise the time taken for the project to accumulate sufficient cash inflows to recover the initial cash outlay, when comparing projects or seeks a target payback period from an individual project. As such, it can be viewed as a risk averse decision criterion in any case, as it is short-termist and liquidity seeking rather than optimising. So to add a further penalty by saying that a riskier than average project would need to payback the capital outlay more quickly is likely to restrict long term investment severely. Upon the inappropriateness of this method most academics agree.

These approaches to risk, together with the setting of conservative cash flow estimates, which make adjustments for unquantified risks rather than actually measuring risk, are criticised by traditional theorists for their subjectivity. However, that could equally be argued against the probabilistic approaches, in that the probability estimates are often subjectively assessed.

A more recent addition to the academic debate on dealing with uncertainty in decision making again comes from economic roots. This involves taking an options approach to capital investment. Options are defined as "rights but not obligations to take some action in the future" (Dixit and Pindyck, 1995, p105). Dixit and Pindyck argue that the NPV decision rule makes too many limiting assumptions e.g. that the project will start at a fixed point in time, and that the choice is a 'now or never' decision which is irreversible. They accept that many major investments are largely irreversible. However, they argue that there may well be an opportunity to delay the project, which gives management more time to evaluate the options, and possibly to generate more alternative ways of doing the project, possibly in smaller stages. Another criticism of NPV which Dixit and Pindyck highlight lies in its application, rather than with the theory, in the high hurdle rates typically applied.

Options theory views an opportunity to invest as a call option, which closes down when a decision is made and a project goes ahead. The value of an option relies heavily upon the concept of opportunity cost, which takes account of the lost benefit of forgoing alternatives. This means adding to the cost of going ahead with a project now, the benefit foregone of delaying and starting the project later, with better information. This could be just as limiting as rejecting projects based upon the NPV rule, even with a high hurdle rate, if it results in options being closed down by external forces i.e. competitors taking the opportunity. More work is needed before this approach can be fully evaluated, especially on its applicability across different market sectors and project types.

Allen seems convinced by Dixit and Pindyck's argument, and suggests that we should "forget the academic definitions of risk" (Allen, 1997). He states that "risk arises from the commitment of resources to an endeavour, the outcome of which is uncertain". He illustrates the effect of the postponement of a project and takes on board Dixit's argument for the disaggregation or phasing of projects. This may be valuable as an additional analysis tool in some projects, where the stakes are high and there are multiple decision points, such as R & D projects (see for example Newton and Pearson, 1994).

To summarise, practitioners are faced with a range of possible approaches to risk, which are not mutually exclusive and have been made easier to apply with modern computer power. Some fit well with particular investment appraisal techniques. They can be categorised in terms of approach as follows:

SOPHISTICATED TECHNIQUES	SIMPLE APPROACHES
CAPM/Beta analysis	Adjusted discount rate
Monte Carlo Simulation	Payback period adjustment
Decision trees/Probability analysis/ENPV	Conservative cash flow forecasts
Sensitivity analysis/goal seeking	Scenario analysis (best/worst case)
Certainty equivalent	
Options Pricing Model	

The next two sections review the response of the practitioners to these approaches.

2.1.3 Surveys of capital budgeting and risk analysis practice in the UK

There have been several surveys undertaken in the UK, particularly in the 1980s, to attempt to discover whether the theoretical approaches to capital budgeting were actually being followed in practice. Table 2.1 summarises key aspects of the main surveys, showing data about how the survey was conducted, in terms of target populations, respondents and response rates, as well as key findings relevant to this study (Drury et al., 1993; Ho and Pike, 1991; McIntyre and Coulthurst, 1986; Mills and Herbert, 1987; Pike, 1982; Sangster, 1993; Scapens et al., 1982).

Most were fairly broad surveys, which enquired into many aspects of the investment decision making process, with the exception of Sam Ho's work and to a lesser extent Drury et al's, which focused upon risk analysis. Whilst there were many similar questions asked, few replicated an existing questionnaire (which makes direct comparison difficult) with the exception of Pike, who repeated his questionnaire in 1986 and 1992, with essentially the same companies (Pike, 1996). Pike's three surveys are included together in one column, showing all four years' data.

One of the reasons that risk analysis did not become the focus of a survey in the UK before 1988 (when Ho's work was carried out), was probably due to the lack of conclusive evidence from the early surveys that discounted cash flow techniques were even being used, let alone sophisticated risk analysis techniques. Pike, in his summary of the evidence (Pike, 1996) puts this down principally to the increasing use of spreadsheets, whereas Scapens suggests that practitioners in the UK may just be slow to accept academic wisdom and take up the theories offered (Scapens, 1991).

TABLE 2.1 Capital budgeting surveys

	PIKE	SCAPENS et al	MILLS & HERBERT	McINTYRE & COULTHURST	HO & PIKE	SANGSTER	DRURY et al
NUMBER SURVEYED	208 (1980) 140 (1986) 129 (1992)	734 UK 497 US	219 corp. 400 div.	750	350	491	866
USABLE RESPONSES	n = 150 (1980) n = 100 (1986) n = 99 (1992)	n = 211 UK n = 205 US	n = 131 corp. n = 216 div.	n = 141	n = 146	n = 94	n=303
RESPONSE RATE	72% (1980) 71% (1986) 78% (1992)	45% 50%	60% corp. 54% div.	19%	42%	22%	35%
PREDOMINANT SIZE OF COMPANIES	Largest	Large	Large	Med.	Large	Large/Med.	Large companies or divisions and subset 46 largest *
DATE OF SURVEY	1980,1986,1992	1980	1984	1984	1988	1989	1992
COMPARISON	1975/80/86/92	UK/US	Div./Corp.	Med/Large	1975/80/86/88	UK/Scotland	Smaller/Larger
RISK ANALYSIS Q	Yes	No	Q on Uncertainty	No	Yes	No	Yes
DCF USED	60% (1975) 69% (1980) 84% (1986) 88% (1992)	52% UK 84% US	68% (IRR) 51% (NPV)	45%	Most	73%	63% (IRR) * 50% (NPV) *
RESPONDENTS	FDs	Group Accounting	FDs (corporate) MDs (divisions)	Accountants	Financial	? not reported	Accountants qualified > 5yrs

The survey results should be viewed, with the sampled population in mind, for example the differences in sizes of organisations, which makes McIntyre and Coulthurst's survey stand out, with smaller organisations, and Sangster's with Scottish companies (also smaller). Size of organisation or business unit did appear to be correlated with the type of techniques adopted in capital budgeting, which was brought out most strongly in Drury and Tayles analysis (Drury and Tayles, 1996).

The role of respondents may also interfere with interpretation and comparison, as not all of them were accountants, and some were at divisional level in large organisations whilst others were at group level. The response rates were not all high enough to make satisfactory generalisations (three out of eight were below 40%), and the framing of the questions (some giving definitions of terms and others not), length and general appearance of the questionnaires differed considerably.

However, having identified the constraints of the analysis, it is still reasonable to conclude that the majority of large organisations in the UK are using discounted cash flow techniques in capital budgeting. We should not assume from the surveys whether or how the techniques influence the decisions, as this type of data was not captured. Cynics might say that none of the financial analysis undertaken by accountants actually drives the strategic investment decisions, but there is no conclusive evidence.

Acknowledging the widespread use of DCF techniques, the question of whether to adjust the discounted cash flows, models or discount rates for project risk, appears to be relevant to most sizeable UK companies. Focusing on the issue of risk analysis, three surveys in table 2.1 (including two involving Pike) had risk analysis questions. A further regional survey, not included in table 2.1, which was carried out in the East Midlands, provides interesting statistics for comparison with these national studies. It investigated the use of formal risk analysis techniques as background to a case based study. The cases explored the informal coping mechanisms managers use to deal with the uncertainty involved in investment decisions (Smith and Murray, 1997).

Table 2.2 shows the main findings on the use of risk analysis techniques of three surveys (see table 2.3 for Pike's). Whilst the regional survey is obviously based on a smaller sample and does not claim to be as generalisable as the other two, it is comparable with Drury et al's study in the size and type of organisation, and the qualification and role of respondents. The percentages shown are the proportion of respondents who claimed to use the specified techniques sometimes, often or always.

Table 2.2 Risk Analysis Techniques

	Ho & Pike, 1988	Drury et al, 1992	Smith & Murray, 1996
	n = 142	n = 240	n= 83
Simulation	8%	5%	1%
CAPM/Beta analysis	15%	3%	4%
Probability analysis	30%	38%	30%
Sensitivity analysis	63%	75%	80%
Certainty equivalent	n/a	n/a	4%
Subjective/intuitive:	68%		see case
increase/decrease discount rate		45%	study analysis
require shorter/longer payback		77%	
conservative cash flow forecasts		72%	

Whilst the surveys are not directly comparable, given the sampling frames and nature and purpose of the questionnaires, the table does show similar low proportions of respondents using what may be described as sophisticated approaches (the first five rows) and high proportions using subjective approaches (the last rows). The certainty equivalent method was only specified in one survey, and as a formal method which is rarely recommended in the texts, it is understandably little used. Scenario analysis was not differentiated from sensitivity analysis in the surveys, but could be classified with the subjective or intuitive approaches. The latter are not included in the table in the Smith and Murray survey as they were covered by open ended questions and subsequent case study analysis.

As the studies were carried out at four year intervals from 1988 to 1996, there is an indication from the surveys that the use of sensitivity analysis has been increasing, with the relevant proportion of respondents rising from 63%, to 75% to 80%. The proportion of respondents claiming to use simulations or beta analysis appears to have reduced, but these apparent trends may be due to the difference in sampling frames and the fact that Drury and Smith asked more divisional level accountants and included smaller organisations in their surveys. Pike claims to have made a more reliable trend analysis from his surveys.

Table 2.3 Pike's trend analysis of Risk Appraisal Techniques (n=98)

Year of Survey	1975	1980	1986	1992
Firms which:	%	%	%	%
Shorten payback period	25	30	61	60
Raise required rate of return	37	41	61	65
Use probability analysis	9	10	40	48
Use sensitivity analysis	28	42	71	88
Use beta analysis	0	0	16	20

Source: (Pike, 1996)

There is increasing use of all techniques shown here, whether subjective or analytical, which shows sensitivity analysis as the most notable increase. Whilst the percentages in Drury et al's study differ, due to the different sampling frame used, the trend in use of sensitivity analysis appears to have continued. Pike puts this down to the increasing use of spreadsheets for DCF analysis which make sensitivity analysis easier. Another view might be that managers find sensitivity analysis easier to interpret, particularly when interpreted as scenarios, with less complicated statistical analysis than the probabilistic approaches. Pike points out that whilst there is an increase in the use of beta analysis, CAPM has come under criticism both theoretically, as a predictive model (Fama and French, 1992) and practically (Lowenstein, 1991) in the US. Dimson and Marsh continue to advocate its use in the UK and to promote the London Business School's risk measurement service, whilst the academic debate continues.

The CAPM debate is not deemed to be of major importance to this study, as it only partially influences the organisational hurdle rate which the company might set for divisional projects, and the systematic risk reflected in the cost of capital is not the focus of the study.

Part of a wider academic debate on capital budgeting, is the existence or not of a theory practice gap, which is generally based upon a comparison of the evidence from the surveys with finance theory. This is discussed in section 2.3, after evidence gained from non-survey based studies is reviewed, to gain a better insight into what and how capital budgeting techniques are applied in practice. Surveys are subject to so much bias in terms of the sampling frame, the definitions of terms and wording of questions, the role of respondents, response rates and non-return bias, that they often provide little more than a rough guide to the application of theory in practice. The next section explores the contribution made by field studies in capital budgeting, with a risk analysis emphasis.

2.1.4 Field-based studies of capital budgeting practice

An early US field-based study provided insights into the strategic investment decision (SID) process (Bower, 1986, first published in 1970). Bower studied four live projects from inception to board decision in a divisionalised company, over a period of two years, and identified key sub-processes including 'impetus', which tracked the political process of project sponsorship (cited later in thesis). There was little reported concerning risk analysis.

A UK study undertaken by Butler, Davies, Pike and Sharpe (Butler et al., 1993) investigated SIDs in twelve companies (5 large, 5 medium and 2 small). Data were collected by structured interviews with fifty five informants, covering seventeen real investment decisions, and from an investment experiment based on eight synthetic proposals. The data were coded and analysed statistically using regression and factor analysis, a more mathematical approach than Bower's.

In many ways the main study was really only one step away from the survey based studies reviewed in the previous section, but the framework was more flexible and the research resulted in a new model of decision effectiveness. The factors which were found to have a high degree of influence on decisions in both real and synthetic decisions were (Butler et al., 1993, p70):

1st Degree of corporate/strategic fit

2nd IRR

3rd Payback period

4th Impact of project failure (worst case scenario)

In the experiment the only other piece of information i.e. ranked fifth, was the best case scenario, whereas information available in real decisions went far beyond these five items. Other factors (of the 16 identified as possible explanatory variables) with a high degree of influence on the real decisions were focused upon *effect*s:

* Effect on product quality
* Level of agreement/opposition
* Effect on productivity
* Growth rate of related market

Carr and Tomkins' study examined the importance of cost management in SIDs (Carr and Tomkins, 1996). They used John Shank's framework for strategic cost management in technology investments (Shank, 1996) to analyse fifty one cases in UK, US, and German companies. They found that successful companies placed five times as much attention on competitive advantage in SIDs, three times as much on value chain considerations, and twice as much on cost drivers, and less on capital budgeting techniques than the others.

The organisations were all in the Motor components industry, where they found a 54% usage of DCF techniques (compared with Pike's 84% from his 1986 survey). The study suggested that non-financial, especially strategic and customer-focused considerations were more important than sophisticated computations. The managers placed more value on good industry knowledge than on formal analytical techniques.

Morone and Paulson studied four case companies in each of four industrial sectors (Morone and Paulson, 1991), focusing on issues about the cost of capital and whether high hurdle rates were limiting competitive opportunities. They interviewed CEOs in companies related to technology and engineering, e.g. Texas Instruments and Intel Corporation.

Key questions in the study included:

* Is the cost of capital an important source of competitive advantage ?
* If yes, how is the problem managed ?
* What accounts for differences in views on the cost of capital ?

The results showed that of fifteen usable responses (one target firm produced no usable result), five replied Yes to first question, where DCF analysis influenced SIDs, eight answered No, where strategic analysis had priority over DCF analysis, and two held mixed views. The conclusion drawn was that the cost of capital was only important where DCF outweighed strategic analysis in decision making. This may have been quite counter-intuitive, at a time when interest rates and corporate hurdle rates in the US were considered to be high. They did not appear to expect to find so many companies giving more priority to strategic rather than financial analysis.

A single case study undertaken in a US company, Fuqua Industries, which also focused upon the cost of capital issue (Gup and Norwood, 1982) showed how a differential hurdle rate was calculated for each division. Gup and Norwood introduce their paper by stating that at the time of their study, approximately half of US firms surveyed were using a single hurdle rate (Brigham, 1975), but the academic debate on the use of a single or a differential rate continued.

Their argument for the use of differential rates was based on the diversity of business activities across the divisions, and the logic in treating each division as if it were a separate company. For an organisation with twenty two divisions, Fuqua found this argument persuasive enough to devote a development project to identify a cost of capital for each business segment.

The paper published the results of the study, without much indication as to how it was carried out, so the methodology is questionable, but the results are of some interest. The model which emerged was an extension of CAPM theory, with an adjustment for each division based on an objective and subjective risk index. It is the nature of the risk index which is of interest here. The objective risk measure was obtained by weighting the variances reported over the previous five years, with a 75% weighting attached to variances from budget and a 25% weighting to year on year variances.

The subjective risk measure was based on a divisional risk profile incorporating an assessment of fourteen 'risk elements', which are described as "factors that management considers important for evaluating each division" (Gup and Norwood, 1982, p22). A weakness in the paper is that 'management' is not defined, so the reader may assume this to mean group level executives, but how many and how was this data collected and analysed ? This is a fundamental flaw in a model based on judgement, to not make explicit whose judgement or how it was sought. However, the fourteen factors seem reasonable, intuitive and flexible enough for diverse business units.

Each division is given a score of 1 to 5 on a risk scale for each element (unless not applicable at all), and the score is totalled and divided by the number of applicable elements to obtain a simple average score. This score is then averaged with the objective risk score to get a combined risk classification, which is converted to a risk index, with a range of 0.9 to 1.2 and a midpoint of 1.05. The range of values in this index was derived by analysing the beta values of firms competing with Fuqua divisions, adjusted for gearing, relative to Fuqua's beta. It is then used as a multiplier to expand or shrink the corporate cost of capital based on the CAPM.

The use of 1.05 as the midpoint in the conversion, equated to a score of 3 on the five point scale, has the effect of adding a 'comfort factor' of 5% to the index, which is not even discussed in the paper. The use of a simple average both to combine the objective and subjective scores, and to combine the fourteen risk elements ignores the possibility that some factors may be more important than others.

It also assumes that all projects appraised within the division will share the risk characteristics of the division, which is not necessarily so, or it ignores any project variation. Overall there are significant flaws in the paper, recognised by Tomkins (Tomkins, 1991), which make its contribution to knowledge in this area very limited, but each single company case study adds something to what we know of practice. In this case the risk elements thought to be worth measuring.

An interesting UK study which looked at investment appraisal in six hotel companies of different sizes, found a diverse range of practices within a single homogeneous sector (Collier and Gregory, 1995). The homogeneity came from the type of decisions commonly made, and the standard use of performance measures such as occupancy rates and average room rates, and building costs per room. It was suggested that since decisions were rarely complex and that information was easily sourced, sophisticated risk analysis tools were not needed. The diversity of practice found related to the way in which the discount rate was determined.

Two companies used the borrowing rate plus basis points or a percentage, one (a division of a larger company) used the group weighted average cost of capital, and one "may have made use of the CAPM" (Collier and Gregory, 1995, p55). This wording of the finding leaves an element of unexplained ambiguity. The other two had no use for a discount rate as DCF analysis was not employed (one preferring the payback method, and the other making only limited use of financial analysis, preferring strategic and market analysis).

None of the companies used formal risk analysis techniques, but the four using DCF analysis also used a form of sensitivity analysis. One unifying feature of the cases studied was the use of management experience of the hotels sector in making judgements on projects. This emphasis on industry knowledge and context specific rules of thumb mirrors the findings of Carr and Tomkins in the motor components industry.

This idea that the theoretical approaches to capital budgeting, and particularly the use of formal risk analysis techniques, were not driving decisions in practice prompted Smith and Murray to explore informal approaches, they called 'coping mechanisms', being used by UK managers (Smith and Murray, 1997). Their study gave an in depth analysis of practice in six case companies in the East Midlands.

Unlike Collier and Gregory, they selected companies from across a range of business activities. They identified four 'coping mechanisms' from the literature initially, for example (Carr et al., 1994; Collier and Gregory, 1995; Drury et al., 1993; Jones and Dugdale, 1994; Marsh et al., 1988):

* Adjustments (to inputs, producing extra conservative cash flow forecasts)
* Experience (to question unrealistic assumptions, using rules of thumb)
* Checking (by cross-examination of proposers and their assumptions)
* Sharing (team-based discussions around problems or specialist inputs)

Further into the study, a fifth mechanism, 'Political behaviour' was added (Bower, 1986), where soundings might be taken in advance of important meetings and decisions. This was found to be particularly relevant to four of the six companies which were divisionalised. After analysing the environment, processes and attitudes to risk in all six companies, evidence led the researchers to add a sixth mechanism which they called 'strategic context', which essentially meant that strategic analysis was being used in practice as a proxy for or as part of risk analysis. It was not clear how 'strategic' the decisions analysed in this study were. Limited use of formal quantitative risk analysis techniques was found. Both of these findings were consistent with Collier and Gregory's. Even in the company where simulation was used to model the production process, it was not used in relation to cash flow forecasts.

In two companies, subsidiaries were expected to assess risk subjectively, by categorising project risk as low, medium or high, but without any guidance as to how the judgement should be made. Rationales were obtained for an illustrative project which had been assessed as low risk. The reasons given were that raw materials prices and labour costs were 'easy to predict' and prices were 'fairly stable'.

So the risk assessment seemed to be based on the level of confidence the proposers had in their estimates. In the other four cases there was no company policy on risk assessment. Two of those were not required to assess risk at all, one was required to identify 'all non-monetary facts' and the other was required to give 'narrative about variables'. Four of the six companies used a capital appraisal manual, but only one company had provided risk training.

Lack of training or awareness of risk analysis techniques was one of the reasons given by over half the respondents for lack of use of formal techniques. Another problem respondents had in applying techniques was linked to the information requirements to input to a quantitative method. The information causing problems was often market information, sometimes technical information, and usually information on the wider business environment.

These concerns went some way to explaining why informal techniques dominated decision making in the six cases. However, this study did not explore the information processing aspect further. The findings may have been linked to earlier work in this area by Libby (Libby, 1981) or Hirst and Baxter (Hirst and Baxter, 1993). The study added some further evidence to support earlier work by Bower (Bower, 1986), concluding that managers do not analyse risk formally, but have developed strategies to cope with it, including the learned pessimism and rules of thumb of their industry.

A recent study which explored investment in R & D projects, and particularly the risk assessment procedures (Nixon, 1995), clearly links the adoption of sophisticated risk analysis techniques (as defined by (Pike, 1988)) with the nature of the decision. All six companies which were reported on (out of thirteen investigated) made some use of probabilistic methods, and three used no less than ten techniques, including simulations, linear programming, and probability analysis, as well as sensitivity and scenario analysis and critical path analysis. In addition to the internal risk analysis techniques applied, two of the three UK companies in the study and to a greater extent the three US companies developed risk assessments in collaboration with external parties.

Most significantly, co-development of risk assessments with customers and suppliers (existing and/or potential) and research organisations was part of at least four companies' procedures, and sometimes with financiers. Again this indicates a strategic and customer focused approach to the consideration of risk (Carr and Tomkins, 1996; Collier and Gregory, 1995).The risks which were seen as the greatest threat to successful innovation for investments examined in Nixon's UK companies were:

* Management capability
* Market/commercial risks
* Financial risks

2.1.5 Studies of strategic and risk analysis in action

An alternative approach to the analysis and selection of major capital investments, which integrates strategic and financial analysis, is offered by Johan Wissema in the first English edition of his little known work (Wissema, 1985), the earlier version having been published in Dutch. He suggests a combination of three methods: financial return analysis; synergy/strategy profile; and societal aspects matrix. Methods proposed for the financial return analysis are fairly standard, and include assumption probing, team based forecasting, sensitivity analysis, and the use of probabilities for dealing with development costs. However the methods proposed for the second and third elements were more novel.

To compile a synergy/strategy profile, Wissema proposed using five point scales to assess the synergy (benefit from combining project with existing activities) and strategic fit (affinity of project to corporate objectives) of a project by each functional area of the organisation. The proposing division, business unit or team input their assessment of strategic fit, based on a questionnaire consisting of at least five questions. Raw scores for each question are weighted to give an overall assessment for seventeen inputs to the profile. This element appears to be an elaborate project popularity survey of internal stakeholders.

Compiling the societal aspects matrix, involves a six step process, which aims first to identify areas of potential danger, select key obstacles (again by a series of detailed questionnaires), evaluate the impact of the project on societal groups. This third step compares benefits and disbenefits again on a five point scale. Then, steps four to six explore possible modifications to the project which retain benefits and reduce disbenefits, assess 'variants' in a key aspects matrix, and summarise how the various interested parties' views have been taken into account.

This analysis of the external stakeholders' likely reaction to the project bears a striking resemblance to cost benefit analysis, based on utility theory (Huber, 1980). This is followed by the building of a process flowchart, which together with the summarised results from the three analyses above form the essence of a feasibility report. Wissema does not describe how the questions (which number close to two hundred) were derived, but gives sufficient illustration to convince the reader that his elaborate scheme has been tested. In a chapter headed 'winding up' he admits, after spending over half the book describing the full scheme, that 'clients' did not respond well to it, and that the procedures had to be shortened at their request.

The reader is not given sufficient methodological information to assess its validity, but Wissema reports the results of a survey of forty companies designed to find out if the methods they used in practice bore any resemblance to his scheme. In an interview based enquiry, respondents were asked to say for each of seven criteria/investment appraisal methods whether they were very much present in their company with great similarity to Wissema's (++), available with a certain similarity (+), dependent on the nature of the investment (+/-), or not available (-).

75% responded very positively (++) to the financial criterion (Payback, NPV,IRR) and to the use of standard appraisal forms, which were not unique to Wissema. A surprising 25% claimed to use an aspect matrix similar to Wissema's, 38% claimed to use an 'intuitive approach' similar to Wissema's, and a less surprising 38% claimed to assess strategic fit in a similar way. 0% claimed high usage of the synergy assessment or strategy/synergy profile, with 88% claiming the latter to be unavailable.

Wissema does not claim the survey to be representative, but does claim the results to give support to his conclusions about the efficacy of his scheme. Elements of the scheme may hold a certain attraction, for example the systemisation of the managerial judgement known to be exercised but rarely made quite so explicit. However, apart from the laborious task of working through so many questions, which with today's technology could easily be computerised, there are likely to be other reasons why practitioners may not respond well to the scheme.

One might be the practical difficulties of designing or tailoring the questionnaires to suit organisations in different industries with different types of projects. Other reasons may have more to do with corporate culture, educational background of managers and management style. Academics do not appear to have taken to Wissema's scheme, with no reference to his work appearing in any of the books or papers reviewed for this thesis, after over ten years.

However, an approach with some similarities to Wissema's, was suggested by Bromwich and Bhimani when evaluating advanced manufacturing technology (AMT) decisions (Bromwich and Bhimani, 1991). They presented a possible format for a strategic planning matrix, which evaluated the costs and benefits of alternative strategies. As their approach involved evaluating some items which can be expressed in monetary terms, some which can be converted into monetary terms, and some which cannot, they used a scoring system (with a ten point scale) to measure the third category.

The matrix was built up from a checklist of potential benefits, taking those judged to be the most important items. It seems less systematic and more pragmatic than Wissema's model, but it is difficult to validate from the limited methodological discussion in the paper. It may have emanated more from the authors' consulting work than from their academic research. Bromwich and Bhimani, like Wissema, deal with strategic and financial issues in an integrated framework. Neither emphasise risk as such, but their use of matrices in an integrated analytical tool is relevant to this study.

Another similar approach developed by a Finance Director of a UK company, claims to be a new capital investment appraisal model, which takes account of financial, strategic and risk analysis (Lefley, 1997). The idea is to create a 'financial appraisal profile' for each project which consists of eight pieces of information, two descriptive, four financial appraisal calculations, a risk index and a strategic index. The first two elements simply describe the project in terms of the anticipated capital cost and estimated life.

The four financial calculations are discounted payback (DPB), a DPB index, the accounting rate of return (ARR), and the modified internal rate of return (MIRR), calculated in the usual way. For a full explanation of these techniques and the rationale and calculation of the MIRR see Pike and Neale (Pike and Neale, 1996, p134-135). The risk index is determined by capturing the consensus opinion of management on the level of risk they perceive to be attached to the project in each risk area, using a scale of zero to minus ten, with minus five representing average risk, and minus ten the highest level of risk. In the illustration, four risk areas are assessed. They are manufacturing; marketing and sales; product; and environmental. How these risk areas were identified is not clear.

Likewise, whether or not the risk areas vary for each project in the case company or for each type of project (no typology is given, but the illustrative project involved investment in advanced manufacturing equipment). Having identified (by whatever method) and assessed each risk area, the area with the highest risk score is taken into the financial appraisal profile as the risk index for the project. The other areas are thereby ignored in the profile, and no account is taken of their relative importance.

The construction of the strategic index is similarly vague, in that it involves the identification and assessment of the strategic benefits of the project, but only illustrates a small selection to demonstrate the principle. In this case manufacturing flexibility; competitive advantage; responding to customer needs; and environmental issues.

Again 'management' identify the strategic benefits, this time applying weightings to reflect their relative importance. The weightings are derived by taking a corporate perspective and ranking each potential benefit on a scale of zero to ten, depending on its importance to the organisation. The project is then assessed for its consequential strategic benefits using a similar scale. A weighted average score is then calculated which forms the eighth element in the financial appraisal profile.

The article only provides a summary of the model, and was not referenced or refereed, so it raises more questions than are answered in this brief exposition. For example questions about how the risk and strategic factors are derived and how consensus is reached by 'management'. The model is similar to Wissema's in some respects, e.g. three types of information (financial, strategic and risk factors), with similar factors taken into consideration.

However, it is far less prescriptive (no standard questionnaires) and disappointing in terms of the naivity of the risk index, which seems as simplistic as Wissema's aspects matrix is complex. We shall have to wait for the author to publish his thesis for further information[1]. In the meantime, it shows that even in smaller companies (the case company is a privately owned group of textile manufacturing companies in the North of England), some progress is being made to try to capture the managerial judgement previously implicit in capital investment decisions.

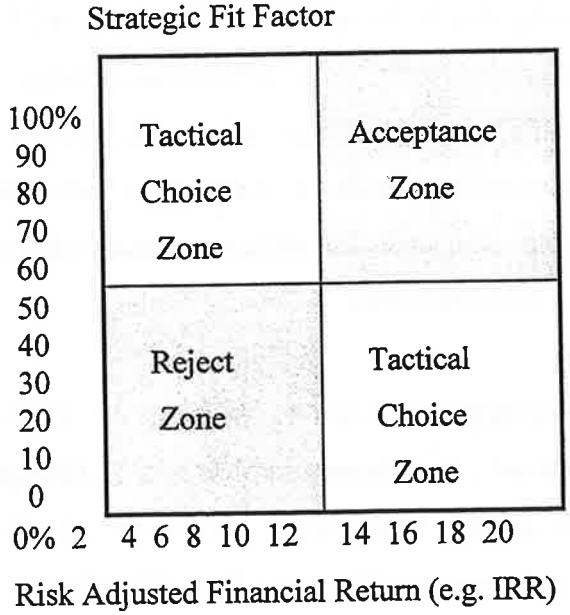
Another example of such work is that of Gary Pugh, who undertook a similar study whilst at AT & T (UK) Financial Community, Redditch (Morgan and Pugh, 1997). Morgan and Pugh describe how this company developed a decision matrix based on a risk assessment scale and a strategic fit scale to extend existing investment appraisal methodologies[2]. The idea of measuring risk by identifying, assessing and weighting a number of risk factors is similar. Here the factors illustrated are technical, market, cost and resource/skill, weighted 50:25:15:10, and the assessment uses a percentage measure, with 100% representing lowest risk and 10% high risk, calibrated in tens. The scale could be confusing with 100% as low, but it facilitates the next step.

[1] Having contacted Frank Lefley to discuss his article, I found that his PhD was in progress in 1997.
[2] Communication with Dr Morgan confirmed the study as an action research project for Pugh's MSc.

The next step is where the major difference lies, in the use of the resulting score, in this case to adjust the IRR. Thus a project with a 20% IRR and an 80% risk score (fairly low risk), would be treated as having an IRR of 16% in the strategic investment appraisal. The strategic fit scale is constructed in a similar way, with a number of dimensions being assessed and weighted. In the illustration given the dimensions are market development, competitive impact, development of competencies and supplier relationships, weighted 40:30:20:10. The assessment again uses a ten point scale of 10% to 100%, with 10% representing a high strategic fit and 100% a low fit. The weighted percentage measure for strategic fit is then used in the decision matrix.

The matrix has two dimensions, strategic fit factor and risk adjusted IRR (figure 2.2). The cut-off point on the strategic fit dimension is unclear, but it appears that any project assessed at more than 50% is above the line, and up to 50% below the line. Likewise the cut-off point on the adjusted IRR scale is unclear, but appears to be at 12%, where projects exceeding this return are placed in the next zone. High fit high return projects are accepted, low fit low return projects rejected, and projects falling into the other two zones flagged up as requiring a 'tactical choice'.

Figure 2.2 Strategic Investment Appraisal Remix



Source: (Morgan and Pugh, 1997, p31)

The model proposed is a practical solution, with some reference to theory, but no citations and a questionable conceptual basis, reducing IRRs. The use of a risk score to reduce the IRR is one of the techniques which Pike would categorise as a 'naive' rather than 'sophisticated' method (Pike, 1988), and goes against the generally accepted theory (Reimann, 1990). However, the value to this company of the matrix, as an additional decision aid to those used before its development, is captured by the authors as:

> "The procedures suggested above are viewed as a means of instigating dialogue within a top management team around critical issues which can become submerged in financial detail."

When put into perspective, using practitioner rationality in this way, the development, and publication (albeit in a professional journal) of this model makes a small contribution to knowledge of what and how techniques are applied in practice, and supports the view that there is a trend towards greater use of risk analysis techniques, but not necessarily those prescribed by Corporate Finance texts. It also illustrates the importance of strategic analysis in the investment appraisal process, found earlier.

Another study which explored managerial perspectives on SIDs focused on the problems of linking strategic with financial analysis (Grundy and Johnson, 1993). The research design was relatively simple, being based on a structured learning process, which took place at a workshop (not in a naturalistic setting). It bears some resemblance to Butler et al's investment experiment, but was not undertaken by individuals or a natural management team. It was carried out with two financial managers from each of four companies in different sectors (drinks, engineering, transportation, and financial services/retail).

The research used pre-workshop interviews to "surface the maximum extent of existing managers' perspectives", then focus group discussion (though not described as such by the authors) at the 'intervention workshop' to "surface residual perspectives" and provide a forum for reflective debate (Grundy and Johnson, 1993, p256). Changes in perspectives were identified through this process.

Grundy and Johnson dismissed the possibility of using Kelly's personal construct theory (PCT) as they assume that "would have required eliciting constructs separately from individuals rather than on the perspectives of managers arising through reflective and interactive debate with one another" (Grundy and Johnson, 1993, p256). This argument is difficult to accept for a number of reasons.

First, they did conduct pre and post workshop interviews, so have engaged in a process of eliciting the individuals' views. Furthermore, it is possible to use methods derived from PCT, such as repertory grid or cognitive mapping techniques, in group situations. In addition to the above methodological issue, the authors go on to claim they followed a grounded theory approach to qualitative data analysis, citing the earlier and less structured version (Glaser and Strauss, 1967), where most grounded theorists now prefer the Strauss and Corbin version.

Key findings included the discovery that linkages between strategic and financial appraisal were diverse and complex and difficult to model, that financial incrementalism may "push exploration of interdependencies to the periphery" of analysis (p262), and managers are reliant on subjectivity in the form of acts of faith, belief and judgement.

An intuitive finding was that issues of concern to academics e.g. cost of capital, were of less concern to managers than many other issues e.g. dealing with uncertainty. They conclude (p263) that "there can be no workable, *simple* and prescriptive analytical framework for linking strategic and financial appraisal *across* a diversity of typically fluid investment decisions".

One of the reasons why they found the issues difficult to unpick may be down to the methodology used (early grounded theory from focus group discussions), or lack of a clear theoretical framework. Another reason may simply be that the combination of participants from four such different organisational and sectoral contexts did not allow for sufficient synergy within the group to focus the discussion.

Whilst the different types of project were identified in the subcategories of the substantive value element (p258, table 1), there was no attempt to focus the group discussion on any particular type of project. This may have caused common linkage problems. The value of this study was disappointingly limited in adding to our understanding of the issues.

2.1.6 Links with the strategic planning process

It has been suggested that academics in the field of finance take too narrow a view of capital budgeting (Jones and Dugdale, 1994; King, 1975). An example of this traditional or narrow view of finance might be Levy and Sarnat, who prefer not to deal with strategy at all, and continue to assume that decisions will be made based on economic evaluation alone. This is understandable where shareholder wealth maximisation is assumed to be the primary objective of the firm (Levy and Sarnat, 1994). Likewise organisational behavioural issues are largely ignored as irrelevant to financial theory, within this economic paradigm.

In the fifth edition of Lumby's book, he at least includes a chapter on 'strategic planning and the finance function' (Lumby, 1994, p25-37), which does recognise a link, but the strategic context for decisions does not permeate the rest of the text. The links between financial and strategic analysis have been emphasised by some academics within the finance field (Mills, 1994; Tomkins, 1991; Ward, 1993), but only relatively recently. Perhaps this is largely due to the development of business strategy as a newer discipline than accounting and finance (Mintzberg, 1994).

King offered a view which placed financial appraisal within a strategic decision making process. The process described by King was based on his analysis of a case involving the addition of extra capacity in the chemicals division of a diversified group . His process model therefore has an empirical basis (King, 1975).

He depicted the process as a sequence of six stages:

1. Triggering (recognition of opportunities)
2. Screening (should the opportunity be pursued?)
3. Definition (what form should the project take? and is it strategically acceptable?)
4. Evaluation (search for information and financial analysis)
5. Transmission (build up of commitment)
6. Decision (final check on worth of project and formalisation of commitment)

Whether it is the case itself or the diagrammatic representation of the process, there appear to be no possible feedback loops. So, whilst it does encompass more than financial analysis (shown as part of the evaluation stage), it is far from an ideal model.

Pike and Neale depict a simple capital budgeting system as a five stage process (Pike and Neale, 1996, p183) labelled as:

1. Determination of the budget
2. Search and development
3. Evaluation
4. Authorization
5. Monitoring and control

This model allows a return from the evaluation stage to the search and development stage as one of four feedback loops, and allows for the possibility of an idea being generated out of the normal sequence, at stage 2, which causes management to consider an increase in the budget by looping back to stage one. It does not stop at the decision point, but also includes a monitoring and control stage, which loops back to the evaluation stage in the process. This appears to be an improvement on earlier presentations of the process. In a divisionalised organisation the simple model may need extending to show the location of activity at the different stages. It may be assumed that all but the authorisation stage takes place at the divisional level, and that the role of group executives is to authorise the capital budget and make final decisions on large projects based on information provided by divisions (Mills and Herbert, 1987).

In today's business environment, with the huge sums needed to invest in advanced manufacturing technology (Eisenhardt, 1989), the concept of authorising an annual capital budget implied by Pike and Neale's process model is possibly outmoded, or restricted to small sums which would not fit the definition of an SID.

An alternative view is offered in the strategic planning literature. Dyson, for example, sets out eleven elements in the strategic decision making process (Dyson, 1990, p7), which are also shown in diagrammatic form, with feedback loops. The book focuses on six of these, which are discussed in order (by contributing authors) and finally linked with analytical techniques (p308). The six key stages are:

1. Objective setting and review
2. Strategic option formulation
3. Assessment of uncertainty
4. Corporate system model
5. Performance measurement
6. Gap analysis and selection

Dyson provides a matrix which positions fourteen analytical techniques in terms of their primary and secondary impact at each stage. Capital investment appraisal is technique number eleven, and is shown as having primary impact at stages 5 and 6, and secondary impact at stages 1 and 3. Risk analysis (defined in the book by the inclusion of Hertz' paper, cited earlier) is technique number 7 and is shown as having primary impact at stage 3 and secondary impact at stages 4 and 5 in the process.

This approach separates out the financial analysis (performance measurement) from the decision analysis (gap analysis and selection), which overcomes Jones and Dugdale's criticism of accountants confusing measures and criteria (Jones and Dugdale, 1994). It also positions the techniques which are assumed to be in the accountants' domain as a minority of the fourteen techniques which may be applied in strategic analysis. This highlights one of the weaknesses of the capital budgeting surveys, in that almost all questionnaires were targeted at accountants or finance directors.

To gain a broader picture of the analysis undertaken in SIDs a full range of executives views should be sought. Marketing and project managers should play a major role in group approaches to decision making (Eisenhardt, 1989; Schweiger et al., 1986).

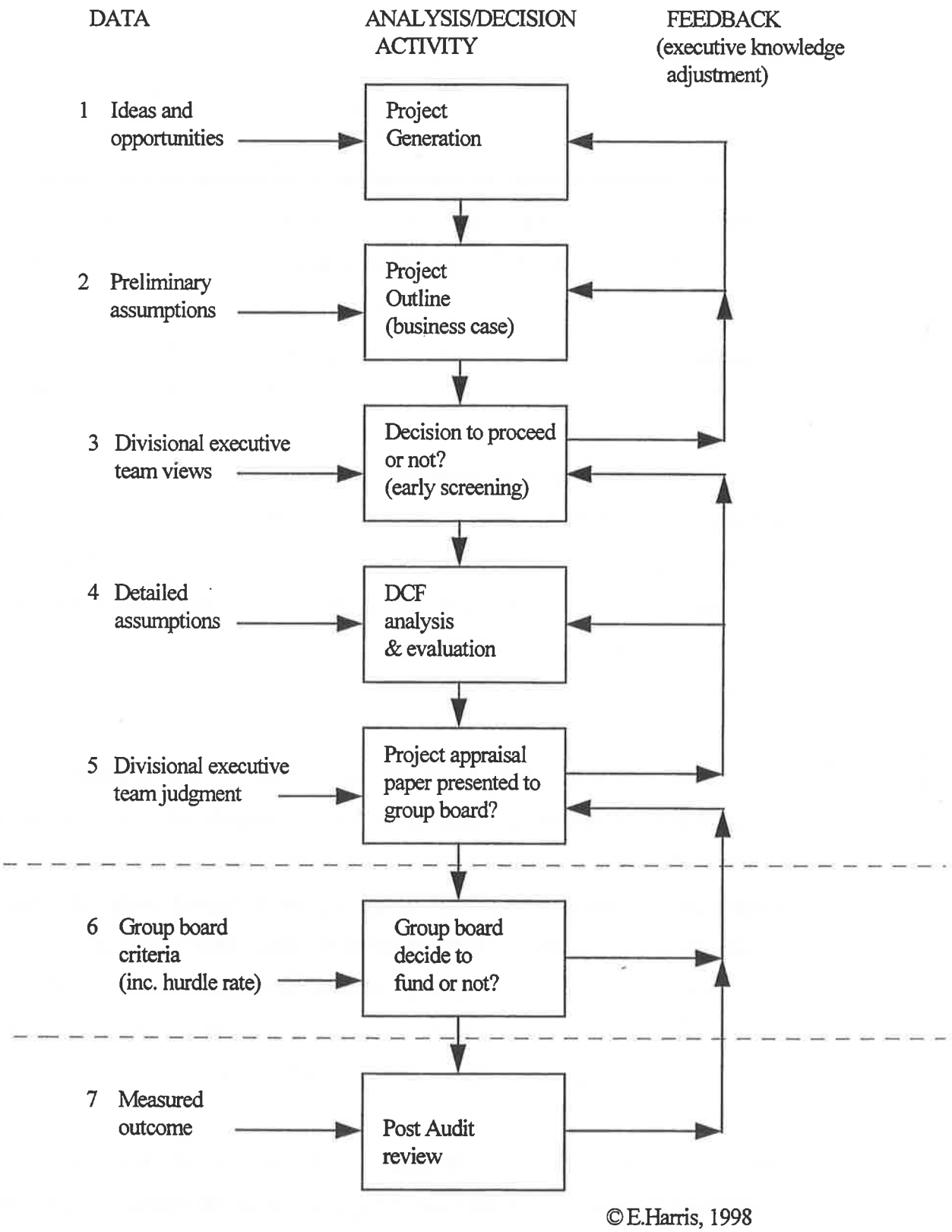
In the consultancy world, the academic distinction of strategy and finance as separate fields is unnecessary, but work and models often go unpublished, being guarded as part of the consultants' competitive armoury. There have been occasional exceptions in decision making provided by consultancies such as McKinsey's, with its strategy theory initiative (Courtney et al., 1997), which draws on both theory and practice. Courtney et al offer guidance on analytical techniques which they suggest should be added to the strategy toolkit to deal with uncertainty. Most of the techniques, scenario planning, game theory, simulation and options theory may be described as sophisticated risk analysis techniques, more or less straight from the text books.

Of the field based studies reviewed in this chapter, most found that practitioners, including accountants, tended to think about projects strategically. Strategic fit came out as an important factor in studies of different types across different organisations and sectors (Butler et al., 1993; Carr et al., 1994; Collier and Gregory, 1995; Grundy and Johnson, 1993; Lefley, 1997; Morgan and Pugh, 1997; Nixon, 1995; Shank, 1996; Slagmulder, 1997; Smith and Murray, 1997; Tomkins et al., 1996).

The model shown in figure 2.3 is an interpretation of the strategic investment appraisal process drawn up specifically for the purpose of this study from the literature and from the author's own observations. It shows that very little of the process takes place at Group level (stage 6), but is located within the divisional domain. Executive judgement is exercised at divisional level at two stages (3 and 5), an 'early screening' stage, once there is sufficient information to make a judgement as to whether the project is worth investigating fully, and the more formal stage when the decision is made to place the project on the Group board agenda.

The focus of this study is on the stages in this process which require subjective judgement (sub-processes), to be balanced against the formal analysis (stages 3 and 5).

Figure 2.3 Strategic Investment Appraisal Process



2.2 Behavioural Aspects of Decision-Making

This section reviews literature on the behavioural aspects of decision-making, with particular emphasis on investment decisions under conditions of uncertainty. It explores some of the reasons why economic theory and optimising techniques may not drive the decisions made in practice. It deals with theories on how individuals and groups may process information and rationalise their decisions.

2.2.1 Assumptions about rationality

Section 2.1 has shown that just as the traditional theory of Corporate Finance is predicated on the assumption that organisational decision making is congruent with the primary goal of shareholder wealth maximisation, formal decision theory also fits within an economic model of rationality. In the social sciences this may be described as functional reasoning. The recent challenging of this assumption in capital budgeting (Northcott, 1991), and the concepts of academic and practitioner rationality (Jones and Dugdale, 1994) support the argument for the existence of a theory practice gap in capital budgeting. Models of rationality are further considered here.

An important contribution was made by Herbert Simon on the boundaries of human rationality (Simon, 1957). He later extended his theory of *bounded rationality* and applied it to business decisions (Simon, 1978; Simon, 1979). He suggested that humans can only make sense of the data available to them within the context of what they already know and have experience of. The reasoning that a person will use when faced with making a choice would therefore depend upon his or her local knowledge and experience, such that a different person will view the same choice differently, as he or she will have a different set of prior knowledge and experience.

Simon challenged the assumptions about man's ability to be rational, inherent in the neo-classical theory of economics. He did acknowledge the improvement on cardinal utility theory made by the development of subjective expected utility (SEU) theory.

However, in view of empirical evidence, he found "it is hard to take SEU seriously as a theory of actual human behavior in the face of uncertainty" (Simon, 1978, p9). He suggested that the gap between normative and real behaviour would be greater where the uncertainty and complexity of the decision were greater, as the capability of the decision maker to search for and process sufficient information would be more of a constraint.

He separated economic rationality out into substantive rationality, which dealt with the principle of evaluating alternatives in terms of their contribution to the economic goal, and procedural rationality, which dealt with the search for and use of information as a basis for evaluation and decision. He suggested that the use of computers would advance man's capacity for procedural rationality.

In dealing with procedural rationality, from an economics perspective, Simon presented the mind of the decision maker and the attention to be given to the decision as a scarce resource, about which insufficient was known. He concluded that theory from other disciplines, such as cognitive psychology, should be borrowed to help explain decision-making behaviour and models of rationality.

David Cooper challenged the assumption of economic rationality in investment appraisal from a sociological perspective (Cooper, 1975). His analysis of the apparent theory practice gap in capital budgeting led him to reject the possible hypothesis that it was due to the ignorance of probability theory and cash flow estimation techniques in firms, in favour of a social subsystem explanation. He argued that the economic rationality assumption did not hold because the firm could not behave as a decision making entity separate from the individuals employed within it. He stated:

> "a firm does not possess a mind of its own and, unless we are willing to make the restrictive assumption that there exists some mechanism to ensure that all participants in a firm will behave in a manner consistent with one well ordered preference function, no immediate meaning can be attached to the concept of maximising a firm's utility." (Cooper, 1975, p200)

The basis for this argument rested upon Cyert and March's behavioural theory of the firm (Cyert and March, 1963), evidenced by the observations of a number of studies where the self-interest of individuals and sub-systems within the structure of the firm provided more motivation for their actions than often vague corporate goals. Cooper suggests three patterns of behaviour associated with the different roles that financial managers might play in organisations, which added to Bower's earlier contribution on investment as a social process (first edition in 1970 of Bower, 1986).

Simon Hargreaves-Heap and others also recognised that the neoclassical economics assumption that a single logic or criterion would drive decisions ignored conflicting evidence from the social sciences (Hargreaves-Heap, 1989; Hargreaves-Heap et al., 1992). The human tendencies to be motivated by mental images of the attractiveness or otherwise of an option, and exercise a kind of 'animal instinct' or intuition, along with the excitement of surprise, are all given as phenomena which influence individuals in making choices and taking action. This makes the risk attitude of the individual vary, not just from one decision to another, but also according to how the options are framed, and the politics involved in the decision.

Jones and Dugdale also deal with rationality from a sociological perspective, and use four facets of rationality to explore "the meanings accountants attach to techniques, information and decision processes in investment" (Jones and Dugdale, 1994, p5). These are objective rationality (pure reasoning based on objective logic), subjective rationality (practical reasoning based on the individual's perceptions and values), inter-subjective rationality (shared reasoning based on occupational or organisational norms), and positional rationality (self-interested reasoning based on the position of individuals and groups in social structures).

The paper is based on semi-structured interviews with five accountants, one academic and four practising accountants with different amounts and types of experience. With such a small sample, personally selected, it is dangerous to generalise about the results.

The results of the discourse analysis revealed that the academic's views were dominated by objective rationality, whereas the practitioners views spanned the four types of rationality without any dominant form of reasoning. This formed the basis for the conclusion that academics and practitioners view investment appraisal very differently. At first this seems intuitive, but it may not apply to all accountants.

Academic and practising accountants come from a range of different backgrounds. Academics in business schools where previous practical experience is an essential recruitment criteria may be expected to think differently from those in traditional University accounting departments. Practitioners who gained a first degree in Accounting or a higher degree e.g. MBA, may think very differently from those who studied for professional qualifications whilst working, without attending University.

Despite this, the warnings about the dangers of academics failing to locate their theories in practical contexts or being sufficiently sensitive to how their own views are constructed may well be perfectly valid. We can all learn by appreciating the bounds of our own rationality. This section has shown how theories of rationality challenge the assumptions of the optimisation rules of neoclassical economics theory. The next section explores the experimental work of cognitive psychologists, which also challenges the utility models which underly much of the traditional capital budgeting theory.

2.2.2 Prospect theory

An advance in the theory of decision making was made by Tversky and Kahneman, which recognised the heuristics and biases that decision makers use when choices are made under conditions of uncertainty (Kahneman and Tversky, 1979; Tversky and Kahneman, 1974). They found that people have the tendency to simplify a complex problem and apply a rule of thumb rather than attempting a sophisticated mathematical programming type of solution. In their early research (Tversky and Kahneman, 1974) the subjective assessment of probabilities was explored by asking people to make a series of judgements.

This revealed three heuristics which were employed in making judgements under uncertainty. The first was *representativeness*, which was used to classify objects or events in terms of a set of characteristics familiar to the research subject. For example, research subjects held stereotypical views of the type of person who would (in their experience) have a particular role, which they then used as a reference point.

When asked to identify the most likely job role that someone described to them might hold, they sought to match these characteristics in preference to using the quantitative data on how many farmers or librarians there were, to compute a probability. So the probability that the person described fitted a particular class was ignored in favour of qualitative data which matched the stereotype.

The second heuristic was *availability* of experience as a reference point. For example, the number of people known by the research subject to have suffered a heart attack influenced their judgement more than the quantitative data given, when asked to assess the likelihood of such an event occurring.

This also covered the ease of access to information, where research subjects were found to search their memory based on the first rather than third letter of a word. The third heuristic was *adjustment and anchoring*, where people made estimates by reference to an initial value (the anchor), plus or minus an adjustment, to reflect new information. The adjustment was often found to be insufficient, which was explained as partly due to a reluctance to move away from the base value. Such problems of calibration could be influenced by the process of elicitation of the estimate, or the motivational effect of rewarding correct answers or penalising incorrect answers.

Together with further similar research and a re-analysis of the work of others, these findings destroyed the descriptive capability of subjective expected utility (SEU) theory, by violating the axiom of economic rational choice. An alternative *prospect theory* emerged from Tversky and Kahneman's observations (Kahneman and Tversky, 1979).

They defined a prospect as a gamble or choice between risky alternatives. In SEU theory, the utilities of outcomes are weighted by their probabilities. So the value of option A, where the outcome would either be a win of a sum of 1,000 or nothing with equal probabilities, would be 500 (50% x 1,000 plus 50% x 0). When research subjects were asked to choose between this risky alternative or option B with a sum of 450 assured, SEU would point to option A as the rational choice (with the expected value of 500 exceeding 450), and option B as the risk averse choice.

Tversky and Kahneman set out to show up the three main tenets of SEU theory as problematic by analysing a series of effects. The first, the *certainty effect* shows that people over-emphasise certain outcomes in making choices where expected values are similar. However, where the possible gain is high enough, even where the probability is low, many people are willing to take a gamble if the stake is low. A good example in everyday life in the 1990s is the purchase (for a small sum) of a lottery ticket, where the chance of winning is minuscule, but the possible gain is of such magnitude, that it tempts people into risk seeking behaviour.

Another example of apparently irrational behaviour is the purchase of loss insurance, where the cost of premiums is far greater than the expected actuarial costs, when the risk statistics are computed. This risk averse behaviour is noticeable where losses rather than gains are concerned, which is labelled the *reflection* effect. Neither would be predicted by the SEU theory, and shows up its weakness in failing to capture common attitudes to risk.

In multiple stage problems, where a decision tree might be used to represent the outcomes, where ultimate outcomes are contingent upon the outcome of a prior event, the difference between SEU theory and observed phenomena was marked. Tversky and Khaneman labelled this the *isolation* effect. Together these three empirical effects identified the lack of applicability of the normative SEU theory in practice, which led them to develop their alternative descriptive theory.

Kahneman and Tversky made the significant claim that their *prospect theory* is compatible with the way the human mind works. From their trials they observed that we have a tendency to evaluate conditions in relation to our experience, using a reference point or anchor, and make adjustments from that point. Examples given include our reactions to brightness and loudness, which we evaluate by comparison with the brightness and volume perceived from our range of past experiences and adaptation from our own norm (Kahneman and Tversky, 1979, p277).

In prospect theory, weights are used to infer preferences, but they are not the same as probabilities, rather they are the respondents reactions to stated probabilities. These "decision weights measure the impact of events on the desirability of prospects, and not merely the perceived likelihood of these events" (Kahneman and Tversky, 1979, p280). In many ways prospect theory could be viewed as an extension or improvement to SEU theory, adding a weighting scheme to the probabilities, rather than as a radically different alternative. If one takes the view that prospect theory turned what was a normative theory which was not reflected in practice, into a descriptive theory, then it could be seen as bridging a theory practice gap. However, that is not how the authors saw it, in their later work on prospect theory In a later paper they clearly stated that "no theory of choice can be both normatively adequate and descriptively accurate" (Tversky and Kahneman, 1986, pS251).

After reviewing the failures of the normative rules to apply in practice, and the phases of framing and editing and of evaluation in prospect theory, they concluded that future research should treat the development of normative and descriptive theories as separate endeavours. They continued to conduct experimental studies to build upon their descriptive model. One of the important findings of the 1986 paper was the impact which the framing of prospects (definition and description of the opportunities) had on the evaluation phase and therefore ultimate choice. Over a number of studies they found that decision makers placed more emphasis on the initial information about the choice (primacy), or on the most recent information (recency), rather than taking a balanced view of all the data.

The effects of *primacy* and *recency* in the human processing of information made an important contribution, which added to Simon's conclusion that the search for and use of information was important.

Other researchers made valuable additions to prospect theory and the heuristics and bias observed in decision making. Samuelson and Zeckhauser introduced the term *status quo bias* to describe the phenomenon of using the status quo or 'do nothing' option as a reference point or anchor in decision analysis (Samuelson and Zeckhauser, 1988). This was explored further by Tversky and Kahneman in their study on reference dependence (Tversky and Kahneman, 1991), but as this focused on consumer choice, it added little to our knowledge of SIDs.

The main criticism of this style of research, using an experimental approach, is the problem of how to simulate and control for the many complexities of the real decision environment. The other weakness in terms of its relevance in business, is the focus on the individual, where decision-making in an organisational setting involves groups and hierarchical decision-making systems.

The main contribution made by Tversky and Kahneman towards the understanding of the behavioural aspects of decision-making, and how people evaluate risk and uncertainty, was the role of bias and heuristics and the importance of information and the framing of decisions. Contributions from other behaviourists, broadly classified as 'constructive', are grouped together in the next section.

2.2.3 A constructive approach to decision making

There have been several literature reviews undertaken over the years which deal with decision making from a behavioural perspective, mostly published in psychology journals, and mostly relating to human decision making generally. One which related more to business and accounting evaluated and summarised the behavioural models of risk taking in business decisions in the 1970s (Libby and Fishburn, 1977).

Libby and Fishburn distinguish between parametric models and expected utility models (e.g. SEU theory), and focus on the former market based mean-variance models e.g. portfolio theory (Markowitz, 1959) and the capital asset pricing model (Lintner, 1965; Sharpe, 1964). At that time there was little in the way of descriptive theory in the business literature, and most behavioural research followed an experimental design rather than a naturalistic enquiry. They reviewed the behavioural research and highlighted the need for more.

> "A better understanding of how managers actually evaluate risky alternatives may lead to the development of techniques that help decision makers better achieve their goals." (Libby and Fishburn, 1977, p273)

The observed behaviour of individuals revealed idiosyncratic attitudes to risk which did not accord with established models, but gave some indication of what influenced managers' risk preferences. Slovic, for example found that a manager's training and prior experience of risk-taking situations was more important than personal characteristics in explaining these differences (Slovic, 1972). This was also important in terms of group decision making, where a group of managers may have been recruited and trained such that they had developed group norms which might lead to a consensus view on risk taking.

Susan Streufert analysed the effects of changes in the information environment on complex decisions by varying the information load given to decision takers and the proportion of that load deemed relevant (Streufert, 1973). Using a simulation and testing the decisions reached by a group of undergraduate students, she tentatively suggested that complex decision making varied with information relevance.

She also suggested that simple decision making varied with information load. This study may have limited value in explaining the behaviour of decision makers in real business situations, but it supports the view that the framing of decisions and presentation of information is important, and suggests that relevance or quality becomes more important than quantity the more complex the decision.

Moon revealed four practical difficulties inherent in the use of models in managerial decision making, which he illustrated by posing four problems and discussing the common weaknesses in applying human judgement to them (Moon, 1988). They were input or calculation errors, use of the wrong model, lack of understanding of the model selected, or misunderstanding the results of its application. His conclusions support the belief that probability and chance are commonly misunderstood (see earlier discussion of Tversky and Kahneman, 1986).

March and Shapira carried out an interview based survey in the US and Israel on managerial perspectives on risk and compared their results with a larger study (US and Canada) published in the previous year (March and Shapira, 1987). They found that managers viewed 'downside' variation as risk more than 'upside', and attached greater importance to the magnitude of the downside outcome than to its probability.

These findings concurred with Tversky and Kahneman's in terms of the loss aversion observed. Managers viewed risk as a multidimensional phenomenon, but 42% of executives interviewed in the Shapira study felt that "there was no way to translate" it "into one number" (March and Shapira, 1987, p1408). They also found a positive attitude to risk in that "risk taking is valued, treated as essential to innovation and success. At the same time, however, risk taking is differentiated from ... gambling" (p1413).

March and Shapira discovered an element of what they described as 'management conceit' about the way their respondents thought that good managers could take considered risks and somehow 'control fate', showing more successful than unsuccessful outcomes.

Payne, Bettman and Johnson made a helpful contribution to the understanding of decision theory with their review of the behavioural literature from 1983 to 1991. Whilst it was largely written by psychologists for psychologists, it also recognised the contributions from economics, statistics and other fields.

As a subdiscipline of psychology, they position behavioural decision research (Payne et al., 1992, p89) as almost unique:

> "because it often proceeds by testing the descriptive adequacy of normative theories of judgment and choice; in doing so, it makes substantial use of psychological concepts in general, and cognitive mechanisms in particular."

They relate the literature to the constructive nature of human preferences and beliefs and the contingent nature of decision-making. They discuss the work of Tversky and Kahneman (cited earlier) quite extensively and the problem of intuitive *vs.* statistical or analytical reasoning. It is suggested that most decision takers make use of both intuitive (fast human data processing which occurs largely in the subconscious mind) and analytical (slower thought processing, which occurs as a conscious process), though fast computerised analysis can aid the latter.

Payne et. al. suggest that decision makers may use their perceptual apparatus for noticing the characteristics of the alternative opportunities, and the analytical frameworks such as cost benefit analysis to decide how to exploit those opportunities. Thus integrating intuitive and analytical approaches (Payne et al., 1992, p116). They go on to consider applications of the research findings reviewed.

Information processing limitations may be overcome by changing the information environment. One example where this is widely known to have affected decision making is the provision of additional information to shoppers in supermarkets to support the buying decision. Earlier research is cited by Payne et.al., but the more recent changes observable are the unit price information (now displayed in addition to pack prices across the product ranges) and nutritional information on packaged foodstuffs so that price or diet sensitive decisions may be made. Another example now familiar to those people who reside in geographic areas where the levels of radon gas are high[1], is the publicity material circulated to encourage people to decide to take risk mitigation action (Smith et al., 1995).

[1] High levels of radon gas can be potentially harmful to people living or working in poorly ventilated properties, where the incidence of cancer has been greater than that for the general population. Publicity material explaining the risks involved, promoting free radon tests and offering guidance on mitigation actions has been distributed in these high risk areas, which includes Northamptonshire in the UK.

The possible consequences of the 'do nothing' option are stressed, with information on the added risk of cancer has been shown to be effective. This obviously supports earlier work on the framing of decisions (Tversky and Kahneman, 1986).

Payne et. al. suggest two approaches to changing the information environment, one reactive and one pro-active. The former approach is to determine how decision makers currently process information and make that processing easier (e.g. by reformatting information in a more user-friendly way). One could argue that the supermarket pricing information would fall into this category, though Payne et. al. classified earlier work in this area as more pro-active as it encouraged specific brand selection.

The more pro-active approach is to determine types of processing one seeks to encourage and design information to facilitate desired behaviour. The radon risk information would fall into this category, in the interests of national health policy. Another application is the provision of decision analysis techniques to help people to break down and solve complex decisions, for example contingency tables or matrices. Sensitivity analysis is an example given of a method "for eliciting the beliefs and values necessary to operationalize decision models" (Payne et al., 1992, p119).

Various ways of combining clinical or human judgement (data processing performed in the mind) with analytical models (e.g. actuarial computations, based on probabilities) are considered. The arguments for using more actuarial than clinical judgement in decision making cited by Payne et. al. were from work undertaken in the context of psychiatric consulting (Dawes et al., 1989), so have limited relevance to SIDs in business.

Payne et. al. conclude that the role of information and its processing is crucial in decision making and that task complexity and the measurement of values are also important. They clearly believe that cognitive psychology has a very important part to play in furthering decision theory, and seem unperturbed by the dominance of research using 'laboratory experiments' and the scarcity of research carried out in naturalistic settings.

Their final comment was that "Behavioral decision research continues to reflect a rich interplay between basic and applied disciplines and between descriptive and prescriptive concerns." (Payne et al., 1992, p123). Their review served to highlight the role of intuition, and the information environment, as generic themes.

Holloman discussed the behavioural aspects of decision making and characterised three domains (Holloman, 1992). The domain of the 'head' was characterised as an analytical process, based on prescriptive theory to solve structured problems where alternatives were known. The domain of the 'heart' was characterised as a highly personalised process, reflected in descriptive theory, to solve nonstructured problems. The third domain, of 'head and heart' was characterised as an intuitive, experience based process, following a heuristic model, to solve partly structured problems. Simon's three models of man (Simon, 1957) were fitted to the domains as 'economic man' (head), 'social man' (heart) and 'administrative man' (head and heart).

He presented arguments as to how each could be perceived as rational, though he also gave counter arguments as to why the economists may call them rational, irrational and nonrational, respectively. He went on to argue the case for intuition and for personalised decisions, with more strength in the former, before concluding that for many reasons, especially the time pressure, volume of decisions and their relative significance, most decisions take place in the 'head and heart' domain, using a combination of analysis and judgement. His argument is difficult to refute.

Linking this back to the case studies in section 2.1.4, Butler et. al. suggested weightings based on the cases they studied. Their research showed the extent to which judgement influenced SIDs as 34% (Butler et al., 1993, p187). However, having identified the importance of human judgement in their sample of SIDs, they did not attempt to link their observations to the relevant behavioural theory. Smith and Murray made a link with behavioural decision research, albeit rather tenuously, in their case study analysis (Smith and Murray, 1997). Their 'coping mechanisms' suggested ways in which judgement is exercised in dealing with risk in decisions, offering an insight into the information environments that existed in their cases.

Hirst and Baxter sought to investigate the descriptive validity of theoretical models of choice and the role of information in the choice process (Hirst and Baxter, 1993). They identified four models of choice and three roles of information, but were unable to find a close enough fit to any one model or role when they analysed a single decision in a single case study, having carried out a detailed investigation. This study highlighted the failure of researchers to discover a descriptive decision theory which is sufficiently robust to stand up to testing, and raises the question as to whether the pursuit of such a theory is analogous to searching for the holy grail.

Another case based study which investigated the role of information in strategic decisions found that fast decision makers use more rather than less information than slow decision makers (Eisenhardt, 1989). This seemed counter-intuitive, but accelerated cognitive processing using efficient problem-solving strategies and maximum information available (within time constraints) led to fast decisions being made without loss of performance. The study was undertaken in the context of the microcomputer industry, described as a 'high-velocity environment', which seemed to have influenced the firms to develop more advanced information systems to support managerial decision making.

The sheer volume of decisions that these executives were faced with allowed them to learn from feedback from past decisions more quickly, and increased their confidence to make fast decisions in the future. One might argue that this strengthened their ability to use Holloman's 'head and heart' domain, as they were able to benefit from more experience in a shorter amount of time and sharpen their intuitive capabilities.

During the 1990s there has been a "burgeoning interest in intuition as a basis for decision making and problem solving in organizations" (Allinson and Hayes, 1996, p119), which was defended very recently by Hunt, though he also labels it fashionable (Hunt, 1998). Whilst intuition or insight may be difficult for people to describe to others (Hunt, 1998), it may be possible to draw it out using cognitive methods of elicitation (Eden and Jones, 1984).

2.2.4 Personal construct theory

The role that human judgement, and in particular cognition, plays in decision making has been highlighted in the previous section. This implies that knowledge about how people make sense of their world and think about the problems they experience is important in understanding how decisions are made. It is in this context that the review of behavioural models of decision making leads one to explore the basic theory of how people construe the world around them. Just as modern financial theory is underpinned by economic rationality, organisational theory and human behaviour is underpinned by construct theory.

George Kelly's personal construct theory laid the foundations for understanding how people make sense of the world, and the experiences they encounter (Kelly, 1955). The basis for personal construct theory (PCT) is the proposition that people make sense of what they encounter by making comparisons with what we already know, noting similarities and differences. That this comparison takes place in the subconscious mind more than in the conscious mind makes the study of this cognitive phenomenon rather challenging.

To simplify this complex theory, each construct is viewed as a bipolar axis which acts as a reference point for human cognition. For example, when we open our eyes we may view the brightness of the day in terms of the extremes of bright and dull days previously experienced. So when we say it is a dull day, we are comparing it with our reference axis and saying it is not very bright. Kelly labelled the limitation of the portfolio of a person's constructs the *range corollary.*

PCT is based on the belief that each person has a unique range or portfolio of constructs, which Kelly called the *individuality corollary*. However, two or more people may construe something in a similar way, especially if they have shared experiences, which make their thought processes psychologically similar. Kelly's term for this was the *commonality corollary.* This is relevant where we are examining group behaviour and organisation decision making, as is the *sociality corollary* where one person "construes the construction processes of another" (Kelly, 1955).

Sociality is not the same as sharing the same construction (commonality), merely understanding how someone else is thinking. The *organisation corollary* deals with a person's system for sorting out the relationship between constructs, like a sort of mental signposting system. Kelly assumed this to be a hierarchical structure, rather like a library classification system. He assumed this to work at multiple levels, such that when we think of brightness for example, we may link this and temperature to sunshine, as part of weather. We may say that the weather is good today, it is sunny and bright. This forms a logical pattern, which Kelly identified after a considerable period of testing his theory with clinical diagnosis.

Other links between constructs have been proposed, including *constellatory constructs* where constructs are grouped thematically, rather like a thesaurus. A summary of the assumptive structure of Kelly's personal construct theory comprising the fundamental postulate and its eleven corollaries is reproduced in appendix 1.

Many experiences and thoughts follow a pattern, and whilst each experience is unique, as time moves on, we understand the here and now by relating it to past experiences and drawing comparisons, according to PCT. We may therefore recognise whole sets of constructs as applicable to a particular case. In understanding investment decisions, PCT would suggest that we make mental comparisons with past investment decisions, using the same basic set of constructs. As these comparisons are often made subconsciously, we may not be sufficiently aware of the thought process to verbalise them, without prompting. This is the role of methods of elicitation such as repertory grid techniques (RGT) and cognitive mapping.

The literature searching undertaken for this thesis only revealed one study on the topic of investment which used PCT (Hunter and Coggin, 1988), but none on the specific area of project risk. This is surprising, when much of the behavioural theory of decision making is based on cognitive psychology. However, it is unsurprising when one considers the tradition of a scientific experimental approach to research, noted by Payne et. al. (cited previously). Examples of RGT being used were found in the related areas of Marketing and Strategy (Ginsberg, 1989; Hayes and Allinson, 1994).

2.2.5 Group processes and consensus

Whilst it is important to understand how individuals process information and think about risk in decision making, the framing, appraisal and choice in SIDs in large organisations involve group processes. The effectiveness of those group processes has been investigated from a variety of perspectives. Jay Hall, an American social psychologist, observed "Group decisions often are frustrating and inadequate. All members want agreement, but they also want to make their own points heard" (Hall, 1971, p51). Despite the obvious problems of a group of people reaching consensus, Hall argues that "there can be great strength in group problem-solving".

In his experimental research with college students, Hall found that synergy in groups, which improved their decision making performance, came not from the length of time the group had been established, but from those who had received formal group effectiveness training. However, his earlier study with natural groups of business managers revealed better performance when they worked in established groups than in ad-hoc groups, when there was no control for training. This suggests that established groups of business managers may have developed their group effectiveness without necessarily receiving the formal training which college students needed.

Hall noted the difference in the way that more established groups of managers handled conflict. He found that groups which had higher levels of initial conflict out-performed those with less initial conflict of opinions. This led him to conclude that "A wide variety of opinions is beneficial to an established group, but disruptive to an ad-hoc group" (Hall, 1971, p52). Hall developed a set of group decision instructions designed to help groups reach consensus. It began with the following definition of consensus:

> "Consensus is a decision process for making full use of available resources and for resolving conflicts creatively. Consensus is difficult to reach, so not every ranking will meet with everyone's *complete* approval. Complete unanimity is not the goal - it is rarely achieved. But each individual should be able to accept the group rankings on the basis of logic and feasibility. When all group members feel this way, you have reached consensus as defined here, and the judgement may be entered as a group decision." (Hall, 1971, p54)

The rules which followed have been used by other researchers as a basis for instructions issued to participants (see for example Schweiger et al., 1986). Hall presented convincing evidence to support his conclusion that "when they follow a few brief instructions, decision-making groups can be expected to do better than even their best members" (Hall, 1971, p88). He suggested that ineffective groups might not only have imperfect ways of dealing with conflict, but may also be pessimistic about their own potential.

Having considered Hall's work on the source of strength in group decision making, it was also around 1971 that Janis was analysing the weaknesses for the first edition of his work on 'groupthink', which was later revised and enlarged (Janis, 1982). He was also an American psychologist, but his 'research subjects' were politicians, and his 'case studies' were US government fiascos such as Pearl Harbour and the Vietnam war. It was from post hoc analysis of published information on these political fiascos that Janis identified the phenomenon of *groupthink*. He described the central theme of his groupthink hypothesis and analysis as:

> "The more amiability and esprit de corps among the members of a policy-making-in-group, the greater is the danger that independent critical thinking will be replaced by groupthink, which is likely to result in irrational and dehumanizing actions directed against out-groups" (Janis, 1982, p13)

The term 'in-group', used by Janis in a political context, might apply to the management groups internal to a business organisation, and his 'out-groups' to those external groups, possibly characterised as the enemy, such as competitors. He qualifies his groupthink theory by stating "I do not mean to imply that all cohesive groups suffer from groupthink, though all may display its symptoms from time to time." (Janis, 1982, p12). The applicability of Janis' theory outside the context of government and the 'US war machine' is questionable. In a business context, the assumptions Janis makes may conflict with systems of managerial control. However, the symptoms are worth considering, if only to rule them out in the organisational setting for this study. The symptoms of group think are set out on the next page:

Type I: Overestimation of the group–its power and morality
1. An illusion of invulnerability, shared by most or all the members, which creates excessive optimism and encourages taking extreme risks
2. An unquestioned belief in the group's inherent morality, inclining the members to ignore the ethical or moral consequences of their decisions
Type II: Closed-mindedness
3. Collective efforts to rationalize in order to discount warnings or other information that might lead the members to reconsider their assumptions before they recommit themselves to their past policy decisions
4. Stereotyped views of enemy leaders as too evil to warrant genuine attempts to negotiate, or as too weak and stupid to counter whatever risky attempts are made to defeat their purposes
Type III: Pressures toward uniformity
5. Self-censorship of deviations from the apparent group consensus, reflecting each member's inclination to minimize to himself the importance of his doubts and counterarguments
6. A shared illusion of unanimity concerning judgments conforming to the majority view (partly resulting from self-censorship of deviations, augmented by the false assumption that silence means consent)
7. Direct pressure on any member who expresses strong arguments against any of the group's stereotypes, illusions, or commitments, making clear that this type of dissent is contrary to what is expected of all loyal members
8. The emergence of self-appointed mindguards–members who protect the group from adverse information that might shatter their shared complacency about the effectiveness and morality of their decisions

Source: Janis (1982), p174-175

Janis set out three antecedent conditions for groupthink, in addition to group cohesiveness. These were 'insulation of the policy-making group' which could limit the group's self-critical capabilities, 'lack of a tradition of impartial leadership' which could allow the leader to exploit his or her power position, and 'the lack of norms requiring methodological procedures for dealing with the decision-making tasks'.

One might view these as unlikely conditions to find in today's large commercial organisations, where management control is effective. However, Janis draws on his earlier research on decision making, which included industrial as well as government bodies, to suggest that where a group displays most of the above symptoms of groupthink, they are likely also to display symptoms of defective decision making. These are listed (Janis, 1982, p175) as:

1. Incomplete survey of alternatives
2. Incomplete survey of objectives
3. Failure to examine risks of preferred choice
4. Failure to reappraise initially rejected alternatives
5. Poor information search
6. Selective bias in processing information at hand
7. Failure to work out contingency plans

These symptoms certainly seem more generalisable than the groupthink symptoms, beyond a political context. The groupthink categories of closed-mindedness and pressures toward uniformity may well be symptomatic of group problems in a business context, though they may be manifested in different ways.

One of the important characteristics of the type of decisions on which Janis tested his groupthink hypothesis was their 'one-off' nature, where learning from past similar decisions was limited. The point upon which both Hall and Janis clearly agreed was the positive effect that an acceptance of conflicting views and the open-ness of argument could have on the performance of the group. The other point upon which they appear to agree is the positive effect of having group members who understand group dynamics, whether by formal training or not.

Schweiger, Sandberg and Ragan studied group approaches in strategic decision making, comparing the consensus approach (based on Hall) with two alternatives (Schweiger et al., 1986). They concluded from a laboratory experiment with MBA students, that dialectical inquiry and devil's advocacy approaches were superior to consensus-seeking, and that some conflict in a decision-making group was healthy.

The limitations recognised by Schweiger et. al. included the normal issue in laboratory experiments of using a group of students as a proxy for 'real-life strategic decision makers'. They also recognised that normal decisions would take place over a longer period of time, with participants sourcing some of their own information.

What they did not recognise was the fact that many business decisions involve more than one group. In particular SIDs may go through group processes at three or four levels in a divisionalised organisation, where the conclusions of the originating group are then questioned as the proposal progresses up the management hierarchy. This 'impetus' was identified by Bower (1971 first edition of Bower, 1986) well before Schweiger's study, yet this structural issue is rarely mentioned in the 'experimental' literature.

Over the last ten to fifteen years there has been a growing body of research designed to increase the effectiveness of group decision making in business, emanating from the information systems field. As information processing plays a large part in SIDs, it follows that computer technology should have been harnessed to systematise this processing. Much of the theory of decision support systems built up when manual systems were more prevalent is still pertinent. One of the pioneers of group decision support systems (GDSS) theory recognised the value of both manual and computer systems was George Huber.

He set out the objective "the purpose of group decision support systems is to increase the effectiveness of decision groups by facilitating the interactive sharing and use of information among group members". He also made the point that this increased effectiveness may be achieved by using a GDSS "in conjunction with proven group management techniques" (Huber, 1984, p196). Huber saw the increasing complexity of the decision environment and the reluctance of managers to spend more time in meetings instead of in other managerial activities, as the two driving forces behind GDSS development. In the early days of development there was a clear role for a GDSS facilitator, an "expert on when and how the GDSS technology can be drawn upon to facilitate the group's endeavor" (Huber, 1984, p198).

He argued for 'real time' systems, where group members could see the effect of their various opinions on relevant assumptions, such that differences of opinion could be resolved within the group meeting, leading to better consensus. This was argued strongly in the case of numeric information, such as cash flow forecasts, where 'what-if' analysis might be carried out during a group meeting. The facts that "meetings are extremely verbal environments" and that "thoughts are primarily shared and modified, not numbers" (p201) create demands of GDSSs to cope with textual information. The helpfulness of visual representations of problems, such as decision trees, creates further demands, for which computer-based GDSSs may be designed.

Watson, DeSanctis and Poole built on the work of Huber and others in their experimental research, in analysing the impact of GDSSs on group consensus building (Watson et al., 1988). They found that consensus improved with use of either computer or manual support systems, when results varied significantly from those of a control group with no GDSS. They measured pre and post meeting consensus, for groups with one of three levels of support (computer based GDSS, a paper and pencil equivalent, or no support system) so that they could analyse the effect of levels of support on post meeting consensus.

The problem with this type of research is how to control for (or keep constant) other possible variables, thereby ruling out alternative explanations for variations in consensus. For example, the difference between pre and post meeting consensus could be down to the dominance of one group member in the discussion and influence over the process, causing other members to change their views.

Whilst their experiment involved 82 small groups of students, they made the point that "many of the students were employed full-time in business settings, and most were working at least part-time" (Watson et al., 1988, p467), so had sufficient business experience to bring some reality to the exercise. They assessed participants' reflections on the problem solving exercise by using a post meeting questionnaire, and carried out mainly quantitative, but some qualitative analysis.

They found that use of the GDSS 'tended to reduce face-to-face interpersonal communication', presented the group with more of a challenge in managing the meeting, and led to a more procedure-oriented discussion, but contributed positively to post meeting consensus.

There is still some variation in opinion on the value of consensus building as an approach to decision making. Eisenhardt gave an example of one corporate executive's opinion "We found that operating by consensus essentially gave everyone veto power..... Nothing ever got accomplished" (Eisenhardt, 1989, p563). What was not clear was what that particular company Vice President understood by 'operating by consensus' and what other possible causes for the fact that in his view 'nothing got accomplished' may have been ruled out. Eisenhardt found that conflict resolution was more problematic in teams who worked more slowly, and that both the degree of consensus and the quality of decisions were better where the speed of decision making was greater.

John Adair presents a more positive view of consensus in his book on management decision making, which explores styles of thinking and problem solving (Adair, 1985). He makes the point, like Hall, that complete unanimity is not a feasible objective in group decision making, but that consensus does not mean the same as unanimity. Adair defines consensus as:

> "When the feasible courses of action have been debated thoroughly by the group and everyone is prepared to accept that in the circumstances one particular solution is the best way forward, even though it might not be *every* person's preferred solution." (Adair, 1985, p157)

This indicates that members of the management team have accepted that a particular course of action be chosen as the best, in the circumstances. The 'circumstances' would include explicitly their evaluation of the feasible alternatives, and implicitly their own goals or criteria upon which the alternatives were evaluated. It could be argued that consensus seeking approaches used in group decision processes may give rise to better goal congruence than alternative approaches.

A study which explored this notion in the context of capital budgeting decisions in a large divisionalised firm in Canada found some interesting results (Zanibbi and Pike, 1996). An experiment was designed to test the goal congruence in investment decision making displayed by managers at different levels and explain their behaviour. Seventy eight managers in a natural resource company were drawn from three levels in the organisation, senior, divisional and departmental to participate in the experiment.

The managers were all actively involved in capital budgeting, with 78% from an engineering or technical background and 15% from an accounting or financial background. Their task was to prioritise 7 project attributes presented in their usual order in proposal papers and to appraise 18 constructed cases. Data was analysed using pairwise correlation to measure judgement consensus. Results showed higher levels of consensus among lower level managers, and especially among the 7% with no engineering/technical or finance/accounting background.

Of the seven attributes, the IRR was judged to be the most important, using discriminant analysis. Whilst the statistical analysis revealed some interesting results, which concurs with other research in terms of managers' preference for IRR as a project criteria. It is not necessarily counter-intuitive (as the authors suggest) that consensus should be greater at the operating level, where project opportunities are often originated and informally screened and the detail of projects is more often discussed. With only five of the seventy eight managers from backgrounds other than the professional areas of engineering or accounting, the conclusion on educational background is quite weak, but again appears to be supported by the background literature.

The political and other contextual aspects of capital budgeting were recognised by Zanibbi and Pike, though not fully discussed (Zanibbi and Pike, 1996). Aspects of behaviour congruence which were not hypothesised or tested, but which were inferred, albeit inconclusively, included the possible explanation for low levels of consensus at top management level.

2.3 Summary and Conclusions

Sections 2.1.1 and 2.1.2 identified the *techniques* prescribed by the normative theory of Corporate Finance for the financial appraisal of strategic investment opportunities and the analysis of the risk involved. The 'prescription' of the net present value rule (Hirshleifer, 1958; Tobin, 1958) and the use of simulation in modelling the cash flow (Hertz, 1964), measures the monetary outcomes expected to flow from the project compared with the corporate financial objective of shareholder wealth maximisation. This follows the optimisation principles of economics, and provides a means for managers to take strategic investment decisions which are economically rational. However, the focus on financial output measures ignores three key problems. Firstly the problem of collecting and validating the inputs to the model e.g. base assumptions about costs, volumes and productivity.

Secondly the problem of evaluating the non-monetary aspects, both in terms of the costs and benefits to the organisation, and in terms of the attitudes and feelings of the decision-makers. Third, but equally important, is the problem of isolating the decision point. The NPV rule makes an assumption about the start of the project (time = 0) and ignores the planning phase, from identification of the idea or strategic option, through project definition and negotiation, to the decision point. As such, it is a static model, which fails to reflect the dynamic nature of business, and the human tendency to form early judgements, however subjective, on the desirability of a project.

These problems emerged in a variety of forms in the field studies reviewed in section 2.1.4, and partially explain why the surveys reviewed in section 2.1.3 found such a low level of usage of the prescribed theoretical techniques. Comparing the surveys of capital budgeting practice in the UK in the 1980s with the economic theory of net present value, the low level of usage of NPV compared with theoretically inferior methods such as payback, led to concerns being expressed by some academics about a theory practice gap.

The gap could be viewed as existing due to a problem with the theory, ignoring the strategic planning *process,* or being viewed from the constraints of an inappropriate paradigm, which ignores managerial *behaviour* (Dempsey, 1997; King, 1975). The gap could be viewed as a failing of practice, in misunderstanding, ignoring or incorrectly applying the *techniques* (Eynon, 1988; Kaplan and Atkinson, 1998, p594; McLaney, 1997, p92; Woods et al., 1984).

Others have been more critical of the method used to discover the practice in the 1980s, by surveys rather than case studies (Northcott, 1998; Scapens, 1990). Pike has argued that the gap no longer exists, even if it did in the 1980s, as his later surveys reveal a far greater usage of DCF analysis and sophisticated risk analysis techniques by large companies in the UK. He suggests that it may only have been a timing gap for theory to become accepted by practitioners (Pike, 1996).

Tyrrall suggests that more companies may be using DCF simply because accountants have been trained to do so, and that organisations may adopt practices just because society expects them to (Tyrrall, 1998). If the gap were merely to be viewed in terms of the usage of DCF analysis, then these arguments may be supported. However, if one views the gap in terms of how appraisal *techniques* are applied and what is actually driving SIDs, it may be argued that the gap does in fact still exist. The view taken here is that the existence of a theory practice gap depends on the identification and interpretation of theory.

Pike's view is seen as too simplistic, as it relies on practitioners answering questions about what techniques are used, rather than how they are used or what actually drives decisions. There are descriptive theories which are practice based, but may contradict normative theory, for example the political *processes* identified by Bower from his case analysis, which suggested *behaviour* whereby decisions were made before any DCF analysis was carried out (Bower, 1986). If a gap exists, it is suggested that it is more of a theory theory gap. Since researchers select which theory they will investigate and how they will view it, the gap may therefore lie in the minds of the researchers.

Key themes which emerged from the detailed studies of practice (sections 2.1.3 to 2.1.6), which dealt with *process* issues, included the length of time a project took in the formulation and development stages of the resource allocation process (referred to as 'definition' and 'impetus' by Bower). Bower found an average of 2 years in the case of strategic investments in divisionalised organisations (Bower, 1986). He also identified the importance of sub-processes, such as the political interactions involved in gaining sponsorship for a project in order to move it onwards and upwards through the levels of approval in a hierarchical structure.

With respect to *techniques*, the key themes included the use of multiple techniques for appraisal and risk analysis (Butler et al., 1993; Drury and Tayles, 1996; Ho and Pike, 1991; Pike, 1996), and the use of industry based experience and rules of thumb as simple informal techniques (Carr et al., 1994; Collier and Gregory, 1995; Smith and Murray, 1997). There was also a preference for strategic analysis over financial analysis by many managers (Butler et al., 1993; Grundy and Johnson, 1993; Morone and Paulson, 1991). Several studies highlighted the importance of the type of project (Bower, 1986; Mills and Herbert, 1987; Piper, 1988), and some focused on particular types, for example R&D and advanced manufacturing technology (Eisenhardt, 1989; Nixon, 1995).

Section 2.1.6 focused on the location of investment appraisal within the strategic planning process, presented in figure 2.2. This showed three possible decision points (steps 3, 5 and 6) where executive judgement might be used. This highlighted the need to consider the behavioural aspects of decision-making in this study. Section 2.2.1 introduced models of rationality, which attempt to explain why managers may not always act as rational 'economic man', but may be driven by self-interest and internal reward systems to behave as 'political man', or may operate in a bureaucratic way as 'administrative man' (Simon, 1957). The logical extension of this theory in a strategic investment appraisal process, identified the need to examine the information both explicitly available to managers (through information systems) and the cognitive information managers draw upon when faced with choices (Cooper, 1975; Hargreaves-Heap et al., 1992; Simon, 1978; Simon, 1979).

The use of human information processing by managers faced with choices about projects with uncertain outcomes was explored in sections 2.2.2 to 2.2.4, with key contributions from cognitive psychology. First, section 2.2.2 reviewed the significant contributions of Tversky and Kahneman, which identified the heuristics and bias applied in decision-making, and developed what they called 'prospect theory' (Kahneman and Tversky, 1979; Tversky and Kahneman, 1974; Tversky and Kahneman, 1986). The framing of a project and the decision-makers' prior knowledge and experience were seen to have a significant effect on how projects were judged.

Section 2.2.3 reviewed other contributions to decision-making from a constructivist standpoint, which followed some themes already identified, such as aversions to loss which lead to a greater emphasis on 'downside risk' than upside (March and Shapira, 1987), information relevance and framing of prospects (Payne et al., 1992; Streufert, 1973), and intuitive versus analytical approaches (Holloman, 1992; Payne et al., 1992). The role of education and training was brought out, especially in relation to managers' understanding of analytical models (Moon, 1988; Slovic, 1972).

From the experimental research of psychologists in the 1970s (Libby and Fishburn, 1977) and 1983-91 (Payne et al., 1992), specific aspects of human information processing and intuition were explored. However, to understand the working of the human mind sufficiently to utilise a cognitive tool in field-based research, it was necessary to go back to the key work of George Kelly (Kelly, 1955), which influenced many researchers in clinical psychology, and more recently in the investment field (Hunter and Coggin, 1988). Section 2.2.4 reviews Kelly's construct theory, and its potential in explaining managers' construction of risk.

Finally, section 2.2.5 identified some potential weaknesses in group decisions and consensus (Adair, 1985; Hall, 1971; Janis, 1982), and their applicability in strategic management (Schweiger et al., 1986; Watson et al., 1988). Further contributions to group processes, such as decision support systems (Huber, 1980; Huber, 1984) added to the behavioural aspects, such as group dynamics, pressures and goal congruence (Janis, 1982; Zanibbi and Pike, 1996).

The main conclusions drawn from the literature are as follows. The theoretical definition of risk is where possible outcomes are known and the probability of those outcomes can be estimated. Risk analysis *techniques* therefore focus on the *effect* of risk. Managers do not think of risk within this narrow definition, but prefer a broader definition, which includes all aspects of uncertainty. They often use a range of relatively simple mechanisms for coping with this uncertainty, most of which are criticised by academics as errors of application of optimising economic models.

Whilst managers may adopt simplistic approaches to risk evaluation, and place a lot of emphasis on strategic analysis in investment decisions, they generally use detailed financial analysis within project proposals, including DCF analysis. However, there is insufficient evidence to suggest that these financial appraisal *techniques* actually drive decisions. Instead, political influences are observed whereby project champions gain support from the next levels of management to advance their projects up the hierarchy to board approval. The importance of this observation may be lessened in today's flatter structures, but it still places a lot more emphasis on the timing of the decision.

In this scenario, with decisions rarely overturned at board level, it is argued that divisional managers need to use a range of *techniques* which they can understand and articulate to others. They need to evaluate projects within the framework of a *process* which reflects their own construction of the problem, and will therefore be compatible with their intuition and *behaviour*. The gap in existing knowledge could be identified as an operationalisable construction of risk, which focuses on *cause* rather than effect. However, this sort of risk construction is likely to be too context specific to be transferable from a small sample to any organisational setting or project type.

This thesis is therefore concerned with the development of a *process* model, or set of *techniques* which capture the cognitive assessment of risk, and influence managerial *behaviour* in decision-making. The model seeks to link these highly qualitative aspects of decisions to the more quantitative financial appraisal techniques.

3. ORGANISATIONAL SETTING

3.1 The Logistics Industry

The logistics industry has developed into a highly complex and competitive sector, which has evolved from what was once described as 'distribution'. It is now characterised by large-scale businesses applying high levels of technological expertise to the management of several steps in the value chain in order to provide specialised logistics services to clients. This often includes the management of many aspects of those clients' businesses which they used to manage themselves. Logistics companies have taken advantage of the trend in corporate strategy to outsource peripheral activities and focus on core business.

As businesses in most sectors are becoming more global and less localised, so too is the need for logistics. Warehouses have become larger and more automated, and vehicle fleets have to cross more borders and deliver goods in smaller windows of time to take account of access times and delivery deadlines to meet customer requirements. Technologies for the temperature controlled storage and transportation of ambient, chilled and frozen products have been developing, and continue to impact upon the capital investment required in the logistics industry.

One of the keys to success is the employment of sophisticated tracking systems which aid the efficient management and delivery of goods (Batchelor and Terry, 1997). The growth seen in the logistics industry has been considerable over the last few years and is expected to continue, especially in mainland Europe, as more companies decide to stick to their core business and outsource their inbound, outbound logistics, or both. Key service providers in the industry are continuously investing large capital sums in new projects, which is one reason why it is a good industry to select for research into capital budgeting. Virtually all business is defined in project terms, as the service being offered to the marketplace is a 'service bundle', as defined in the marketing literature (see for example Hutt and Speh, 1992).

3.2 The Organisation

The organisation selected is a major European Group in the logistics sector. It is quoted on the UK Stock Exchange and was ranked amongst the top ten European logistics operators in the Financial Times Logistics survey (Batchelor and Terry, 1997). The Group is divisionalised based on market sectors, which are defined by the type of products carried and the type of customer for whom they are carried. An organisation chart is provided for the Group and for one of its major divisions (see appendix 2).

In 1997 the Food and Consumer Division operated a total of 4.8 million square feet of warehouse space in the UK and delivered 300 million product cases and 40 million hanging garments. The Industrial Division made 2.6 million time specific deliveries of 40 million packages, using 500 vehicles, travelling over 133 million kilometres in the year[1].

The pace of change in work practices needed to support this organisation's growth has led to innovation and flexibility being embedded in the corporate culture. The organisation went through both major restructuring (involving a demerger) and minor restructuring (redefining market segments and geographic responsibilities) during the period of this study (over two years). The researcher approached the UK based Industrial Division initially, and gained access to the other divisions and Group level executives later in the study, following the success of 'phase one'.

3.3 Projects

The units of research were major capital projects requiring a proposal for Group level funding, according to Group policy and procedures. The type of strategic investment decisions (SIDs) being appraised initially were business development projects or 'infrastructure' investments. No company acquisitions were included in the data analysed for this thesis (see section 6.1).

[1] Source: Published accounts 1997/98.

3.4 Project Appraisal Techniques

Investment appraisal is a regular activity, involving a range of techniques which include sophisticated techniques according to survey findings (Ho and Pike, 1991). The organisation employed well-established techniques for appraising major capital projects, which were communicated to divisional Finance Directors (FDs) in a paper from Group Head Office. The paper is summarised in the box below.

THE APPRAISAL OF MAJOR CAPITAL PROJECTS

The paper (dated 1995) deals with measures which are used in project proposal papers, in order of priority, with number one used as the primary measure:

1. IRR - real internal rate of return using discounted project cash flows to exceed hurdle rate. The paper explains why IRR and not net present value as a measure, where the decision is usually to proceed or not, as opposed to choosing between a number of mutually exclusive projects. An appendix shows the calculation of the hurdle rate, based on the weighted cost of capital, using the Capital Asset Pricing Model (CAPM) to ascertain the cost of equity, and the paper explains the premium added to the cost of capital to reach a target rate for realistically projected base cases for new development projects of average risk.
2. RoACE - return on average capital employed (rate given for cumulative RoACE to be reached by end of third year of operation as guidance for most projects).
3. Payback - pre-interest payback of less than five years stated as normal expectation.
4. Risk analysis - after ascertaining base case assumptions and returns, at least one *upside* scenario and several *downside* scenarios should be modelled (not all cases need be presented to the Group board, but at least one *downside* scenario is required, and a *shut down* case should be modelled, taking account of financial consequences of withdrawal, to ascertain maximum cash at risk if the project fails).

It is particularly relevant to note here that a 'scenario modelling' technique, which is classified as 'sensitivity analysis' in the literature (see section 2.1.2) was the stated method of dealing with risk in this organisation prior to this study.

3.5 Participants

The nature of this study, both in terms of the research questions (section 1.3) and the findings of prior field-based research (section 2.1.4) meant that divisional executive team members would have the greatest detailed knowledge about the type of projects commonly proposed. It was therefore the management teams at divisional level in the organisation who were targeted as the main participants in this study.

The executive teams of the UK based Industrial Division and the Continental Europe Steering Group were the first two teams of participants (see appendix 3). Access to team two in Continental Europe resulted from the perceived success of the research in team 1 by its executive team and the new Group Chief Executive. As far as possible a natural work-based setting was used to gather the data, which is important in research of this type (Lincoln and Guba, 1986). This usually meant conducting the focus group meetings in the management teams' boardroom.

The key participants in this study are members of the divisional boards, including managing directors, finance directors, operations and business development managers, project managers and directors of Marketing and of Human Resource Management (see appendix 3). They collectively have many years of experience in the industry, and have amongst them a number of bright up and coming executives, including at least one who has moved up to the main group board since the research for this project began.

All executives proved to have a reasonable awareness of the principles and practice of investment appraisal, including the use of discounted cash flow techniques and sensitivity analysis. However, there was only one 'financial expert' in each management team participating in the focus group discussions (see chapter 4) at any time.

4. RESEARCH DESIGN

In discussing the choices that were made about the methodological approach and research methods and techniques employed, it is useful to revisit the main aim of the research:

To provide a useful insight into managers' perceptions of the risk attached to strategic investment projects, and to develop a new process model for risk assessment which will enhance strategic decision-making.

Chapter one identified the need for an in-depth investigation which would illuminate how '*risk*' (the object of the investigation) is understood by '*managers*' (the subjects of the investigation), within the context of the strategic decision-making process. It is desirable for a '*process model*' to be transferable to the natural business setting of other managers, whether in the same organisation or not. This indicated a need for a framework where the model could be designed and tested in an organisational setting.

The approach chosen was *action research*, operationalised by using a *focus group* method, together with the framework of a *repertory grid technique*. These three elements of the research design are explained below in terms of their form, application and justification in relation to the research questions and the relevant theories.

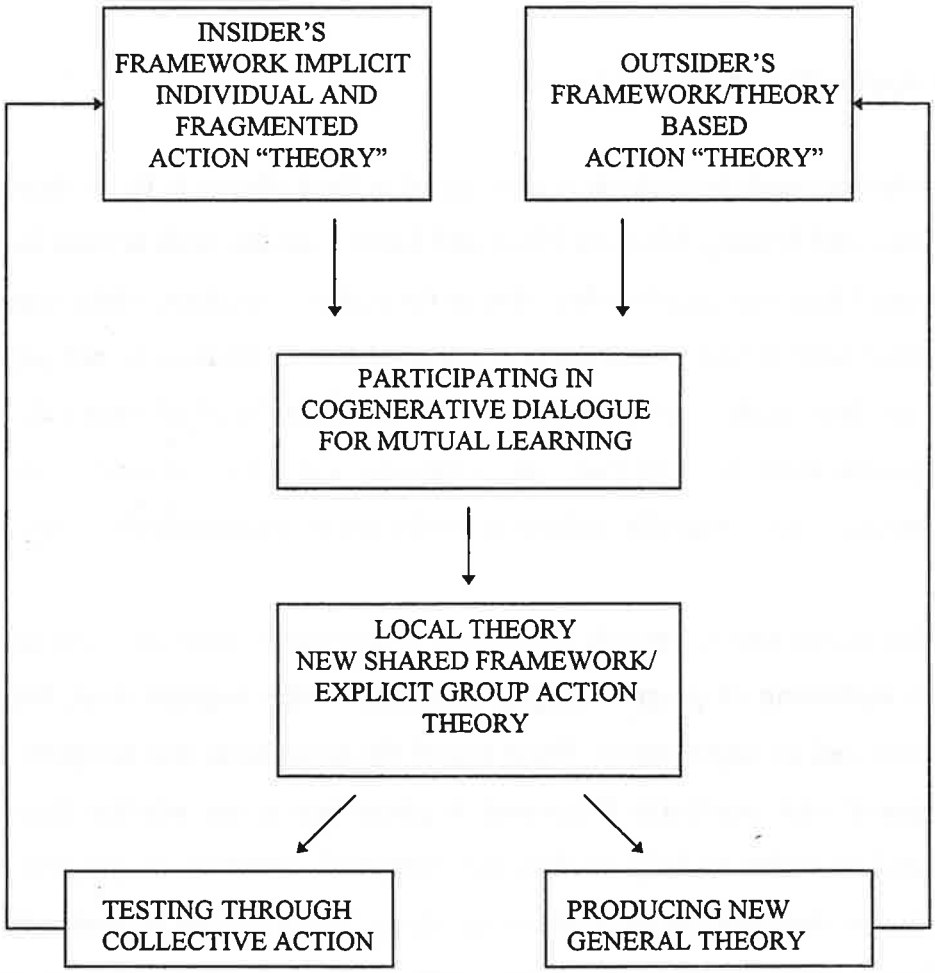
4.1 Action Research

4.1.1 Action research defined

The approach taken was primarily an *action research* methodology, first suggested by Lewin and further developed by Argyris and Schon (Lewin, 1963, Argyris and Schon, 1978). Participatory Action Research involving practitioners more as co-researchers rather than merely as research subjects (Argyris and Schon, 1991), is considered more valuable, based on the Lewinian proposition that causal inferences about human behaviour are more valid if the humans in question participate in building and testing them.

Elden and Levin's model of participative action research (figure 4.1) shows the value of the practitioner (insider) working with the academic (outsider) in an atmosphere of mutual learning (Elden and Levin, 1991). The outcome of this process is the development of a local group action theory that provides both a new shared framework for organisational use, and by testing through collective action, a new general theory. The feedback loops indicate an iterative process whereby the researcher continues to engage with relevant literature as the research progresses, just as the insiders continue to learn from testing and refining the emerging framework.

Figure 4.1 - A model of a participative action research Scandinavian Style: The cogenerative way.



Source: Elden, M & Levin, M (1991, p130)

Easterby-Smith et al (Easterby-Smith et al., 1991, p81) identify *change* as a key objective of *action research*, and suggest that:

> "the researcher's role can be viewed as a cross between an 'importer' of new knowledge to organisational members and a medium through which individuals can express the way they view the organisation or change".

This fits well with Elden and Levin's model, where the 'outsider' brings a framework or theory and the organisational members participate in cogenerative dialogue with the outsider, with a view to generating a new local theory which helps them to learn and to take action.

4.1.2 Application of action research

The action research programme was designed in three phases to fit the three research questions, and broadly followed Elden and Levin's model, with several loops round the frame. Phase one could be described as the exploratory phase, which was designed to explore how divisional managers understood risk in relation to the projects they were involved with. During this phase the researcher worked primarily with one management team, to elicit their risk constructs, with plans to validate the findings both internally and externally, subject to results and to organisational access.

The plan in any action research programme is necessarily fluid, as cumulative results and an evaluation of progress largely determines what happens next, for both the researcher and the organisation. Phase two of the programme was designed to use the participants' risk constructs discovered in phase one to see whether they could be measured in order to help explain the perceived riskiness of projects. It could therefore be described as the explanatory phase. The plan was to work with at least one further focus group at this stage, either within the same Group or in another organisation.

Finally, with the outcomes from both the exploratory and explanatory phases, phase three was designed to build on the cogenerative learning by testing the emergent local theory or framework as an aid to 'live' decision-making. This testing phase could be described as the experimental phase of the study, which would help to validate the contribution from the earlier phases, and produce a new general theory according to Elden and Levin's model.

4.1.3 Justification for action research

With the 'how' type research questions, there were a number of approaches which may have been chosen. The main alternatives to action research would have been to adopt a case study approach, or to use a grounded theory approach.

The case study approach is extremely flexible, as defined by Yin and several others (Brown, 1998; Otley and Berry, 1994; Scapens, 1990; Yin, 1994). It is similar to action research in that it may be used as a vehicle, but does not assume how it will be driven. In other words, it needs to be operationalised by data collection and analysis techniques. For example, data may be collected from structured interviews, and where sufficient responses, analysed by content analysis (Butler et al., 1993). It may involve one single case, as argued by Yin, or several cases as by Butler et al.

It is more common to see case study research where the researcher wishes to observe how an existing process operates than where the process is to be developed as part of the research. It would have been feasible to use a case study approach with a developmental or experimental agenda if the development was well defined by previous literature and already planned by the organisation. Examples might be the implementation of activity based costing, or business process re-engineering.

However, in this study, the participants did not have a clear plan for the development of project risk analysis, but were willing to be guinea pigs for the researcher to work with, initially to the researcher's agenda.

In considering the research approach, there were a number of clear ideas from the literature, such as the apparent theory practice gap in capital budgeting, the problems of practitioner versus economic rationality, and the concept of heuristics and bias in decision making, which were all relevant to the research, but did not on their own provide the driver for the vehicle. So, the possibility of adopting a case study approach was set aside (though not ruled out) while alternatives were considered.

Another alternative would have been to take a grounded theory approach. This would have suited the developmental objective and the lack of prior theorising on risk constructs in capital budgeting. The researcher first considered the original Glaser and Strauss' version of grounded theory (Glaser and Strauss, 1967), and took the opportunity to meet Barney Glaser at a grounded theory workshop[1] with a view to adopting this approach. The outcome was that grounded theory was discarded as it was clearly an approach which did not suit the researcher's philoshophical position. Significant criticisms have been made of Glaser's grounded theory (see for example Archer, 1988).

Using grounded theory for studying SID phenomena is still quite rare in management accounting research, and the best example was not published until decisions for this study had been made (see Slagmulder, 1997). Slagmulder's work is an example of the use of Strauss and Corbin's version of grounded theory (Strauss and Corbin, 1990), which has far more structure to it than did the original Glaser and Strauss version. The method was used to reasonable effect, but without any change agenda.

However, the adoption of grounded theory, whichever version may have been followed, did not sit well with the change agenda which the researcher shared with the participating organisation in this study. Whilst grounded theory may have elicited the participants' understanding of risk as a concept, the value of action research was not only in enabling them to formalise their thinking about project risk, but was also in developing and operationalising the participants' own metrics.

[1] Grounded Theory workshop organised and hosted by Kingston Business School, 28 November 1996.

This suited the research in terms of the collaborating organisation, as the Managing Director of division one had expressed the need for his management team to update their knowledge of investment appraisal theory and practice, and for them to develop a systematic approach to risk analysis.

4.2 Focus Groups

4.2.1 Focus groups as a research method

The work that guided the use of focus groups in this study is that of the 1988 edition of Morgan (revised, 1997), a social scientist whose research centred around social issues such as retirement, widowhood and risk factors for heart attack cases. He provides a guide to focus groups as qualitative research, without the emphasis on marketing applications which many other authors give. In market research, the group interview technique is usually referred to as *focus* groups, and the facilitator as a 'moderator'. The term facilitator has been used in this thesis, as a term more usually used in organisational and management development, and in action research.

Morgan identifies the features of focus groups and contrasts them with other research methods such as participant observation and individual interviewing. The key distinguishing feature is the importance of the interaction in the group and the resolution of differences in building a consensus which explains the collective experience of participants (p28-29).

Morgan sets out the strengths and weaknesses of focus groups as qualitative research in chapter 2. The strengths include time efficiency, the observation of interaction, the control which the researcher has over the discussion and therefore exploration, and that they are well suited to researching topics of attitude and cognition. Weaknesses include the lack of comparability, often the lack of a natural social setting, possibility of contamination of the data by undue influence by the researcher, and that they are not well suited to topics of roles or organisation.

Morgan argues that focus groups can be used to generate and to answer research questions, where the goal is "to get closer to participants' understandings of the researcher's topic of interest". One of the recommended uses of focus groups is for the "description of cognitive processes and perspectives" (Morgan, 1997, p36).

Morgan goes on to deal with the detailed considerations in planning, conducting and analysing focus groups. Matters such as the number and size of groups are dealt with. It is suggested that three to four groups may be sufficient, especially where the results in the second and third groups are predictable from the results of the first group. However more groups, at least six to eight are considered necessary for detailed content analysis or for discussions with less structure. A group size of six to ten is identified as a norm, with four to twelve being possible and six to eight considered ideal.

A whole section is devoted to the selection and source of participants, which is more important if dealing with cross-sectional groups from the general community. It is recognised that in business there are 'ready made' groups naturally occurring, but the point is made that top-level executives are likely to need some incentive to participate. Where 'naturally occurring' groups are involved, especially where participants would normally discuss the research topic in day-to-day interaction, there is more homogeneity in the background of participants, though not necessarily in their perspectives.

The matter of the level of researcher involvement is given due consideration, with some useful tips for facilitating discussions with a high level of involvement without "putting words into participants' mouths". The key skill is to keep the discussion 'focused' on the topic and to anchor the discussion as far as possible to the research question, while allowing participants to offer a range of observations which take account of their context.

Morgan provides a very useful and practical guide on how to conduct focus group research, which identifies the practical dilemmas and some of the common weaknesses of the approach, but does not go into much depth on the conceptual issues involved, such as consensus building and the dangers of 'groupthink'. It is therefore appropriate to introduce other authors' perspectives on group processes (Fern, 1982; Hedges, 1985; Janis, 1982; Schweiger et al., 1986; Watson et al., 1988).

Whilst Janis' work on 'groupthink' was essentially theorising based on a post hoc analysis of government, and particularly military decisions, it is possible to generalise the main 'symptoms' of the groupthink syndrome to other types of group. The eight symptoms observed are categorised into three types (Janis, 1982, p174):

Type I	Overestimation of the group
Type II	Closed-mindedness
Type III	Pressures toward uniformity

The third type, which may be more relevant to focus groups, include self-censorship of deviations from consensus (or lack of conviction to pursue own doubts and counter-arguments), shared illusion of unanimity (for example taking silence to mean consent), suppression of the minority by the majority (for example by showing up the minority as being disloyal to the group), and mindguards (a self-appointed member who protects the group from adverse information). These factors, if present could impinge on the value of data collected by a group interviewing technique.

Easterby-Smith et al discuss a group interviewing technique known as 'cognitive mapping' (Easterby-Smith et al., 1991, p81) as a form of action research where:

> "the researcher can facilitate exploration of organisation member's perceptions, views and beliefs in relation to particular organisational problems".

Easterby-Smith et al (p94) describe this group interviewing technique as one which:

> "takes an 'action research' perspective, regarding any changes in individual attitudes and organisational policies as an important part of the research process".

Easterby-Smith et al position the technique of cognitive mapping as a specialised sort of focus group research, developed relatively recently, based on a modification of the repertory grid technique, itself based on Kelly's personal construct theory (Kelly, 1955). The principle of the cognitive mapping technique is to model organisational members' perceptions of a problem, so that they can see the analysis unfold as they solve the problem.

It has been used in strategy development (often by consultants), and can be performed manually or by computer. Colin Eden has written widely on its use in strategy development (see for exampleEden and Simpson, 1989) and on the underlying principles of the repertory grid technique (Eden and Jones, 1984).

Features of this method may include *stimulated recall,* where the facilitator asks the group to recall an event or experience, and *playback*, where the facilitator feeds back data recorded to verify the *players* understanding of it.

4.2.2 Application of the focus group method

Focus group meetings were used as the main data collection method throughout the action research programme, to gain insights into the perceptions of natural decision making management teams on the topic of project risk. It is at the divisional level within large divisionalised companies that most projects for capital investment are originally identified and evaluated, even though ultimate funding decisions are made at Group level. It is the managers on, and reporting to, the divisional board who hold the most detailed knowledge of the projects being considered, so were the most suitable participants for focus group discussions on project risk.

Given that the group discussions for this study took place in a board-room setting, results were captured manually using flipcharts and other visual aids. Discussions were tape recorded so that discourse could be analysed when the research was written up, both for short executive style reports for feeding back to participants, and for the thesis.

The planning for focus group meetings involved the preparation of an outline agenda (pre-circulated and agreed with the natural chairperson of the management team) to help steer the discussions, and a facilitation pack which contained the names and brief details of the participants, flipcharts and slides (both blank and pre-prepared, such as activity briefs, blank grids, Likert scales etc.), recording equipment, tapes, and copies of any output from previous meetings.

Awareness of the dangers of 'groupthink' (Janis, 1982) and the protocols of consensus seeking in strategy development (Schweiger et al., 1986) helped to inform the facilitation of focus groups in this study. Schweiger provides a useful checklist for consensus building which influenced the researcher in the role of facilitator, and contributed to the contents of the user guide written to assist the organisation in self-facilitation (see appendix 8).

4.2.3 Justification for focus groups

Using the vehicle analogy (Brown, 1998), focus groups were selected to drive the action research vehicle, as this fitted well with the 'cogenerative dialogue' element of Elden and Levin's participative action research model. It was well suited to exploring managers perceptions, working in their natural groups within the organisation. It was also well suited to the researcher's profile in terms of her experience of working with groups of managers in training and consultancy roles and of chairing both formal (committees) and informal (working groups and learning sets) meetings.

The method relied on the co-operation of managers and their organisation, which had been negotiated at an early stage. It was seen as potentially more beneficial than a series of individual interviews, and suited the open style of management being engendered in the participating organisation. As the research was being conducted in an organisation on a part-time basis, at the same time as the researcher holding a responsible full-time position in another organisation, it was also selected as a time efficient method of engaging with practitioners. For theory development as opposed to hypothesis testing it provided an ideal means of eliciting qualitative data. This still left some decisions to be made about data analysis.

As Morgan points out, focus groups are rarely used as a sole research method, but more often as a component, alongside one or more other methods in a larger study (Morgan, 1997). Selected here as the primary method of collecting qualitative data, but combined with repertory grid techniques (see 4.3) and some other supplementary methods (see 4.4), it was more justifiable than as a sole method.

4.3 Repertory Grid Technique

4.3.1 Repertory grid technique

The repertory grid technique (RGT), was first devised by George Kelly, based on his personal construct theory (Kelly, 1955). The essential aspects of personal construct theory (PCT), which underlie this technique are outlined in chapter 2. The RGT is based on a system of bipolar constructs by which people understand their world, according to Kelly. The work that guided the use of RGT initially in this study was Fransella and Bannister's manual (Fransella and Bannister, 1977), and Fay Fransella's personal instruction at a workshop[2]. RGT is defined by Fransella (p5) as:

> "an attempt to stand in others' shoes, to see their world as they see it, to understand their situation and their concerns"

[2] Repertory Grid Technique workshop at Henley Management College, 14 May 1996

RGT was devised as a method of elicitation of the constructs by which elements of a person's repertoire are understood. It makes explicit the individual's theoretical framework, which, by its nature, evolves over time as a way of making sense of personal experiences. RGT is normally used with individuals, and makes no value judgement about the correctness (as may be perceived by the researcher) or otherwise of the person's construing. However, it may be argued, that by inducing the person to verbalise their construction, their own understanding is being developed, and may well change as a result of the inquiry.

A number of guiding principles for using grids are presented (Fransella and Bannister, 1977, p6-9), including the range of convenience, which recognises the context-driven limitations on the range of elements within a person's cognition. Other principles relate to Kelly's corollaries (see appendix 1).

In a repertory grid, the dimensions are 'elements' and 'constructs'. The elements are chosen to represent what is being investigated and should be representative of the pool from which they are drawn. The constructs elicited should be capable of being related to elements other than those elements selected for the grid construction, and should be explicitly bipolar. For example, if researching management styles, the elements might be people (who hold managerial positions) known to the research subject, and the constructs might be the style characteristics by which the research subject understands the managerial style of those people, which could be applied to other managers of the subject's acquaintance. One such construct might be formality, with *formal* and *informal* defining the poles of the construct.

Once the grid dimensions have been identified, usually by a 'triad' process, which works by asking the subject to consider three elements, and say what two have in common which differs from the third, each element is measured on a scale (with bipolar extremes) for each construct. The scale must be decided as well as a rule about whether a cell may be left blank or not.

There are many unanswered questions about RGT, even though the literature on it has built up over the past forty years, with a significant revival in the early 1990s[3]. Some of the questions raised (Rugg and Shadbolt, 1991), which are relevant to this study are:

* Whether to elicit or to supply the constructs?
* Whether or not to modify the two dimensional grid?
* How should the constructs be classified?
* Does the use of RGT with groups rather than individuals conflict with PCT?

These questions have been addressed within the context of this study, and are either dealt with in section 4.3.2 below, or in the evaluation (chapter 8).

4.3.2 Application of repertory grid technique

The repertory grid technique was used to elicit the managers' constructs on the risk profile of projects and to collect data on their assessment of the level of risk attached to individual projects. The grid dimensions are shown in appendix 4, with 'risk attributes' as the 'constructs' by which managers understand the 'elements' and distinguish between the risk levels of 'projects'. The research used stimulated recall by asking participants to reflect upon three recent SIDs, which were representative of the type of projects encountered (i.e. within their range of experience).

The elements were selected with the aid of the Finance Director as a set of projects with differing levels of risk (low, medium and high), which were likely to be recognised by the group as such. It was possible to use the triad method of RGT to elicit most constructs, which were then 'measured' using a 5 point scale and entered on the grid. No blank cells were allowed, such that all projects were assessed on all attributes.

[3] Kelly's 1991 publication is the latest version of his 1955 work

The 'scores' for the triad of test projects were obtained from the focus group discussion, arrived at by consensus. The group discussions were tape-recorded, not to be transcribed, but for the researcher to play back when interpreting the grids.

The risk assessment of initial projects was used to refine the constructs and categorise them into 'constellatory constructs' or sets of related attributes. Figure 4.2 shows four of the twelve constructs to illustrate the method. The attributes were defined in bipolar terms to facilitate risk assessment, with 1 and 5 as the extremes and 3 as the average level of risk for a project (in the group's experience).

It was important to encourage full discussion in a consensus seeking process and for scores in the grid to be arrived at for the group (rather than by individuals). Arguments and counter-arguments were exchanged until agreement was reached, in a way the group would operate in a normal meeting with an agenda. The score agreed would not necessarily be expected to match a mean calculated from individuals' 'first impression' scores.

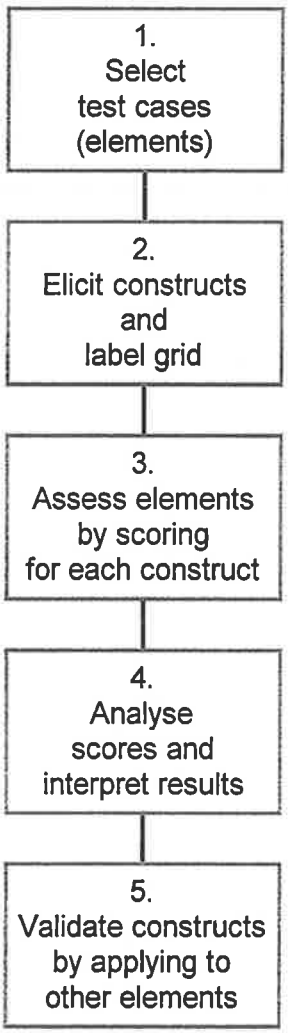
Figure 4.2 Repertory grid extract - risk assessment of 3 projects

PROJECTS (Cases 1 - 3)

RISK ATTRIBUTES (1 - 12)	High Case 1	Med Case 2	Low Case 3
Strategic Fit	3	2	1
Expertise	4	3	2
Image	2	1	1
Size	5	3	2

A diagrammatical representation of how the repertory grid process was applied is presented in figure 4.3.

figure 4.3 repertory grid process



4.3.3. Justification for using repertory grids

RGT was chosen as a process to elicit the group constructs on the risk profile of projects (figure 4.3) for a number of reasons. There is a "paucity of methods that are suitable for operationalizing the subjective charateristics of managerial mental maps into quantitative and reproducible measures" (Ginsberg, 1989, p417). RGT utilises measures which turn the data into quantitative data, making it possible to link the project risk analysis to the financial analysis. RGT is drawn from the same behavioural area of cognitive psychology as the decision-making theory (for example Kahneman and Tversky, 1979), so it was felt to have a good theoretical fit. Lastly, for the executive teams to be able to continue using the technique on their own, the grids were expected to be relatively user-friendly (with some guidance).

4.4 Supplementary Techniques

A number of supplementary techniques were employed in the study as outlined below.

4.4.1 Multi-attribute utility theory (MAUT)

Since the risk attributes were of unequal importance, a technique was required to add weightings to the attributes to reflect the relative importance which participants attached to their constructs. The method used was borrowed from MAUT, as described by George Huber in his book on decision making (Huber, 1980).

MAUT was developed in the United States as an aid to decision making in not for profit organisations, e.g. government departments, which had finite cash resources and numerous potential projects competing for those resources. It gives a framework for quantifying 'stakeholders' perceptions of the benefits they would anticipate to flow from a particular project. It uses a mathematical model to measure the preference for an alternative expressed by a number of people, representing those who may be expected to benefit from the project The key elements of the model are the measurement of preferences in utils against a number of attributes of unequal importance, for each alternative which may be chosen.

The work by George Huber on the additive MAUT model , was linked to investment appraisal (cost benefit analysis), and it was selected for this study purely as a method of applying weightings to a number of unequal attributes. Using Huber's illustrations as a guide, the plan was to ask participants to identify the most important attribute and assign it a weight of 100. Then all other attributes were assigned a number between 1 and 100 which reflected the group consensus on the importance of the attribute relative to the most important. These weights were summed and converted to percentages, which were applied to the raw scores, to compute a weighted risk score for each project.

4.4.2 Document analysis

During the course of an action research programme it is usual to acquire various company documents, most of which are confidential (as opposed to published documents). Examples in this study are the capital project appraisal procedure paper summarised in chapter 7, (which few participants, either more senior or within the Finance function were familiar with), and specific project proposal papers. Project proposal papers were highly confidential, and not normally acquired by the researcher. One exception was the paper relating to the highest risk project assessed, which is the basis of the sample case analysis used in presentations (see appendix 6). Other documents available in the public domain, such as company accounts and the company newsletter (mailed out to shareholders and analysts twice a year, and available in the reception area of most of the company's offices) were used to help the researcher understand the organisational setting (see chapter 3).

4.4.3 Individual interviews

A number of individual meetings were arranged to plan, prepare for, or respond to the output from the focus groups. These are listed in appendix 3.3 and formed an integral part of the action research programme.

5. PROJECT RISK ATTRIBUTES

The results set out in this and the next two chapters are from the series of focus group meetings held over a period of two years (see appendix 3). The number of meetings, projects discussed at those meetings and participants in the discussions are set out in table 5.1 below.

Table 5.1 Focus Group Statistics

Team/Location	**Meetings**	**Projects**	**Participants**
1. Industrial, UK	4	5	8
2. Continental Europe Steering	2	3	8
3. TCN, UK	1	3	5
4. Food & Consumer, UK	1	3	6
5. Food Services, UK	1	3	7
6. France	1	3	8 *
7. Benelux	1	3	10
8. Germany	1	2	5
Totals	*12*	*25*	*57*

* The French group meeting was attended by 10 people, 8 of whom were the normal management team, and two were in attendance to observe and did not participate in the discussion. Only full participants have been counted in the table.

The data from the first phase of the study were the constructs by which participants understood project risk. These qualitative data were analysed by defining and categorising the constructs through discussion. The discussions were tape-recorded, but not transcribed. Instead, the researcher distilled the group discussion into executive reports which formed the feedback to the participating management teams.

From the first focus group meeting with team one, initial project risk constructs were elicited by comparing and contrasting three selected projects, using the repertory grid technique. During the discussion, several possible constructs were elicited, but the group did not reach a good shared understanding of their meaning until meeting two. At the second meeting full definitions of the risk constructs were generated and agreed after some aggregation and disaggregation.

The result was a list of twelve constructs by which the riskiness of projects was perceived by participants. Each was defined in bipolar terms, which were equated to risk scores of 1 and 5 on a five point scale, with 1 being low risk and 5 high risk. The definitions are summarised in appendix 5.

The twelve constructs were:

- Strategic fit
- Expertise
- Image
- Size
- Complexity
- Planning timescale
- Cultural fit
- Quality of information
- Demands of customer(s)
- Environmental factors
- Negotiating Strength
- Proposed contract terms

The constructs were labelled 'project risk attributes'. Many attributes were construed as being linked in some way. Some of the strongest links were found to lie in four groups or 'constellations', relating to the corporate factors, the project opportunity, the external or market-based factors, and the competitive position of contracting parties. These are set out below, with the definitions of each attribute in the 'constellation', as described in the user guide, which was gradually put into use across the organisation.

The project risk attributes derived from the first management team's focus group meetings were presented to the second and subsequent teams for feedback. This feedback confirmed the list of twelve attributes as applicable and appropriate, such that none was actually changed, though most were queried and discussed in reaching a shared understanding of their meaning.

The discussion in this chapter is limited to the output from the focus groups, in other words the data and their initial analysis. Further discussion, and the researcher's reflections and interpretations of these data are set out in chapter 8.

5.1 Corporate Factors

These were the risk attributes which linked the project to the corporate strategy, strengths, weaknesses and image of the Group. These factors were positioned at the top of the list as it was felt that any project which was perceived as high risk in relation to these factors would be difficult to pursue, almost regardless of the rest of its risk profile and its forecast cash flows. However, the attributes within this category were not seen as having equal importance, or necessarily greater importance than attributes in other categories (see chapter 6).

5.1.1 Strategic fit

Strategic fit: the potential contribution to corporate strategy as stated in published documents (e.g. mission statement) and in business plans (e.g. market segment penetration) of the project (1=good fit, 5=poor fit).

This attribute was widely discussed in all divisions, with concerns initially about how the extent of a project's strategic fit could be measured on a five point scale, and whether any project which scored 5 should even be considered beyond this attribute. This was resolved in the third meeting of team one by discussing the timing of the risk assessment and what preliminary work would have been done to get a project proposal to an appropriate stage for risk assessment to be meaningful.

It was agreed that any project would need to fall within a feasible range in terms of its strategic fit to be considered for a full project appraisal at all. Therefore strategic fit was considered both as a prerequisite for a project proposal and as a project risk attribute.

5.1.2 Expertise

Expertise: the level of knowledge and skill needed for the project to succeed which exists in the company. (1=relevant strength, 5=relevant weakness).

This attribute covered the different types of expertise required for the project to succeed, including technical know how and management capability. A project involving a novel approach to a logistical solution or some other innovative process would score higher, as the company would not have tried and tested the necessary expertise. It may score highly simply due to a shortage of the necessary skills or management time to take on the project. This was felt to be partly controllable (by buying in technical or managerial resources), and partly uncontrollable (in terms of the uncertainty involved in estimating skills required).

5.1.3 Image

Image: the potential damage to the company's reputation or brand image which may derive from the project and related publicity, e.g. public sensitivity to product being carried (1=insensitive, 5=sensitive).

This was an attribute which participants did not expect to be a major issue. Many projects would be considered low risk on this attribute. However, it was retained as possible cases were described e.g. the transportation of nuclear waste, live animals etc. which could be potentially damaging, even though no such cases could be recalled.

Image was felt to be a positive factor on occasions, where reputation may be enhanced e.g. transportation of high quality goods like designer clothing or high profile business like formula one racing team equipment.

5.2 Project Opportunity

These factors related to the project as defined in the project proposal document, which, following the standard format, would include financial analysis and underlying assumptions.

5.2.1 Size

Size: the scale of the project relative to existing business, indicated by capital expenditure required, length of contract, and annual revenue predicted (1=small, 5=large).

In the first team this was clearly understood as a factor which contributed to the riskiness of a project. The participants had experience of bidding for a very large contract with a top UK company which represented an increase of at least twenty percent on their existing business at the time. It was an aborted project, as the prospective client eventually chose to keep all its logistics in-house.

However, much management time had been invested in the prospective project, and competitors had put in unrealistic bids which put the company under pressure. The project was one of the first three selected for the repertory grid exercise, and was assessed as high risk (5 on the risk scale) on this attribute, contributing significantly to the overall score of 4.34 (see chapter 6). This experience caused some emotive language to be used during this part of the discussion.

5.2.2 Complexity

Complexity: the number of and association between variables or assumptions inherent in a project, which complicates the company's ability to predict the outcome (1=simple, 5=complex).

This attribute was closely linked to the expertise required for the project to succeed, which was dealt with under Corporate factors (5.1.2 above). However, it was decided to assess it separately as a project feature, which would often reflect the technical complexity due to client specifications, but could also reflect the design choices made to ensure the facility would have sufficient flexibility to attract further clients.

Complex logistics solutions were seen as a particular competitive strength, and the company had developed sophisticated methods of modelling solutions by computer simulations. Thus, a high score on this attribute could be compensated by a low score on expertise, where relevant strengths were perceived.

5.2.3 Planning timescale

Planning timescale: the time available to research and develop a project proposal before a decision must be made and a contract signed to meet the required deadline for the project to proceed (1=long, 5=short).

This was a problem often encountered by participants, where they experienced considerable time pressure in putting together a business proposition to a client imposed deadline. It was felt to be a common problem across the divisions due to the nature of the logistics industry. Many new clients would not realise that they might wish to outsource their warehousing and distribution operations until they had outgrown their existing facilities and were close to crisis point. This did not usually allow much time for research, planning and negotiations before a decision would be needed to enable contracts to be signed.

5.3 External/Market Factors

These related to the external context for the project, which focused on the customer, due to the nature of the projects normally encountered by participants (see chapter 6).

5.3.1 Cultural fit

Cultural fit (of parties): the potential match or mismatch in the corporate values beliefs and practices of the contracting parties involved in the project (1=good fit, 5=poor fit).

Where one or more third parties were involved in a project it was felt that the quality of their relationship with the company could impact significantly on its success. Often there would already be a good working relationship with existing clients when new contracts were being proposed. However, where projects had run into problems, whether with new or existing clients, a mismatch of core beliefs, values and understanding of business generally and logistics specifically was identified. This distinguished the high risk project from the other two in the repertory grid exercise.

In mainland Europe, the term 'cultural fit' was deemed to have a slightly different meaning, with country culture entering the cultural fit equation. Some participants did not feel that just because two contracting parties had similar corporate cultures it would auger well for the project. The definition was therefore reinterpreted to fit users' own contexts. This could therefore cover personal relations between relevant companies' representatives.

5.3.2 Quality of information

Quality of information: the reliability, validity and sufficiency of base data and other relevant information available to form the basis for project assumptions and appraisal (1=good, 5=poor).

This attribute focused on the information from third parties e.g. suppliers and customers. Often a contract would need to be negotiated and a business case drawn up quickly using assumptions inherent in customer specifications, e.g. productivity rates. Some customers may be more skilled at collecting and analysing this sort of data than others and some would be less open about the basis of their statistics.

This attribute was closely linked with planning timescale, as the more time available tended to mean that the quality of information could be improved. Less reliance might be placed on customer derived data where there was sufficient time available for the company to run its own tests and gather and analyse its own data. Although, the high risk project assessed by division one as 5 (high risk) on this attribute, was only assessed as 3 (normal risk) on planning timescale.

5.3.3 Demands of customer(s)

Demands of customer(s): the challenge posed by customer requirements, by business specification e.g. non-standard containers, or level and nature of customer contact e.g. frequent communication expected with staff having no or low knowledge of logistics (1=barely demanding, 5=highly demanding).

This attribute was linked with the complexity of the project, though the two were not always seen as positively correlated. Sometimes a customer could be extremely demanding in terms of the amount of attention they sought, even where the logistical solution itself was not complex. Some customers, e.g. Marks and Spencer plc were renowned for being demanding, in terms of quality standards, but not unreasonably so. It tended to be customers who were outsourcing their logistics operations for the first time who were cited as creating unrealistic demands. Once exposed to alternative solutions and more outside information this risk might be expected to reduce.

5.3.4 Environmental (PEST) factors

Environmental (PEST) factors: the likely impact of Political, Economic, Social and Technological factors on the project, e.g. TUPE[1] (1=low impact, 5=high impact).

There was quite a lot of discussion around whether these factors should be assessed separately or whether they should be aggregated. In the end they were aggregated because it was felt that not all elements would be relevant to all projects and that

[1] TUPE is the employment legislation introduced just before the research began, governing the transfer of employees from clients or previous operators when existing facilities were taken over.

compared with other risk attributes they were unlikely to be of great importance individually. During risk assessment exercises across the Group this attribute rarely took up much of the discussion or caused emotive language to be used about a project.

One aspect which did feature regularly in this part of the discussion was that of relevant legislation. In the UK, TUPE was an important consideration, but as liability could be covered by indemnity clauses in contracts, the problem became one of negotiation of favourable contract terms (see 5.4.2). In France there was concern expressed about the impact of the proposed restriction on the working week in terms of the viability of projects under negotiation. It was possible to limit this risk by action or by price variation in contracts.

5.4 Competitive Position

These two attributes could have been included in the previous cluster as part of the marketing context for the project, but were viewed as distinct in terms of the contractual obligations which the project would result in.

5.4.1 Negotiating strength

Negotiating strength: the power position of the company relative to the other contracting party(s), e.g. due to relative size, reputation, or competitive advantage (1=strong, 5=weak).

This attribute covered the relative strength or weakness of the company's bid for the business in a competitive tendering situation. Where the company could demonstrate superior processes, e.g. sophisticated tracking systems or pallet/tray cleaning systems, or other advantages over competitors' market offerings, it may reduce the risk attached to the project.

This was often seen as positively linked with the next attribute, contract terms, in that a strong negotiating position may enable the company to dictate terms rather than be dictated to. In some cases the customer might have contract terms firmly set (as a result of past experience for example) even though the company had a clear lead over competitors in terms of winning the business.

5.4.2 Proposed contract terms

Proposed contract terms: the evaluation of the likely contract terms, and potential to pass risk(s) to other contracting party(s) (1=favourable, 5=unfavourable).

The researcher queried whether in fact this was part of the risk profile of a project or whether it was part of the response to the risks inherent in the project. After much debate in division one, which was borne out by later focus group meetings in other divisions, it was considered as both. In the same way as attribute one, strategic fit, was seen as both a pre-requisite and a risk factor, contract terms (predicted at the decision point) was seen both as a risk factor in its own right as well as part of the response to other risk factors.

Chapter 6 deals with the relative importance of these project risk attributes and how the weightings were derived as part of the project risk assessment process.

6. PROJECT RISK ASSESSMENT

Having elicited and defined the project risk attributes (reported in chapter 5), the next phase of the research used these attributes to explain the risk profile of further projects, which had either been recently appraised or were at the decision making stage. In order to assess the overall risk of a project, each attribute was discussed by the team and scored on the five point scale to ascertain the 'raw scores'. These then required weighting to calculate an overall score for the project.

These scores and weightings provided the quantitative data, which were analysed for 25 cases (the projects identified in table 5.1). As the analysis was repetitive, only a sample is included in this thesis. Much of the analysis was undertaken by participants in the developmental sessions. The role of the researcher was to facilitate this analysis by leading the group through its project discussions, and capturing the consensus views as weights and scores in the project risk assessment grids.

During the early discussions on possible weightings to be assigned to risk attributes, it became apparent that one set of weightings may not be appropriate for all projects. This was debated at length, with the result that two types of project were identified, with quite different characteristics. When the second team of participants reached this stage, they found that typical projects in Continental Europe were a cross between the two, which resulted in a third type being identified. It became clear that further types of project could arise in the future, which may require different constructs or different weightings in their risk assessment.

This typology emerged from the qualitative data analysis from this phase of the study, derived from discourse analysis from the focus group discussions. Key words were recorded, on tapes, flipcharts and overhead transparencies during discussions, which characterised the projects described by participants. The three project types identified in this study are set out below.

6.1 Project Typology

6.1.1 External client

This type of project was specific to one customer. It might represent additional business, i.e. a new contract with an existing customer, or it might involve a new customer. Often there would be specialised equipment needed. Investment in vehicles, which may ultimately belong to the company or a third party (but seldom to the customer) was usually required. The business would normally be covered by a relatively short-term (in capital budgeting terms) contract, which would specify pricing arrangements and indicate likely volumes and destinations. Negotiating the precise terms of such contracts involved a considerable amount of management time.

6.1.2 Infrastructure

This type of project could share some common features with the first type, in terms of contracting or the nature of fixed assets required. However, it was more likely to benefit several or all customers, and would normally involve new or enhanced facilities, in terms of buildings and equipment, especially investment in computer systems. There may be an element of speculation involved in establishing new facilities without a specific user in mind.

Negotiations with suppliers and contracts for services or maintenance would be common to this type of project. Location and environmental considerations would possibly be important. The timescale involved could well be longer-term, without necessarily having a finite project life. In such cases an 'artificial' or hypothetical cut-off point might be used in the discounted cash flow calculations.

6.1.3 Shared user

This type of project is a cross between types 1 and 2. It would usually involve the design, building and operation of specialist warehouse and distribution facilities, with a multi-user objective. Such facilities would often be developed with one lead client, with the prospect of attracting further clients later, to fully utilise the capacity. Investment required in this type of project would be high, to provide the substantial capacity needed to deal with the throughputs of several large European customers in an efficient operation. Such projects might require a development phase of up to three years before the facilities would be fully operational.

6.2 Weighting of Risk Attributes

Table 6.1 (on the next page) shows the weighting of project risk attributes agreed in team one for projects of types 1 and 2. It can be seen from table 6.1 that for 'external client' type projects there are seven attributes with weightings of 70% or more, which are deemed to be most important. These are expertise, size, complexity, quality of information, demands of customer(s), negotiating strength, and proposed contract terms.

In the case of infrastructure projects the seven most important attributes are almost the same. The significant difference is that complexity is deemed to be more important in external client projects (weighted at 90% and 20% respectively) and environmental factors are deemed to be more important in infrastructure projects (weighted at 30% and 100% respectively).

For both project types only seven of the twelve factors are really contributing significantly to the overall weighted score. However, the remaining five factors (weighted at 45% or less for type 1 and only 10% or 20% for type 2) were deemed to be important enough elements of a project's risk profile to leave them in the grid. This was agreed by participants in order to force the discussion and evaluation of less important attributes to take place, to form a balanced view of the project's risk profile.

Table 6.1 Weighting Of Risk Attributes

	WEIGHTINGS			
	EXTERNAL CLIENT		INFRASTRUCTURE	
	TYPE 1		TYPE 2	
RISK ATTRIBUTES	weight	%	weight	%
CORPORATE FACTORS:				
Strategic fit	20	3	10	1
Expertise	100	14	80	12
Image	20	3	20	3
PROJECT OPPORTUNITY:				
Size	85	12	70	11
Complexity	90	13	20	3
Planning timescale	20	3	20	3
EXTERNAL/MARKET FACTORS:				
Cultural fit of parties	45	6	10	2
Quality of information	85	12	80	12
Demands of customer(s)	70	10	80	12
Environmental (PEST)	30	4	100	15
COMPETITIVE POSITION:				
Negotiating strength	70	9	80	12
Proposed contract terms	80	11	90	14
TOTAL	715	100	660	100

Since blank cells were not allowed, every attribute required a score, but if the consensus for a project was that it was not risky at all on a particular attribute it could be scored 1. Together with a low weighting, this would result in little impact on the overall score, but with the assurance that this aspect of the project profile had been considered.

For the weighting exercise, the brief asked participants to assign 100 to the most important attribute, and to assign a number between 1 and 100 to other attributes, according to their perceived relative importance. The exercise had worked quite well with the first team following this brief, albeit with limited use of the full range. In team two (Continental Europe) where project type 3 emerged, the participants decided to carry out the weighting exercise in a different way, even though the briefing was the same as that used with team one. These participants decided, of their own accord, that it would be easier for them to categorise the attributes into three categories, of high, medium or low importance for type 3 projects. Having carried this out (without any researcher intervention) they proceeded to assign weightings using one to one hundred, within and across the three categories, thus ending up by following the brief in a two-part process. Results are shown below in table 6.2.

Table 6.2 Type 3 Project Weightings

	TYPE 3 SHARED USER	
RISK ATTRIBUTES	weight	%
CORPORATE FACTORS:		
Strategic fit	50	7
Expertise	100	14
Image	20	3
PROJECT OPPORTUNITY:		
Size	60	8
Complexity	100	14
Planning timescale	75	10
EXTERNAL/MARKET FACTORS:		
Cultural fit of parties	70	9
Quality of information	100	14
Demands of customer(s)	40	6
Environmental (PEST)	50	7
COMPETITIVE POSITION:		
Negotiating strength	30	4
Proposed contract terms	30	4
TOTAL	725	100

Comparing type 3 (multi-user projects) weightings with type 1 (single user projects), the closest in terms of characteristics (see table 6.1), the three most highly weighted attributes (expertise, complexity and quality of information) are common to both.

However, planning time-scale (weighted at 75%) is the next most important in type 3 (only 20% for type 1), and size is equal third most important (weighted at 85%) in type 1 (weighted slightly lower at 60% fro type 3). The other major difference is that the importance attached to competitive position factors in type 1 (weighted at 70% and 80%) is not reflected in type 3 (where they were weighted at 30% each). This was explained as being due to less reliance on any one customer or contract for a type 3 project. This also explained the lower weighting (40%) attached to demands of customer(s) in type 3 projects (70% for type 1).

Strategic fit was seen as more important by team two. Accepting it also as a pre-requisite, due to the scale of type 3 projects and their more speculative nature, it was weighted at 50% (only 20% for type 1).

6.3 Timing of Risk Assessment

The timing of the project risk assessment was identified as a key issue, as the extent and understanding of relevant information which the managers have, as the basis for such assessment, changes over the project planning and initial implementation stages. The grid was designed to be used at the decision point, with the information or base assumptions reflected in the cash flow forecast in the project proposal paper.

However, the managers felt they could benefit from using the grid much earlier, with rough forecasts, to avoid spending time on potentially high risk project proposals which they would not get funded. It was also suggested that the risk could be re-assessed with hindsight at the post-audit stage, as part of the learning process. Thus the grid is being used at three stages in a project's life, at an early screening stage, as part of the divisions' project proposal paper for a group board funding decision, and at a post audit review stage.

However, it is at the decision point where the risk assessment is required by the Group board, and where it links in to the financial appraisal techniques as a decision aid (see chapters 7 and 8). Use at an earlier stage is optional, and very little data has been collected for analysis at this stage. The main difficulty which participants identified with carrying out a full risk assessment at an early stage is that insufficient information may be available to make judgements on all twelve attributes.

For some projects with long lead times, they may be assessed at each of the three stages, but such data was not specifically sought for the purposes of this study. At present most data has been collected at or after the decision point. Very few projects have been selected by participants at an early screening stage for risk assessment during the research and development of this risk assessment technique. Changes in the risk score from the decision point to the post audit point were analysed for three team one projects, to validate the grid technique at the decision point (see chapter 7).

6.4 Results of Risk Assessment

Table 6.3 shows the assessment of a type 1 project by team one. It shows that whilst the project was fairly low risk overall (indicated by an overall score of 2.04 on the scale of 1 to 5), its size, complexity and proposed contract terms, followed by the quality of information available, contribute the most (each over 10%) to the overall weighted risk score.

The interpretation was that the project should go ahead, based on this and the financial evaluation presented in the proposal. The participants agreed that the four factors highlighted in the above paragraph would deserve more management attention to implement the project successfully, as they had contributed the most to it's risk score.

Initially, project risk assessments were made for past projects, i.e. at the post audit stage. Actual decisions were noted, but expected returns from the original project proposals were not, as the object at this stage was to focus on risk assessment.

Table 6.3 Project Risk Assessment Grid

	GROUP RESULT Type 1 e.g.		
	RAW SCORE	WEIGHT	WEIGHTED SCORE
RISK ATTRIBUTES	score x	% w	wx
CORPORATE FACTORS:			
Strategic fit	1	3	3
Expertise	1	14	14
Image	1	3	3
PROJECT OPPORTUNITY:			
Size	3	12	36
Complexity	2	13	26
Planning timescale	3	3	9
EXTERNAL/MARKET FACTORS:			
Cultural fit of parties	1	6	6
Quality of information	2	12	24
Demands of customer(s)	2	10	20
Environmental (PEST)	3	4	12
COMPETITIVE POSITION:			
Negotiating strength	2	9	18
Proposed contract terms	3	11	33
TOTAL wx / 100	**24**	**100**	**2.04**

Table 6.4 shows the risk assessment results from the first 4 projects assessed in the UK, where weighted scores of 1.45 to 4.34 were found.

Table 6.4 - Team 1 (UK) Project Risk Assessment Results

Project Type	Timing	Weighted score	Risk Ass't	Decision
I	Post audit	4.34	High	X
II	Post audit	1.86	Low	✔
I	Post audit	1.45	Low	✔
II	Post audit	2.81	Med	✔

The interpretation of these scores was that a score of up to 2.5 was considered low risk and 3.5 or more high risk, with scores between 2.5 and 3.5 considered medium risk. The highest risk project assessed at 4.34 (see appendix 6) had not gone ahead, whereas the other three had (all assessed at less than 3.5). It was felt unlikely that any project with an overall score exceeding 4 would be approved at Group level.

Of these four projects, the first three were the test cases selected by the Finance Director as likely to be high, medium and low risk. Whilst the results place them in that order, the second case was assessed as low risk, which the participants agreed after the event was a fair assessment. This shows that an individual's pre-conceived ideas may not be borne out by following the group process (see chapter 8.1).

In Continental Europe the first 3 projects assessed ranged from 2.97 to 3.81 (table 6.5) and had all gone ahead, with the highest risk project presenting management with the most problems in terms of implementation.

Table 6.5 - Team 2 (Continental Europe) Project Risk Assessment Results

Project Type	Timing	Weighted score	Risk Ass't	Decision
III	Post audit	2.97	Med	✔
III	Post audit	2.99	Med	✔
III	Post audit	3.81	High	✔

It was suggested by some participants that the nature of Continental Europe projects made them more inherently risky than those experienced in the UK. This is discussed in chapter 8.

6.5 Illustrative Case

The illustrative case in appendix 6 is the first of the four cases in table 6.4 above, and the highest risk case (scored at 4.34) analysed as part of this study. The customer profile, proposition, project definition and proposed contract are summarised in appendix 6 from the detailed project proposal paper presented to the Group Board (one of the pieces of documentary evidence collected and analysed for the study). The project risk assessment grid is also shown in appendix 6. Tape-recorded discussions were replayed to gain further insight into how the consensus project risk scores were reached in this case.

There were several of the division's competitors who were effectively 'waiting in the wings' to bid for a contract with this customer. The customer's own marketplace had become very competitive (from essentially what was a monopoly position not long before). The customer was still unused to such a competitive business environment, and unused to outsourcing activities such as logistics. The focus group participants spoke about this customer as if it was 'the customer from hell', both in terms of the lack of understanding of alternative logistics solutions, and the negotiators' unrealistic expectations. This was reflected in higher than average risk scores for:

Cultural fit of parties	scored 5
Demands of customer	scored 4
Negotiating strength	scored 4

The proposition was for complete outsourcing of the customer's wide-ranging logistics operations which were mainly but not exclusively in the UK. The proposal was to take over existing arrangements and gradually move over to a new solution involving the construction of a specially designed National Distribution Centre (NDC). The nature of the destinations (some 'dead drop' sites, at out of town locations, and some retail type sites in town centres), the range of items to be stored and carried, and the target times for distribution presented something of a challenge. The customer profile and the importance of the outsourcing decision was such that the project would have attracted a great deal of publicity, mostly positive for the division.

This was represented in the following risk scores:

Complexity	scored 5
Environmental	scored 4
Image	scored 2

The discussions with the customer had been going on for a relatively long period of time, and there was no real sense of urgency to conclude a deal or implement the solution coming from the customer. In fact, when participants reflected on this case, they expressed the feeling that the customer's representatives did not really know what they wanted to do, mainly due to their limited grasp of the problem. The customer's representatives were quite secretive about how they had operated their logistics function previously, and gave very little information e.g. one day's productivity rates, which could not easily be validated. This led to an average risk score for timescale, but a high risk score for quality of information:

Planning timescale	scored 3
Quality of information	scored 5

The project definition, which reflected the solution proposed to meet this customer's requirements used core skills, but not enough was known about the customer's specific market sector. This raised a concern about the level of relevant expertise which would be required for the project to succeed. It also raised a strategic issue, and the fit with strategy was felt to be higher risk than average, due to the new market sector being entered. These factors, together with the sheer volume of business anticipated (representing a 20% increase in the division's business) accounted for the following high risk assessments:

Strategic fit	scored 4
Expertise	scored 4
Size	scored 5

Finally, the chance of obtaining favourable contract terms with this customer was not considered to be very good. At least two of the terms which the management team

wanted (strike cover and termination protection) were unlikely to be achieved, which put this risk score above average:

Proposed contract terms	scored 4

During the discussion about this project participants twice felt a need to register such strength of feeling about a risk score that it went off the scale. In fact, so much so that on 'quality of information' they jokingly scored this project at 10. The other occasion they wanted to go off the top of the risk scale was on 'size', as it was the biggest project they had ever considered in the division.

It can be seen from the weighted scores in appendix 6, that since both of these factors were given a high weighting (12% each), they contributed 120 out of the total score of 434 (i.e. 28% of the score from 17% of the attributes). When taken together with 'expertise' and 'complexity', the four attributes accounted for 241 out of 434 (56% of the risk score from 33% of the attributes).

As this case was one of the triad of test cases, it helped to validate the grid, by showing an overall score of 4.34 on the five point scale, which was recognised as being highly appropriate for this project. It formed a useful 'anchor' or reference point for this management team in later risk assessments. It was also used in the presentation at the corporate conference, and in subsequent training sessions, as a case study for managers to practice using the project risk assessment grid.

This case was also used as a reference point in deciding how to categorise the risk score into high, medium and low categories when combining it with the financial appraisal in decision-making, which is explained in the next chapter.

7. DECISION MAKING AID

7.1 Linking Risk and Return

This phase of the study was concerned with linking the project risk assessment scores to the financial appraisal. At a meeting with the Finance Director in team one, a paper on capital budgeting produced by an analyst at Group head office was obtained, which is summarised in chapter 3. This identified IRR as the primary financial appraisal technique used. The FD was asked about its application, with particular reference to its theoretical limitations, and the possibility of using MIRR (see chapter 2).

The conclusion drawn from this interview was that the FD felt that MIRR was unlikely to be as easily understood by the non-financial managers, and that in any case, projects tended to have relatively short lives, typically tied to two or three year contracts, such that the difference between IRR and MIRR was unlikely to have a significant impact. Far more concern was expressed about the hurdle rate being well in excess of the cost of capital, and placing an extra burden on divisions to earn high returns.

At the fourth focus group meeting with team one, the linking of weighted risk scores with project returns was discussed. The group considered how the risk scale of one to five might relate to a feasible range of acceptable project returns, and the possibility of using a risk-adjusted hurdle rate to discount the cash flows. The data analysed at this stage were mainly qualitative, in terms of the issues and arguments concerning the decision criteria currently applied and how improvements could be made.

There were three main issues discussed:

(a) What rate of return should be expected of a project of average risk?

(b) What should the minimum acceptable return be for the lowest risk project?

(c) Should the risk scale be linked to the return scale in a linear relationship?

The first question prompted a discussion about the existing hurdle rate and how it was derived, which was answered by the Finance Director, with some help from other participants, by reference to the paper summarised in the box above. There was some support for positioning the average risk score of 3 at the IRR hurdle rate, but more support for the IRR hurdle rate plus one percent (adding a further 'comfort' margin, as participants perceived the Group's declared hurdle rate as a minimum, not as an average).

On the question of acceptable returns for low risk projects, the discussion about where to position a risk score of 1 centred around whether this should be the IRR hurdle rate, or whether it should be the basic cost of capital. There was more support for the latter as it was pointed out that few projects would be assessed at a weighted risk score close to 1, but if there were to be such a low risk project, it should be considered, as long as the cost of capital was covered. The lowest risk score found at this point in the research (out of five projects assessed) was 1.45.

A slide was shown to see how the risk scale and the return scale could be linked in a linear relationship (question c), but there was some concern over the sensitive area around the hurdle rate, and more support for using a three step scale (above, below and close to the hurdle rate). This point was taken up later in version two of the decision matrix which emerged.

The team agreed that the risk/return scales should be considered further by the outgoing Finance Director (who was about to retire) and the incoming Finance Director (who was being promoted from within the division) at a meeting with the researcher, as part of the implementation of the new risk assessment process model. This took place as two separate meetings in June and August 1997 (see appendix 3), such that an interim result, in the form of a project appraisal matrix (version one), was produced in between, and presented to team two in July 1997.

7.2 Project Appraisal Matrix

After the discussion with the retiring Finance Director of team one, a simple two by two matrix was developed, which is shown in figure 7.1.

Figure 7.1 - Project Appraisal Matrix (Version One)

PROJECT RETURN (IRR)	PROJECT RISK (weighted score) LOW	HIGH
HIGH	✔	???
LOW	?	X

After presentation to team two and further discussion with the Group Finance Director, where a three step approach with a marginal band was suggested, this became a three by three matrix (figure 7.2).

Figure 7.2 - Project Appraisal Matrix (Version Two)

PROJECT RETURN (IRR)	PROJECT RISK - (weighted score) LOW (1 - 2.5)	MED (2.5 - 3.5)	HIGH (3.5 - 5)
HIGH > x %	✔	✔	?
MED (x-2) to x %	✔	?	X
LOW < (x-2) %	?	X	X

x = hurdle rate previously applied

The cells in the matrix were labelled with a ✓ where the risk score and rate of return were considered to be acceptable to the Group board, with a **X** where they were not acceptable, and with one or more **?**s where the risk and return were possibly acceptable, but 'referred' on some aspect. Responses to these are discussed later.

The other obvious difference between versions one and two of the project appraisal matrix, apart from the addition of a marginal band, was the identification of hurdle points on each scale. Version one prompted a discussion with team two about the risk hurdle point, which was unresolved until the marginal band was added.

The matrix was tested by positioning a number of cases which had been assessed by team one, as part of the experimental phase of the study, where the project risk assessments were carried out by the management team without the researcher present. Table 7.1 shows a sample of UK data used to test the matrix for 'live' cases.

Table 7.1 - Project Appraisal Matrix Test Results.

Team	Project Type	Risk Ass't	Return (IRR)	Matrix	Decision
1	1	Low	High	✔	✔
1	1	Low	High	✔	✔
1	1	Low *	High *	✔	? (then ✔)
1	1	Low	High	✔	✔
1	1	Low	Med	✔	✔
4	3	High	High	?	? (then ✔)

Of the six cases shown in table 7.1, five fell within ✔ cells in the project appraisal matrix (indicated in column 5 in table 7.1), and were ultimately funded (indicated by the decision in column 6 in table 7.1). The third case (row 3 in the table) was initially referred, as the low* risk assessment was near the medium cut-off point and the high* return was only 0.4% over the cut-off point, thereby making it close to a **?** cell. The sixth case (on the bottom row of table 7.1) fell into the **?** cell of the matrix and had previously been referred. The high return shown was based on the revised proposal for this project which showed an anticipated return well above the IRR required, at which point the project was funded.

7.3 Management Responses to the Matrix

The managers' responses to the decision matrix and the positioning of projects within it were elicited by inviting comments and feedback from participants at the corporate conference, and from subsequent focus group meetings (see appendix 3, specifically the 7th to 11th meetings with teams 3 to 7). Further feedback was also obtained at Group level at individual and team meetings with members of the Group executive (see appendix 3).

The results are therefore dealt with at the two different levels, divisional and Group. At divisional level, the results have been categorised into formal and informal responses to the positioning of projects within the decision matrix. Formal responses were those verbalised and agreed in focus group discussions, or in the form of written feedback collected from each table of participants at the corporate conference. Informal responses were those alluded to in focus group discussions, and communicated often by body language, side-conversations and innuendo (part of the qualitative data captured by the researcher and noted shortly after each meeting, during a playback of the tapes).

7.3.1 Formal responses

The response at divisional level to projects in the ✔ cells, was to put forward the proposal to the Group board for funding, which was anticipated.

The formal response to the **X** cell project has not been widely tested as few cases were positioned in this area of the matrix. However, teams agreed that whilst not all such projects would necessarily be abandoned if they fell into this area, such projects would not be put forward for Group funding as they stood. It was implied that they may possibly be treated as **?** projects if there was a strong enough rationale to reconsider the project in a different way. The projects which fell into the **?** cells were of most interest to the researcher, and stimulated some lively discussion among participants.

The formal responses to these ? cells were agreed by participants as fitting into one of the following:

* If Medium to Low return, do the project differently, i.e. more efficiently to improve the expected return.
* Reduce or disaggregate the project if possible, to consider a smaller or first phase project.
* Cover or pass on the risk to customer(s) via better contract terms, i.e. higher price or 'insured' costs.
* Delay the decision until further/better information becomes available.

7.3.2 Informal responses

Informal responses to ? projects alluded to in discussions included:

* Revising the return towards 'upside scenario' figures without actually *doing* the project differently. Rather *viewing* the project differently, until the return exceeds the IRR cut-off point for a ✔ cell.
* Revising the risk score down by revisiting one or two attributes with higher weightings until the overall score falls under the cut-off point for a ✔ cell.

It was difficult to gauge the extent to which these responses may be used in practice. Evidence in the form of internal memoranda between divisional team members and the Group Chief Executive regarding risk assessments submitted with project proposals suggested that any aspects which did not ring true were likely to be picked up and questioned.

The interpretation here is that teams were creating the impression with the researcher that they could get away with responses that would 'pull the wool over the eyes' of the Group board, when they actually knew that it would be difficult to do so. Some participants may have been demonstrating this behaviour as a kind of bravado, particularly in the all male management teams who were unused to having their meetings chaired or facilitated by a female. Others may have simply been more used to divisional manipulation of proposals to meet Group criteria in their past experience.

7.3.3 Group level responses

The Group board was happy for the divisional board to make their formal responses, such that few ? projects may be brought to it for consideration and likely referral. They were obviously aware of the possibility of the informal responses, the first of which had clearly occurred to a limited extent prior to the use of risk assessment grids and the decision matrix.

In order to minimise the latter, the Group board called for an explanation of the risk score and key risk attributes for the project within the proposal document, and would question any area of the risk assessment grid if the assessment did not ring true.
Generally, the decision matrix was seen as helpful and less likely to result in 'massaging', partly as it had opened up a marginal band which had not existed previously. Basically, in the past all projects had been expected to show a return in excess of a single hurdle rate, whatever the perceived risk level was.

It appeared, from comments made by divisional Managing Directors (who were members of both the divisional board and the Group executive team) that the Group board were now placing more reliance on project proposals which fell into the ✔ category on the basis that the divisional boards now spent more time and thought on their proposals. This was illustrated by one divisional MD commenting on the implementation of the grid/matrix in a focus group discussion, who said:

> "I've seen two projects presented [to the Group Board for funding] that used this matrix as support, and there is an automatic buying in to the conclusion in fact".

The formal management responses set out in 7.3.1 above were agreed by managers at both divisional and Group levels in the organisation, and were put into practice and incorporated into the user guide (see appendix 8). Further interpretations and discussion of these results are in chapter 8.

7.4 Learning from Post Audit Reviews

The procedures as implemented added to management learning in two ways. First, to identify key risk attributes at the decision point which would need more management attention in implementing a project. These would be the top two or three attributes in terms of their contribution to the weighted risk score. Second, to add a risk assessment perspective to the post-audit procedures to improve future decision making.

It would be expected that if projects were well managed and controlled they would not only produce target returns but they would not increase on the risk scale several months into the project, but decrease or remain constant when assessed with the benefit of hindsight. Table 7.2 shows a comparison of the results of a post audit group assessment (conducted without reference to the original assessment) with the original risk scores, assessed by team one. Comments were analysed from the post audit discourse to explain the differences.

Table 7.2 - Comparison of Post Audit and Decision Point Assessments

	Decision Point		Post Audit		Difference	
Case	Weighted Score	Risk Ass't	Weighted Score	Risk Ass't	Δ Score	Δ Ass't
1	2.35	Low	2.17	Low	-0.18	Still low
2	1.86	Low	1.60	Low	-0.26	Even lower
3	2.15	Low	2.64	Med	+0.49	Higher risk

Table 7.2 shows the risk scores and assessments made at the decision point in the third quarter of 1997, and at the post audit review carried out approximately six months later. The scores for the first two cases were the same for over half of the twelve risk attributes, higher for one or two attributes and lower for three attributes. With the benefit of hindsight, this pattern is what might intuitively be expected.

However, the third case was assessed as higher risk overall, and significantly so on four attributes. Comments made at the post audit discussion indicated that the project had turned out to be larger and more complex than anticipated and that internal politics had caused problems in terms of the cultural fit of the parties involved. The queries which arose over the base data suggested that the quality of information at the decision point had been poorer than anticipated.

Most of these issues had been picked up fairly early on in the implementation of the project, and it seems likely that the risk level may even have been assessed as higher at decision point plus a month than at the post audit. There remains a question as to whether the risk assessment at the decision point was too optimistic (a view held by the group finance director). Other questions may be whether or not circumstances changed which meant that the higher risk could not have been anticipated, or whether the use of hindsight interfered with the comparison. The hindsight effect cannot be easily avoided in any post audit review process. Despite these possible limitations on the post audit analysis, the confidence shown by organisational members in the risk assessment tool did not waver as a result.

8. DISCUSSION AND REFLECTION

8.1 Interpretation of Results

To go into an organisation with a tape recorder and a flipchart, and face a senior management team with an agenda that included tricky questions like 'What is risk?', expecting meaningful debate to take place in a short meeting, might have filled even the most experienced researcher with trepidation. The results from the focus groups, individual meetings and presentations went beyond what might have been initially hoped for from one organisation, and rewarded the time and effort which had gone into the preparation. This chapter interprets the results in relation to the extant literature, reflecting on both the outcome of inquiry and the process of discovery.

8.1.1 Project risk attributes

The construction of project risk (chapter 5) was essentially the shared repertoire of the UK Industrial Division, tested and validated by the various management teams in the organisation. The glossary of terms set out in appendix 5 reflects the improved definitions of the attributes needed for all teams to understand the twelve attributes and use the repertory grid based assessment technique. Construct validity is primarily assured by the internal process of feedback to participants, and the questioning and challenging of the attributes in the focus group meetings and company presentations.

If one takes Kelly's personal construct theory at face value, no further validation is necessary or appropriate (Kelly, 1955), as the construction is personal to those doing the construing (see appendix 1). According to Kelly, it is possible for a number of individuals to construe something in a similar way, especially where they have shared experiences (range of convenience) and have similar psychological processes (commonality corollary). Whilst this may apply to some or all of the UK Industrial Division managers in team one, it is most unlikely to apply to all managers in the organisation (individuality corollary).

What we observe in the acceptance across the organisation of these twelve attributes is more of an understanding of the construction of others (sociality corollary). Therefore, the attributes now used in risk assessment company-wide, were derived from the constructs which were common to the members of the first team. Accepting that constructs may be personal to the participants, the twelve project risk attributes may also include factors thought to be important by managers in other organisational contexts, which would indicate that similar attributes may be found if the process were replicated. Thus having taken organisational acceptance as 'internal validity', it is also appropriate to consider 'external validity' here.

'External validity' may be seen as the corroboration of the results from this study found in other studies reflected in the literature. Taking the attributes individually, it is certainly possible to draw links with the empirical evidence dealt with in the literature (chapter 2), even though methods of discovery were quite different. Those links are discussed here, by taking each of the twelve attributes in turn.

The first group of attributes, corporate factors, were certainly not industrially specific, and were expressed in general enough terms to be useful across many organisational settings. The literature supports the fact that 'strategic fit', the first attribute, is important in SIDs (Butler et al., 1993; Lefley, 1997; Marsh et al., 1988; Morgan and Pugh, 1997; Morone and Paulson, 1991; Smith and Murray, 1997), but is it part of project risk? Whilst the participants were clear about its place in the risk profile of a project as well as its role as a pre-requisite for a project to be considered, it is not immediately obvious in what way the degree of strategic fit contributes to risk.

In many ways this whole group or 'constellation of constructs' labelled 'corporate factors' came about by participants thinking in terms of the corporate level concerns, and the consequences of proposing a project to the Group board. At divisional level, there were real risks perceived (of having a project turned down, or of taking on a project which has a negative impact on the Group) in proposing a project which may be judged to be a poor fit with corporate strategy, outside the range of divisional expertise, or likely to damage the company's reputation or brand image in any way.

There was a feeling that any projects which were high risk in these terms would normally have been screened out and rejected prior to any 'formal' evaluation procedure. This supports earlier findings (see for example Bower, 1986; Marsh et al., 1988). If one takes Bower's argument that most managers act in self-interest, one can see the personal risk attached to proposing any project with an extreme (negative) position on these factors. At corporate level, there would be greater risk attached to accepting any project outside the stated strategy, as the financial press has a habit of exposing such actions and causing possible stock market reaction, as in one reported case (Marsh et al., 1988, p98).

'Expertise' is far more obviously part of the risk which needs to be assessed before taking on a project, and represents one of the biggest constraints of business growth. Expertise, as defined by participants, embraces both the technical skills and the management capability required for the project to succeed. The former is easier for the divisional team to assess, and possibly easier to control in the longer term. The latter is recognised as part of business risk (ICAEW, 1998).

Divisional management capability would be unlikely to be assessed negatively in a project which would proceed to the Group board, but were it to be purposefully assessed as positive when the team knew of cause for it to be a serious constraint, it would be most likely to be picked up under Group board scrutiny (Marsh et al., 1988). Corporate management capability would be unlikely to be so relevant in a decision about a project to be implemented by a division, unless the project involved a company acquisition (a project type not covered by this analysis).

When considering 'image', it was viewed initially in terms of the sensitivity of the project to 'bad publicity', which shows that managers fell easily into thinking only about the downside of risk (March and Shapira, 1987). Later, when managers were possibly motivated to identify attributes upon which their favoured projects could attract a 'below average risk' rating, they came upon the idea that good publicity could flow from the project.

An example was given of winning a contract from an important and well known customer, which might encourage other customers to follow suit. A revision to the definition of this attribute has accordingly been made (see appendix 5).

Two of these three factors fit closely with two factors felt to be important in SIDs by managers in Butler et. al.'s case companies, namely 'degree of corporate fit' and 'contribution to corporate image' (Butler et al., 1993, p70). Expertise was not included separately in their list, though one may assume that core competences should be taken into account in deciding strategy and assessing 'degree of corporate fit'.

The next group of attributes focused on the 'project opportunity', which to some extent must reflect the type of projects that participants had experience of, in the context of the logistics industry. However, it is quite possible to see how these attributes may be relevant in other organisational settings, for example size and complexity of the project. Possible additional factors may be required in a manufacturing context, for example the effects on product quality and productivity (Butler et al., 1993).

One project assessed by team one which was never implemented, was judged to be particularly risky, in terms of its size and complexity, (factors shared with another UK project which had been implemented, and had performed badly). The scale of the project was not in itself felt to be a causal factor, but obviously had the effect of magnifying the consequences of a poor outcome. The scale of potential loss was a highly weighted factor in Tversky and Kahneman's experimental prospects, which shows that their research subjects were concerned with the scale of outcome in their decision making (Kahneman and Tversky, 1979).

The participants explained how the norm experienced in terms of project complexity had been increasing in logistics generally, but still varied considerably from one project to another. From their recent experience, more complex projects were taking up greater resources at the planning stage, with some projects almost going through a post-decision research and development phase.

In case analysis of R&D projects, Nixon found that some quite sophisticated risk analysis techniques were being used, indicating that risk was recognised as being higher for these types of projects (Nixon, 1995).

Planning timescales were found to be quite long in the cases studied by Marsh et. al. (see chapter 2 section 2.1.4), where projects were traced from initiation to decision (Marsh et al., 1988). Again, the participants explained that planning time was crucial in their context, but typically shortened by clients wanting 'to outsource immediately' and competitive pressures in the logistics industry to gain market share by responding quickly.

The argument that many decisions could be put off in order to keep the company's options open (Allen, 1997) was fundamentally opposed by the construction of planning timescale here, where time was a considerable constraint which came as part and parcel of the prospect.

The projects which participants were used to were dominated by business prospects which presented themselves as packages (though rarely neat ones), which could be taken up (often involving competitive tendering) or not. Whilst there was some flexibility for the company to specify their solution, they were normally responding to a client's logistical problem, on the basis of information supplied by the prospective client. The next section, dealing with 'external or market factors', therefore includes one or two attributes which are fairly context specific.

The 'cultural fit' of parties may be context specific in that the success of logistical operations, which are outsourced, depends on the provider and the customer, and sometimes their customers, working well together. Wherever people have to work together, a whole range of *modus operandi* issues apply. The organisational culture of parties linked strategically is highlighted by Schein as an important factor in the success or failure of the strategy (Schein, 1985), which justifies its place in the attributes assessed in SIDs.

An advantage of using this definition is that it forces managers to think about their own organisational culture, in order to assess any possible mismatch. This does assume that managers may have previously thought about such issues, which, from the discussions, some of the them clearly had not. The risk assessment process became quite tortuous in some meetings when this attribute was discussed by managers who had difficulty construing organisational culture. It was suggested by one team that this attribute should be relabelled 'customer relations', which was perhaps more widely understood across the organisation. Cultural fit, in the case of infrastructure projects, was a broader construct, relating to any contracting parties, not just customers.

The next item, 'quality of information', by contrast, was perfectly well understood. It is also accepted in the literature that the uncertainty inherent in market based predictions can cause information asymmetry in capital investment decisions (Emmanuel and Otley, 1990, p346). Whilst more research may reduce the uncertainty inherent in the cash flow forecast (Allen, 1997), there is often limited time in which to collect and analyse more information. The quality of information, expressed as confidence in estimates, influenced risk assessment in a recent case (Smith and Murray, 1997).

The fact that information is often given by the customer, as outlined above, makes the understanding of this construct quite context specific. Again, within the context of logistics, where working closely with customers, to meet their specifications, the nature of those specifications can be uncertain or difficult to meet. This risk is more often of a technical nature, contrasted with cultural fit (perceived by some as customer relations), which is more to do with people, custom and practice and communications.

However, in discussions on the attribute 'demands of customers', what caused the customer to be demanding (to the point of becoming a real nuisance), was often difficult to verbalise. Managers just agreed that they could recognise an awkward customer when they came across one, and that they could distinguish 'demands' from 'the quality of working relationships'.

It is not easy to find the 'nuisance' factor in literature on strategy, as it is not generally of so much concern to top management, but more to those lower down the ranks who experience the angst of regular contact with customers and who may be held responsible for the sort of problems that arise. However, it does feature under 'customer service' aspects of industrial marketing (see for example Hutt and Speh, 1992), where the risk of not meeting customer needs is often seen as a failure to understand or fulfill customers' service expectations.

'Environmental factors' are more central to both strategy and marketing, but more difficult to construe, as this attribute is an amalgam of several factors. An 'environmental analysis' forms part of any prescriptive model of strategic planning (Dyson, 1990; Mintzberg, 1994; Wilson et al., 1997). Most of these factors would normally have been assessed as part of the annual strategic review (see chapter 3), prior to any project appraisal. This eased specific assessment, as it was a project specific review, with an available 'anchor' (Tversky and Kahneman, 1974).

Using PEST (political, economic, social and technological factors) analysis, was the agreed approach to the assessment of environmental factors which participants used. It was accepted that legislation which may impact on the uncertainty of outcome of a project would be included here. This attribute remained aggregated due to its lesser perceived importance, relative to other attributes, in explaining the riskiness of a project.

The final two attributes labelled 'competitive position' related to the context in which projects invariably involved the negotiation of contracts. 'Negotiating strength' was talked about not only in terms of the specific contracting parties, usually the company and its 'external client' or 'lead client' in the project, but also in terms of the comparative strengths of competitors. Up until the moment that a contract is signed, the business could be lost to a competitor, so it is perhaps a different type of risk to 'proposed contract terms' which deals with the commitment to terms which may (or may not) prove to be favourable. The UK Industrial Division team seemed to be able to differentiate better between these two attributes than subsequent teams.

One management team has actually suggested that only one attribute is needed to reflect the risk attached to contract negotiations. The evidence from the quantitative data, which shows little or no difference between the scores for these two attributes in virtually every project assessed. This would tend to support that either the definitions require revision and clarification, or that they should be merged into one newly defined attribute. The former has recently been agreed.

Other teams raised questions concerning possible additions to the twelve attributes, but after probing their meaning and discussing how they related to existing attributes, they were generally found to be covered by one of the twelve. It is likely that the Group level review of the risk assessment model taking place in October/November 1998 will result in one additional attribute concerned with the 'quality of the customer'.

Finally, when reflecting on the attributes overall, the question of whether or not they are actually all about risk may be raised. It is quite obvious from the discussion of the constructs, that a narrow textbook definition of risk is not being used by these managers. In many ways, what they construe as risk is what academics may call uncertainty, that which cannot be expressed as a possible outcome with an assumed probability or chance of occurrence (Kaye, 1994; Levy and Sarnat, 1994; Lumby, 1994). Thus reflecting this type of uncertainty in the cash flows is not possible. The sort of risk that is being construed here is more about the unpredictability of events.

It follows then, that an assessment of 'project risk' which is based upon these attributes, does not preclude the use of probabilistic cashflow forecasting, as it is not assessing the same thing. These are non-financial aspects which managers recognise and label as 'risk' factors, which fit better with the 'risk drivers' dealt with in the risk management literature (for example Chapman and Ward, 1997, p122) than with the definition of risk commonly found in Corporate Finance literature. A comparative analysis of these factors set out in table 8.1 shows quite a close match.

Table 8.1 Risk Drivers and Risk Attributes

Chapman and Ward's project risk drivers (Chapman, 1997, p122)	Project risk attributes identified in this study (see appendix 5)	Comments on common elements
1 Definition of project	1 Strategic fit & 3 Image	Strategic definition
2 Concept and design	5 Complexity	Technical design risk
3 Financing arrangements	8 Quality of information	DCF assumptions
4 Logistics	6 Planning timescale	Critical path analysis
5 Local conditions	2 Expertise	Capability of local team
6 Resource estimates	4 Size	Scale of investment
7 Industrial relations	10 Environmental factors	eg TUPE, working week etc.
8 Communications	7 Cultural fit & 9 Demands	Customer relations
9 Project organisation	12 Contract terms	Statement of responsibilities

Chapman and Ward's 3rd risk driver 'financing arrangements' may be narrower than the 8th attribute in this study which deals with all the DCF assumptions in 'quality of information', not just the project funding. Their 1st risk driver 'project definition' and their 5th 'local conditions' are broader than their equivalents in column two of table 8.1, but would include the 'corporate factors' (attributes 1 to 3) in column two.

Their 7th risk driver 'industrial relations' has typically been dealt with in this study under the 10th attribute 'environmental factors', which aggregates mainly external factors. Industrial relations are so closely linked to employment legislation in logistics, it comes under the 'legal environment'. Their final risk driver 'project organisation' is partially covered by the statement of responsibilities contained in the contract, though it would also cover the responsibities and task allocation within the firm, as well as between the firm and its customer (or other contracting party).

The 11th project risk attribute 'negotiating strength' is the only attribute which does not have an obvious equivalent in Chapman and Ward's risk drivers (Chapman and Ward, 1997).

It is also one of the attributes which is likely to be redefined in the process model review, and is almost concerned with pre-project risk, or in other words the risk of investing time and effort in planning a project which is then lost to a competitor.

8.1.2 Risk assessment process and consensus

Bower argued that the degree of uncertainty attached to projects varied with three factors, including the type of project, the business sector, and the management profile (Bower, 1986, p12). The business sector was constant in this study, but the type of projects and management teams varied.

After eliciting the risk constructs, and defining the attributes, it became apparent that not all strategic business development projects had the same characteristics. Two types of project were identified at the third meeting with team one, when discussing the relative importance of attributes, which resulted in two sets of weightings. The attributes were reviewed to see whether the different project types needed to be reconstrued, and separate sets of attributes generated. The team did not feel this was necessary, and agreed that the one set of twelve attributes was appropriate to both types, but with different levels of importance.

In subsequent meetings with other teams, the issue of project typology was moved up the agenda, such that project characteristics were discussed first (see appendix 3). This resulted in a third type being added during the action research programme, and two more types to be added later in 1998/99. The timing of project typology early in the development process is reflected in the model shown in figure 8.1 and discussed in section 8.2.1. below.

The initial risk assessments were carried out for three test projects at the first focus group meeting, without too much difficulty. The assessments were reviewed at the second meeting, together with simple average scores (i.e. prior to the weightings exercise), again at the third meeting, when a fourth project was assessed, and again at the fourth, when weighted scores for four projects were presented and a fifth added.

No revisions to raw scores were required by participants, and overall scores were agreed as fair assessments. Each time a triad of projects was assessed, the team worked across the rows of the grid (see appendix 4), comparing projects on one attribute at a time, to gain full benefit from using the comparison of elements (cases). This cemented the construct pathways (Kelly, 1955) and not only reinforced the shared understanding of the attributes, but also establishing norms or 'anchors' for the team to work with (Tversky and Kahneman, 1974).

On reflection, it may not have been so easy to agree ratings in these early assessments, had it not been for three factors. Firstly, team one had a significant number of recent projects, from which to select their three test cases, so had been able to draw upon more collective experience of project appraisal than some of the other teams. Years of experience in the industry (Collier and Gregory, 1995; Smith and Murray, 1997), management profile (Bower, 1986), and the learning and innovation process (Marsh et al., 1988) were highlighted as important in case studies in project appraisal, as well as in experimental research in decision making (Slovic, 1972). This varied from one team to another in this study, and seemed to impact on how easy they found the assessment process.

Secondly, the first team was working with its own constructs (see commonality and sociality corollaries in appendix 1). It was likely to be more difficult for other teams to construe in exactly the same way, which is why it was important to present the attributes at the corporate conference, and to help subsequent teams to fit the attribute definitions into their own cognitive pathways, and discuss and agree their own interpretations.

Thirdly, the first team seemed to work well together, almost adopting a textbook model of consensus building (Adair, 1985; Hall, 1971), and a well developed team dynamic (Handy, 1993, p165). It was not the only team to display these characteristics. From the researcher's perspective, the ease with which consensus was reached by each team, when assessing the risk profile of their own projects, was evaluated (as **H**igh , **M**edium or **L**ow) as shown in table 8.2 below.

Reflection on team dynamics and the researcher's evaluation of the teams' abilitiy to reach consensus is subjective, but was aided by listening to tape-recordings, as well as observations on body language, and language used in informal discourse outside recorded meetings, which was noted as part of the researchers rough post meeting notes. The results are shown across the bottom row of table 8.2.

Table 8.2 Team Dynamics and Ability to Reach Consensus

Team	1	2	3	4	5	6	7	8
Number of members	8	8	5	6	7	8	10	5
Dynamics/consensus *	H	H/M	M	M/L	M/L	H	L	L

* H=High, M=Medium, L=Low

Team size may have impacted slightly on consensus, with teams 3 and 8 finding it more difficult with only five members, which may be counter-intuitive. However, both teams 3 and 8 had a new member, and less experience of working together, and of project appraisal.

Teams 7 and 8 had the greatest difficulty, but both had disrupting influences of recent or imminent organisational change. Team 7 (the largest, with 10 members) had just been through a merger, and the newly merged management team carried a lot of mental baggage, which impacted on their performance. Team 8 had experienced some restructuring, and was just about to lose their Managing Director (the most experienced manager amongst them). These circumstances certainly appeared to impact on team dynamics, as indicated by the Ls in the table, as the management literature suggests it might (Handy, 1993).

Teams 1,2 and 6, all with eight members, worked well together. Especially, in the case of team 2, at their first meeting, the second being affected by a slight change of membership, involving one member who, it turned out, knew he was going to leave the company.

Size of team is noted in the research literature as important, when conducting focus group discussions (Morgan, 1997, p42-43), where 6 to 10 is recommended as an appropriate number of participants to recruit. Eight was also the 'magic number' of team members which Belbin identified in his work on team roles and team effectiveness (Belbin, 1981). This study shows that eight members may work best in this type of setting, but as they were natural teams (not formed specifically for the purpose of research) it was noted rather than controlled by the researcher.

The factors, other than size, which appeared to be linked with high (H) consensus were collective amount of experience of project appraisals, stage in team development (little or no recent change in membership), and positive feeling team dynamics.

The factors which appeared to be associated with low (L) level consensus ability were few recent projects of real strategic importance, recently formed or changed team (still not norming, let alone performing) (Adair, 1986), and a negative presence in the team (generally or vested in one member). The researcher's construction of team dynamics could add personal bias, so this view is offered as a reflection through the lens of the researcher, not as generalisable data.

The academic qualifications of divisional team members were not ascertained, so it was not possible to draw any direct link with this aspect of consensus, as Pike and Zanibbi did (Zanibbi and Pike, 1996). However, the team roles were ascertained (see appendices 2 and 3), and the mix of technical/operations or engineering, financial, and other managers was comparable across the teams.

The stage of the risk assessment process development where there were the most problems with consensus, was not at the stage of rating the projects, but at the stage of weighting the attributes. This is viewed as a problem of research method, in that the technique (borrowed from multi-attribute utility theory), proved to be a little too cumbersome in practice, and would not be used again in the same way (see section 8.3.2).

The time taken for a particular project to pass through the various stages of development and evaluation, from identification of the opportunity to final approval to go ahead, may be considerable. Bower found that the whole process took between one and two years, with three of his four cases taking nearer two years (Bower, 1986, p253).

Precise data was not available to measure the full period for all 25 projects analysed in this study, but sufficient data was available to suggest that the norm was between one and two years, with a few taking less than a year, and at least one taking more than two years. However, it may also be the case that the norm is reducing, as external time pressure to complete negotiations was a particular concern.

The Group executive has made risk assessment, using the model developed, a required part of the project proposal papers. Given the time period during which the risk assessment could take place, timing of the risk assessment was a question which needed addressing, leading to the identification of three alternatives.

The user guide makes it clear that risk assessment is essential at the decision stage, optional at an earlier stage (for 'early screening'), and recommended at the post audit stage. However, there may be a question about the exact timing of the 'decision stage'. Given that the proposal put to the Group board is first considered at a meeting of the Divisional board, usually within the preceding month, the main risk assessment, per the user guide, will normally take place at the point when the cash flow and its underlying assumptions are agreed. The documented assessment will therefore normally be at least one month old when the Group board considers it formally.

The difference between this type of risk assessment (which is non-probabilistic), and the main theoretical approaches (for example Hertz, 1964), is that modelling risk in the cash flow is analysing the effect of risk, i.e. it is outcome based, and this technique is analysing the source or root cause of uncertainties. As Jackson and Carter point out, there is limited opportunity to take remedial action at the effect level (Jackson and Carter, 1992).

The ability to respond to risks and take action before a project is finalised for a Group level decision provides a good reason for project teams to analyse risk at an early stage. In later focus group meetings, teams did take up this opportunity to select a pre-decision case for analysis, which shows that this optional timing may well be taken up voluntarily. Once managers become more familiar with the framework, it is more likely to be used at an earlier stage.

As the assessment is subjective, based on incomplete (as it always is, concerning the future) information, it has been shown to be quite time-sensitive. Such that, it is likely to be assessed differently in some way after the passing of a week, let alone a month. The change is most likely to occur in the rating of an attribute, where additional information has come to light.

However, as Kelly observed, each person's construct system is being constantly updated, as the events and experiences affecting that person are cognitively processed, and networked with existing construct pathways (Kelly, 1955). The meanings of the attributes may therefore be updated in the minds of managers, which would cause them to argue differently when assessing the same project a second time. In other words the facts of the project may have changed, but so might the cognition of project risk attributes. The question arises 'does this matter?'

From a practical viewpoint, the simple answer is no, as the decisions (both at divisional level and at Group level) are not based on proposal papers alone, but backed up by verbal presentations, questioning and discussion, which might be expected to draw out any significant changes occurring since the documentation was produced. What is important is that the date of the assessment is recorded, and identified with the documentation which includes the relevant base case details, since the result of the risk assessment is interpreted together with the project return. This caused some difficulty in projects which were being assessed retrospectively for this study.

It was soon realised by the researcher that the clock could not be turned back in the managers' cognitive systems. When using stimulated recall, and asking participants to assess projects after the decision point, it was not satisfactory to assume that they could recall the project as proposed, without recalling facts and feelings about the project arising in the intervening period.

Temporal stability has been investigated from an academic viewpoint, as it is not uncommon to collect data by seeking retrospective reports from research participants. George Huber reported the results of tests which involved retrospective reports on organisational decisions sourced from 35 participants in a single research organisation who were key participants in those decisions (Huber, 1985).

Data collection was repeated using the same instruments and methods after six months, and found to be 'satisfactorily consistent', particularly in terms of content, when compared to the earlier reports. He contested "that the forces favouring stability of recall are stronger than those that undermine it", and set out to support the proposition that any inconsistency over time was due more to intervening events than to cognitive errors.

His results did support this proposition, and identified two particular response-order biases. Participants mentioned more important information earlier in interview sequences than less important items, and they talked about problem-related items before solution-centred items. This showed that recall was generally reliable, but that the first intervention, together with information gathered in the intervening period had an effect on how people sorted and re-sorted information in human cognitive processes.

This finding matches the experience in this study. Participants focused on the key success factors of a project, and highlighted the critical attributes when assessing it post-decision. Real time decisions were discussed in terms that spanned many aspects, even when following a list of attributes. The few assessments repeated at the post audit stage revealed event-related explanations for any differences.

8.1.3 Decision-making aid

The project appraisal matrix (appendix 7 and chapter 7, p121) may appear to be oversimplifying what are recognised as complex decisions, by reducing the analysis to two dimensions, each with three classifications. Four important points need to be stressed. Firstly, that no single criteria has been found to or might realistically be expected to drive the decision (Ho and Pike, 1991). Neither the IRR, before this study, nor the matrix now in use, will be the sole basis for the decision. Management pay attention to multiple criteria, both quantitative and qualitative.

The second point is that the matrix summarises, for convenience, a volume of data analysed in both dimensions. The IRR is computed from cashflows built up from many variables, and the risk score is arrived at from assessing twelve attributes, many of which are clusters or aggregates of more factors. So, each dimension is multi-variate. Thirdly, the importance attached to the discourse necessary for the satisfactory completion of the risk assessment is greater than the number which results. The number should be indicative and representative of the level of risk and its construction, but the matrix should not be viewed in isolation.

Since there is an overlap in the membership of the project team, the divisional management team, and the Group executive team, there is opportunity for the discourse to be passed on with the risk score. This sharing of information within and across teams has been seen as a mechanism for coping with uncertainty in previous case studies (Smith and Murray, 1997).

The fourth point is that rationales for risk scores are called for in the project proposal document, which may form the basis of questioning, and reduces the possibility of 'game-playing' behaviour, such as making adjustments to input variables in the cash flow analysis (Smith and Murray, 1997). Managers know all about the self-interest and politics of organisational decision making, which still appears to surprise academics brought up in the tradition of normative economics (Bower, 1986).

Senior managers encountered in this study do not hold high academic awards[1], but they demonstrated a high level of knowledge in terms of their industry and the organisations operating in it, in the focus group discussions. This included those participants relatively new in post in this organisation, who generally came in to their management post with significant industry knowledge and experience.

This was particularly noted on more than one occasion when the researcher used a 'household name' company in a hypothetical case in order to explain or illustrate a point in a focus group meeting, and was met with an instantaneous analysis of how the company organised its logistics, where its national distribution centres were, and which company provided its logistics services (whether it was their customer or not). This use of industry knowledge in logistics mirrors the observations in the motor components industry (Carr and Tomkins, 1996) and hotels and catering (Collier and Gregory, 1995).

As a decision aid, the matrix brings together the primary criteria from the financial analysis, in this case, the project's IRR, and the result of the risk assessment, in the weighted risk score. This does not preclude the decision-takers from drawing upon other financial measures such as payback, which is also calculated in this organisation's standard project appraisal procedures. Neither does it preclude other forms of outcome oriented risk analysis such as sensitivity analysis (or 'upside', 'downside' scenarios, as used in this organisation). The matrix brings together the two measures for which managers in this organisation have shown a preference, and so satisfies their preference for these as dominant, but not sole criteria.

Managers in the organisation have collective ownership of their decision processes and support systems. It is argued here that decision tools which they have participated in developing, which reflect their way of conceptualising projects, are more likely to be used in a meaningful way than those which may be 'imposed by accountants', for example probabilistic budgeting.

[1] Based on secondary data sourced from the company's annual report.

The use of matrices fits with the bipolarity of personal construct theory (Kelly, 1955), and is well used in both strategy and marketing (Dyson, 1990; Wilson et al., 1997) to represent choices and trade-offs. The trade off between risk and return used in this matrix may be viewed as conceptually the same as that which underpins so much of corporate finance theory (Levy and Sarnat, 1994; Lumby, 1994), emanating from investment market economics (Lintner, 1965).

The organisation in this case conforms to certain aspects of normative theory in its use of discounted cash flow analysis, but in common with many other organisations prefers IRR to NPV (see table 2.1). Whether using IRR or NPV, participants preferred not to rely upon any single decision rule, but to use alternative appraisal techniques, especially where the financial analysis reveals marginal results.

The managers who participated in this study at divisional level viewed the formalisation of a 'marginal band' as highly desirable. They accepted that the project proposal procedures (chapter 3) which they had been working to, was expressed as 'guidance', thus not ruling out the Group board consideration of a project which narrowly missed the target IRR, but did not actually believe that such a proposal would succeed.

The addition of a recognised marginal band gave them more confidence in the flexibility of the Group executive's attitude towards their proposals. The matrix may not eliminate, but might be expected to reduce certain behaviour found in earlier studies, such as post hoc rationalisation and manipulation of proposals at project team or divisional level (Marsh et al., 1988; Smith and Murray, 1997), which may have been going on to a limited extent in this organisation, more in Continental Europe.

Having reviewed a number of matrix based project appraisal methods in chapter 2 (Bromwich and Bhimani, 1991; Lefley, 1997; Morgan and Pugh, 1997; Wissema, 1985), and identified several shortcomings, in what might appear to be similar approaches, a comparison is made below.

Unfortunately, with the exception of Wissema (whose work was published as a research monograph), there is insufficient detail of these earlier models to enable much comparison. Wissema's scheme (section 2.1.5) is described in some detail, and offered a framework which was highly specified and comprehensive in its coverage of aspects of a project. It was designed in a manufacturing environment in 1942 (when the work was first published in Dutch). Some of the questions posed in his various questionnaires, particularly in the strategy/synergy profile and societal aspects raised issues reflected in the attributes which emerged from this study, but the process model proposed here (figure 8.1), it is argued, is more practical (overcoming Wissema's main shortcoming) and more flexible.

Lefley's financial appraisal profile contains eight measures, including a risk index and a strategic index, but the risk index is simply the highest of four assessed risk areas. Far more detail is given on the financial measures, which indicates that risk may not have been thought through quite as well, and its assessment not structured so much as in this study. The foci of Lefley's study appeared to be the links between strategic and financial analysis, rather than risk analysis.

SIDs are complex, and the type of project and industry are important (Bower, 1986; Piper, 1988). This process model (see figure 8.1) may offer more flexibility than Lefley's in terms of transferability to another industry, because neither the risk areas, nor the criteria on which they are assessed are prescribed. Rather there is a framework proposed here for discovering the relevant constructs, which enables a self-defined structure to be put in place. In that way it has similarities with Bromwich and Bhimani's approach (Bromwich and Bhimani, 1991).

Morgan and Pugh's approach comes closer to that developed here, but again it is unclear how the four 'types of risk' were derived, and what guidance or language managers in Pugh's organisation use to operationalise it. The method by which Lefley's or Pugh's models were developed is not adequately explained (within the limitations of professional journal articles) so it is difficult to gauge for example what involvement non-financial managers had in the development.

Two of the divisionalised companies in Smith and Murray's study incorporated a risk measure into their project appraisal, by including a subjective assessment of high, medium, or low risk, but there seemed to be no clear guidance as to the factors assessed or the assessment process (Smith and Murray, 1997). What this study shares with the four prior studies cited here (Lefley, 1997; Morgan and Pugh, 1997; Smith and Murray, 1997; Wissema, 1985), is the benefit of instigating managerial dialogue on project risk.

The added benefit of the model proposed here is that it offers a method whereby an appropriate context-specific language, verbalised by the managers themselves can be captured and operationalised to make that dialogue more meaningful. Having captured the language and sorted it into a grid based on human cognitive systems, it is easier for others in the organisation to understand the risk assessment being made.

An important aspect of the study for the participating organisation was the training and development of their management teams. In implementing any new decision aid or process, the users need to acquire a sense of ownership and understanding of the techniques involved and the implications for their area of operations. The user guide was written to support management learning at all levels, including the more junior managers who may not be involved in strategic decision-making, but would be involved in project definition and data collection.

Training events have been held to support the learning, initially with the researcher's help, but subsequently the researcher has not been required. This demonstrates the success of cascading, in so far as the FDs in the organisation now have the confidence to run their own training activities in relation to the use of risk assessment grids and matrices.

8.2 Contribution to Knowledge

8.2.1 Project risk assessment process model

The unique contribution of this thesis is:

To show how the repertory grid technique can be applied to the construction of project risk, and to develop a project risk assessment tool for use as part of a group decision aid in strategic investment decisions.

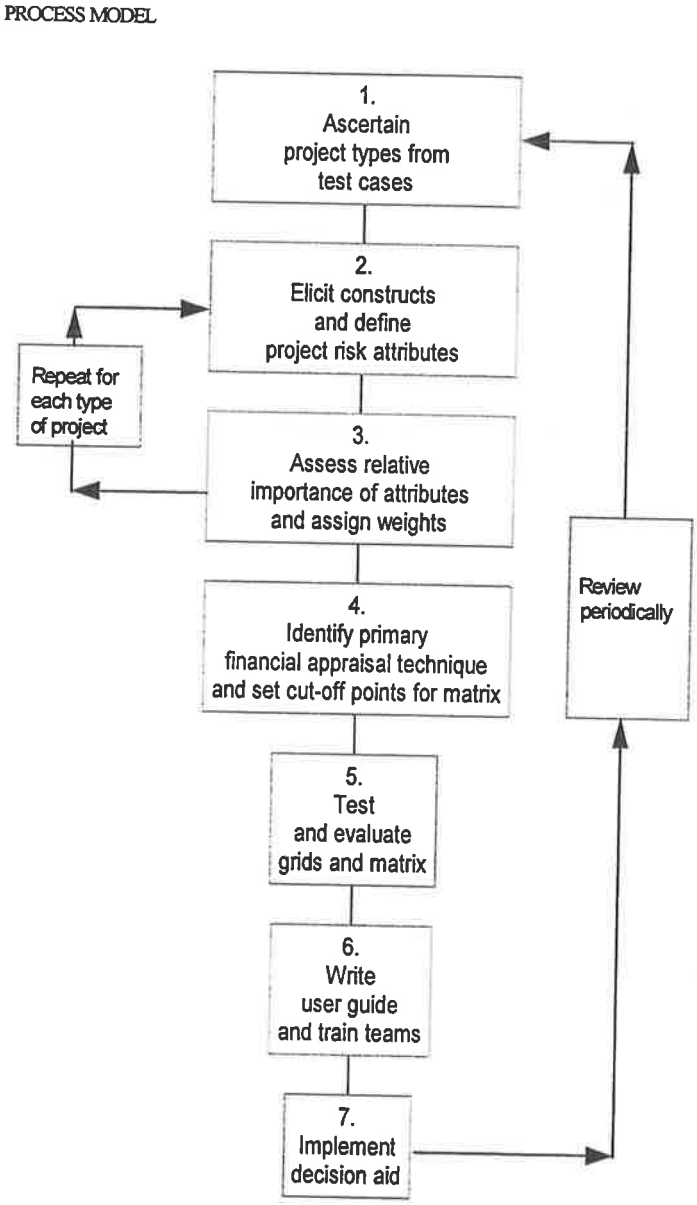
The process model draws on personal construct theory in utilising a repertory grid based framework for practical use in decision making. It has been tested in a single organisation operating in a single industry broadly defined as logistics. The synergy of its business across divisions was important in testing the construct validity.

The flexibility of the framework, and the way it operationalises managers' own cognitive systems, gives it high potential in terms of its transferability to other organisations.

However, it is vitally important to begin with an empty grid and an empty matrix if applying the framework in a new setting. This makes the process model look very simple (see below). There are basically seven stages in applying the process model to produce and use a management decision aid, which are summarised as:

1. Project typology
2. Project risk constructs
3. Weighting of project risk attributes
4. Labelling of matrix
5. Testing and evaluation
6. User guide and training
7. Implementation

Figure 8.1 Process Model



The stages in the process model are shown as sequential in the diagram in figure 8.1, with only two feedback loops. However, it is unrealistic to expect to follow all seven steps without more feedback or feed forward loops.

The previous steps would need continuous review, and the shape of the end result and its usability will be in view throughout as the goal. Step two may be reduced to reviewing prior constructs when repeated for the second and subsequent type of projects. An additional approval stage may be required in between steps five and six, involving a presentation of the results of evaluation and a draft user guide, before senior management agree to implementation. As any business manager, consultant or researcher will know, apparently simple models may actually be difficult to apply for many reasons, in a real and complex context.

The complexity comes from the setting, in terms of the type of business, the type of projects, the type of organisation structure, and the background and behaviour of the management teams. Logistics is a fairly complex business, but not extremely so, when compared with many manufacturing operations.

There are now two more types of project under consideration, in addition to the three identified and tested so far. Five types of project may be more or less than might be found in other organisations, but could in fact be quite representative.

Managers in other organisations may work well in teams, or may require some training, particularly in consensus building, in order to benefit from using this group process. The ability, understanding and skill of the facilitator is of course important, if the simple model is to be applied properly in any unique setting, with successful results. What is meant by properly is with due regard for the method and its underlying theory, and cognisance of its limitations. Success in this context is the fitness for purpose of the completed grids and matrices, in the eyes of the managers who will use them. In diversified organisations, more than one set of constructs would be required in order to cover the business specific as well as generic constructs.

There is a danger inherent in using a commonly labelled grid for diverse management teams in different organisational settings, as they are most likely to construe project risk in different ways, and would not therefore have the ownership and understanding of the attributes (conceived by others) necessary to gain full benefit from its use.

8.2.2 Insight into qualitative aspects of risk

In investigating project appraisal in a natural setting, many aspects of process, protocol, techniques and organisational culture have been observed. By undertaking a detailed study in a single organisation over a period of more than two years, a rich picture has been built up, which whilst context-specific in many ways, contains brush-strokes and colours which may be found in alternative settings.

Having embraced a theory derived from psychology (Kelly, 1955), an approach to field work derived from psychology (Lewin, 1963), and having viewed the data from more of an interdisciplinary viewpoint than many earlier accounting-oriented studies, the results may be of interest to a broad range of academics. From a management perspective, there are insights into the management profile, structure, and control systems in place in this organisation, and of marketing analysis, and financial techniques employed. From a behavioural perspective, there are insights into group processes and consensus, and the application of a psychological method of enquiry.

The successful testing of a process model which draws upon methods from one discipline (psychology) to solve a problem created by another (if management is viewed as a discipline), in a way which links up to techniques derived from another (finance, itself derived from economics), may encourage others to step outside the boundaries of their discipline in viewing their research questions. Others may be specifically interested in the logistics sector, which is a dynamic and fruitful sector for studies of a technical, transport, and environmental nature. This study provides some insights into the way business is conducted in the sector, and the way projects are perceived by managers, many of whom have previously worked in other organisations in logistics.

8.3 Reflection on Research Process and Methods

8.3.1 Repertory grid technique

The repertory grid technique (RGT) was not used without reference to and acceptance of the corollaries of the underlying theory of personal constructs (see appendix 1 Kelly, 1955), thus avoiding a common failing of researchers to use RGT as an instrument to explore ideas inherent with contradictory assumptions (Fransella and Bannister, 1977). An exploration of and reflection on the philosophical underpinning of constructivism (see for example Gammack and Stephens, 1994) revealed a good match with the researcher's ontological and epistemological beliefs, which meant that RGT was used in a constructivist spirit.

The fact that the organisation (normally the divisional FD or MD on the team's behalf) chose the test cases (*elements*), rather than the researcher, had three benefits. Firstly, projects were chosen which all managers participating in the focus group meetings were judged to be familiar with (therefore the cases were within the team's *range of convenience*), which the researcher was in no position to judge.

Secondly, as the researcher was not selecting the elements, it was possible for projects to be included where the selectors preferred the researcher not to see the full proposal documents, with potentially sensitive and confidential information. The fact that such documents were not demanded by the researcher (though around half were provided voluntarily) appeared to give those responsible for confidential information some initial comfort when agreeing to participate in the research in the first place.

Finally, and perhaps more importantly, participants did not need to worry if they said things in the tape-recorded discussions which may have contradicted what was said in the formal documentation presented to the group board. They understood that the researcher was more interested in their thought processes, hopes and fears about the projects than in trying to catch them out or pass judgement on decisions and statements they had previously made.

In allowing teams to self-select their test cases, it was important to explain the research idea, objectives and outline of the process beforehand. The dilemma was in deciding how much prior explanation to give. Too little and there was a risk of either non-cooperation or a difficult gap between participants expectations and experience, which could impinge on the success of the meeting. Too much and there was the risk that the researcher could contaminate the data, by influencing participants' pre-meeting views so much as to find the researchers ideas and constructs emerging rather than those of the participants.

The only information given prior to the first focus group meeting was an outline research proposal, set out on a single A4 page, presented first with a letter and then at a brief meeting with the Managing Director (which also served to provide initial company information for the researcher to appreciate the organisational setting), followed by a short briefing (verbal exchange) with the Finance Director to explain the request for and desirable basis for selection of three test cases. Both meetings were necessary to gain access to work with the full management team, though an early positive indication was given when the researcher first met the Managing Director[2].

The dilemma of how much information to give participants continued through the study, in focus group meetings with the first team (deciding how to explain the tasks or steps involved in the RGT process, how to prompt and steer the conversation, and how much help to give in resolving any conflict in the group). The researcher took as minimalist a stance on this as possible, particularly early on, at the construct elicitation stage. However, more information was demanded and presented, when first widening the research to Continental European participants. Partly due to suspicions about 'people from head office' with whom (in their eyes) the researcher was associated, and partly due to a post demerger reorganisation which was taking place at the time, it was deemed necessary by the new Group Chief Executive, for the researcher to win support for the research project, on its own merits, to assure full participation.

[2] At a nationally organised Innovation lecture where a mutual interest in innovation provided an excellent opportunity to suggest an action research collaboration

The need for a mini-presentation about the nature and objectives of the research to team two at their first focus group meeting, made it difficult to replicate the RGT process exactly with this and subsequent teams. However, support was quickly gained, especially after the corporate conference (see appendix 3), to enable the validation of constructs already elicited, and an exact replication was not needed. The process of successfully validating a set of constructs and sharing the information and understanding of them by producing and disseminating documentation has been illustrated (see for example Gammack and Stephens, 1994, p85). Success in this context is evidenced by continuing (after the researcher has 'left the field') use of that documentation.

Kelly (1955) suggested that twenty to thirty constructs may be required to classify the concepts relating to the focus of convenience (subject matter of the study) satisfactorily, whilst Gammack and Stephens suggest that fewer often suffice, especially when working in a practical rather than abstract domain. There were twenty to thirty possible constructs elicited at the first meeting. It was only after further discussion, where bipolar terms were agreed, that some possible constructs were either removed or aggregated, in order to arrive at a set of agreed attributes, of sufficient importance, relevance and consensus.

The process of assigning weights to reflect their relative importance confirmed the set as twelve. A set of ten attributes had been recorded by the researcher and played back to the team, who argued for two more to be included, based on their interpretation of the previous meeting. This served as a salutary lesson for the researcher, who had printed off sets of ten for participants, which required editing for future use.

The twelve project risk attributes were essentially the 'product' of the first team of participants in the UK Industrial Division. Whilst the Continental Europe Steering Group underwent a similar exercise, they were allowed to know the attributes which had emerged from the UK, thus they were largely working with the construction of risk of other managers rather than their own.

As one member of the team was present at both the UK Industrial and the first of the two Continental Europe Steering group meetings, the exercise could not be replicated exactly. Replication of construct elicitation is more important where a number of individual constructions is to be compared by statistical analysis. Since that was not the plan in this study, and qualitative analysis was used to gain more of an insight into the consensus on project risk construction of managers, validation became more important than replication.

The level of consensus on the constructs and their meaning, in the context of different teams' experiences was very high. Initial exceptions, were resolved after further discussion, and 'localised interpretations' of attributes emerged, which fitted those contained in the user guide. However, as Gammack and Stephens point out, "not all constructs are equal and the investigator must attempt to ascertain which are truly relevant" (Gammack and Stephens, 1994, p87). The relative importance of constructs proved to be the main methodological concern.

It was not until several teams had attempted the weightings exercise, to assess the relative importance of the attributes, that the lack of consensus described in section 8.1.2 above on this aspect was discovered. The difference in the numeric values assigned by different teams could have been symptomatic of either poor understanding of constructs (and therefore poor construct validity) or a weakness in the weighting technique. Construct validity appeared to be high, as did the consensus that the overall weighted scores reflected the teams' views on the appropriate risk category for the project. The impact on overall risk scores found by applying the different sets of weightings was negligible, with often no difference at all. However, the semantic difference was a concern, which was taken up at Group level.

The meeting with the Group executive team in Northampton in August 1998, was originally planned for the approval of the 'final' definitive version of the user guide, and as an opportunity for the researcher to gain feedback as to how *the process* had been working from their perspective.

The main amendments to the user guide were agreed, and there was some very good feedback from those members of the team who had been involved in the research and in post long enough to have seen the impact on the quality of proposals being presented to them from the divisional teams.

However, two issues prevented the final approval of the definitive user guide at that time. The first issue (raised by the researcher) was how to deal with the difference of opinion found on weightings across the group, which it transpired was not feasible to resolve in the short time allocated in the meeting. The other issue (raised by the Group Chief Executive) was the fact that during the two year period of the field study several changes in personnel had occurred at Group level. The relocation of Group headquarters in 1998 and the settling down after the 1997 reorganisation had resulted in only half of the August 1998 membership being the same as in October 1997, when *the process* had been presented at the corporate conference.

The way forward agreed was for the researcher to return to facilitate a further focus group meeting, with the current Group executive team, after new members (including a new Group Finance Director) had learned more about *the process*, to discuss and agree the weighting of attributes to be included in the definitive user guide. The following section reviews the effectiveness of the method used to weight attributes, and suggests the way forward.

In reviewing the results of the use of RGT in this study against the literature (Fransella and Bannister, 1977; Gammack and Stephens, 1994; Kelly, 1955; Rugg and Shadbolt, 1991), it has proved to be a very successful technique in this application. Indeed, the practical value of the RGT has been such a methodological success in achieving the research objectives, that the process model and insights (described in 8.2 above) owe much to it. It has satisfied the dual purpose of investigating managerial perspectives on project risk and providing a tool for practitioners to use in project risk assessment.

8.3.2 Multi-attribute utility theory

Multi-attribute utility theory was drawn upon to provide a supplementary technique for weighting a number of attributes deemed to be of unequal importance. The plan set out in section 4.4.1 of this thesis seemed suitable in terms of a prioritisation scheme, which turns qualitative human judgement into quantitative measures.

The system of scoring out of 100 may have been applied, as by Morgan and Pugh, without reference to any theoretical basis (Morgan and Pugh, 1997). However, in planning this study, the answer to the question of 'why a scale of 1 to 100 applied in this way?', was that if it works in cost benefit analysis (Huber, 1980), why not here? Had the researcher had more personal experience of applying cost benefit analysis, the practical difficulty discovered here may have been foreseen. As partly explained in section 8.1.2 above, managers found the large scale difficult to reach consensus on.

In cost benefit analysis, it is usual for representatives of interested parties, now referred to as stakeholder groups, to assess non-financial issues by attributing scores and weightings. However, whether or not these participants discuss their views, no attempt is made, in the theoretical framework set out by Huber, for consensus to be reached. The individual scores are then averaged to obtain an overall score, which may not match any individual view, or consensus view if one were obtained.

In attempting to apply this system in a group process where consensus and shared understanding were required, it fell down by giving too wide a choice (1 to 100) to gain agreement. When tested with the first team, the problem was not so great, as the members worked extremely well in consensus-seeking mode, and were applying the weights to their own constructs. The shortcomings became more apparent when using the system with subsequent teams, who were not so practised in group decision making processes, working with constructs they had only partly internalised, at that stage, and in Continental Europe were often working in their second or third language.

The system tested later, which is still being evaluated, using a five point scale, fits better with the scoring system, and appears to achieve the aim in a more straightforward way. What was interesting was that team 2 used a three level classification system, before assigning weights, as an intermediate step, because they found the 1 to 100 scale too difficult to apply in one step (page 113). In the constructivist spirit which guided much of this study, it seems reasonable to adopt a system which fits with participants' preferences and more naturally with psychological processes.

It also follows that as prospect theory has shown up the shortcomings of subjective utility theory, by showing that people do not think probabilistically (Kahneman and Tversky, 1979), and prefer to use anchor and adjustments, and rules of thumb (Tversky and Kahneman, 1974), then they may prefer a five point scale to help them differentiate levels of importance or preference, to a 100 point scale. Where a 100 point scale was used, teams did not use more than half a dozen values, avoiding any which were not divisible by five, and using mainly values divisible by ten.

The importance of this supplementary technique was not great in terms of the overall process, and whilst changing the system is making it easier to use, the impact on calculated risk scores has been negligible. The consequences in the organisation have been to test the new system and await board approval to change the user guide. For the academic outcome, the process model outlined in section 8.2 above has been adapted.

8.3.3 Focus group processes

Focus group processes generally worked well for several reasons. Firstly because the researcher was used to facilitating group discussions in a management development context, and had established appropriate skills and an action learning style. This had been practised with groups of similar size, managerial level, and demographic distribution to those encountered in this study. The term 'demographic distribution' used here covers the range and mean age, educational background, gender, ethnicity and social class. The researcher had experience of working with MBA students from most European countries, though always in English.

The participants were used to working in teams, and attending loosely structured and formal meetings, though two teams were not used to regularly working in English (French and German). The French team prepared themselves well by having acquired a copy of a previous presentation, and having it translated into French prior to their development meeting, and by having their Managing Director's personal assistant (a skilled linguist) attend the meeting in case any translation was required. In the event, their English was better than they thought, and the meeting proceeded smoothly.

The situation in Germany was different, with a smaller group, with less experience of the subject of discussion, and a poorer command of English. These factors were further compounded by their management style, which was more formal (using each other's surnames and titles) and far less consensus-building. They volunteered their opinions, but did not seem motivated or used to seeking agreement.

Instead they seemed to expect their leader to pronounce a conclusion, which he may normally have done in their past experience, but did not seek to do in this meeting, in the knowledge that he was soon to leave the organisation. This comment on their style is not intended as a criticism, but as an observation, which matches to a large extent the experience of other UK researchers who have undertaken field work in Germany (see for example Lawrence, 1988).

Using Holloman's analysis of people in terms of whether they use their heart or their mind or both to guide them in decisions (Holloman, 1992), the French seemed happy to use their hearts, the Germans preferred to use their heads (as 'economic man' in Simon, 1957), and the English were keen to use both. This is of course a very simplistic generalisation, though the qualitative data may be viewed in this way. How it impacted on focus group discussions is difficult to separate out from other factors, for example size of group (see 8.1.2 above).

Reflecting on the meetings, with the aid of tape recordings and the researcher's notes, in terms of group dynamics, few if any of Janis' groupthink symptoms (see page 67) were observed.

On one or two occasions, there were signs of some pressures toward uniformity, which may have been interpreted as 'self-censorship of deviations from consensus' or 'shared illusion of unanimity' (symptoms five and six of Janis' eight) but they could equally be interpreted simply as members being happy to move on down the agenda, accepting the majority view on a particular detail. As consensus, not unanimity was sought, this is not seen as a weakness in the method (see section 8.1.2 above regarding consensus).

In one or two teams, there was a 'lack of norms', which was the only one of three antecedent conditions identified by Janis. This proved to have more impact on the focus group meeting, in terms of it over-running the allocated time. However, it was not a major problem, as members were willing to stay and complete the agenda, and benefit from the learning process, however slow their progress was. One meeting ran for six hours instead of three to four, and several over-ran by an hour or so. Whilst it can cause some fatigue to set in, amongst the team and the facilitator, it was worth it to both parties to sense the satisfaction of having completed the planned task. Only rarely did anyone leave the meeting for more than twenty to thirty minutes.

8.3.4 Action research

Action research is a term which is perhaps misused when alternatives do not suit the style of research being discussed. It may not always be practised within the true spirit of its Lewinian foundations, or with sufficient appreciation of its psychological underpinning. It is often dismissed, by academics as uncreditworthy and indistinguishable from what may be termed consultancy. Similarly, consultancy tends to suffer from the reputation of the worst rather than the best consultants.

Management consultancy can be seen as sharing the same roots, in terms of gaining access to the 'psychological life space' of organisational members in order to learn (Lewin, 1963,p62), which Schein draws upon in his model of process consultation (Schein, 1987).

Since many of the methods, analytical techniques and skills used by management consultants and action researchers may be the same, it is worth reflecting on the differences. There are several factors which distinguish action research in this case. The first is the identification of the topic of interest and formulation of a research proposal prior to selecting a suitable collaborating organisation and negotiating access. The second is the dual purpose sought by the researcher and wider academic community as well as by the organisation in terms of learning and management development.

The third, a focus on data collection which is primarily aimed at answering the researcher's questions (though participants' questions contribute to the detailed agenda which evolves) in the spirit of cogenerative learning (Elden and Levin, 1991). An even more important factor which distinguishes action research from consultancy is the theoretical knowledge base which the researcher constantly refers to and updates throughout the field study, and which is used to triangulate, or relate findings from the observation of practice to the extant literature. This is highlighted in the top section of the diagram of the action research process which emerged, shown in chapter 1 (figure 1.1, page 6).

The process consultant may be concerned with internal validity, to ensure that the client has sufficient ownership and understanding of the results to utilise the solutions developed, but is not generally concerned with external validity, or publication of results and instruments for the scrutiny of the academic community. The consultant's reward is not generally recognition for scholarly achievement, and the furtherance of their discipline or domain, but the commercial exploitation of ideas as a source of income generation.

To summarise, it was the agenda, goals, focus of inquiry, reference to relevant literature, including that on research methods, which differentiated this action research programme from a consultancy assignment. However, in reflecting upon the success of using an action research methodology, the key factors included the utilisation of the researcher's consultancy skills, and the level of 'client satisfaction' with the results.

The good philosophical fit with personal construct theory, the repertory grid technique and the psychology literature on decision making was felt to make action research a good methodological choice in investigating the research questions in this study. It would have been more difficult to operationalise without the structure of RGT, and without the commitment of the Group Chief Executive and his management teams to participate in so many focus group meetings and tolerate the intrusion of a researcher.

8.4 Limitations of Study

8.4.1 Organisational setting

The targetted industrial sector proved to be a good choice for the study of SIDs as it continued to grow in terms of market size, with the continuing trend for businesses to outsource their inbound and outbound logistics operations. This meant that most providers of logistics services would have had significant opportunities to grow their business by making strategic investments, even if they did not increase their share of the market during the period of this study. Other sectors, for example computer systems services may have provided similar growth opportunities, but not necessarily with capital investment in the same order of magnitude.

Within logistics several organisations may have been selected for this study. Indeed the original research programme envisaged, would have involved a division in more than one organisation. However the aims of the research were better served by working with several divisional management teams in the first organisation, since this afforded greater opportunity to playback the results to participants to gain feedback, and develop the emergent risk assessment process model through to successful implementation. Access was gained to begin a similar research programme in another large divisionalised organisation in the logistics sector. Preliminary meetings were held in October and November 1996 with the MD and FD, and agreement was reached that research could begin after their busy Christmas period.

The plan was to replicate as closely as possible the research which had been started in the first organisation in order to validate the results. In the event, group discussions did not go ahead, partly due to the outcome of and commitment to the research in the first organisation, and partly due to a hostile take-over bid for the second collaborating organisation early in 1997. However, the information gained from the two individual interviews, where questions were asked about project types, SIA criteria and risk analysis methods served three purposes.

Firstly, the project types talked about were similar. Two types were identified, which were logistics operations (business development) projects, and 'other' projects, which fitted with the 'external client' and 'infrastructure' projects analysed here. Secondly, it was apparant that the former were seen as more risky and demanded more management attention and risk analysis. Risk analysis appeared to have been developed for new projects, but how much was in the minds of managers and how much was documented as a routine process was unclear. What was clear from these tentative discussions was that risk was on the management agenda and the two managers interviewed were keen to develop their team discussions on the subject.

Finally, there was the prospect of using this organisation as a contingency plan, as they indicated that collaboration might be possible when things settled down after the take over. In case these managers lost their posts in the restructuring and the opportunity to collaborate was lost, a further potential company was targetted later in 1997.

This time it was the logistics division of a large retail group, which would have provided a less competitive scenario, but with an interesting link between corporate headquarters and the division. The researcher's contact, recently appointed as Logistics Director, had previously been the Finance Director in the main retail operation, and was well known (in management accounting circles) for a critical view of traditional textbook approaches to financial management and the need for more innovative approaches.

By the date of my meeting with this Director in January 1998 it was clear that no further collaborating organisation should be required for this study, as the testing of constructs and the grid had been established with five management teams, with three to five more on the horizon. Also issues of comparability across different organisations would have been greater than those across one Group. Though the organisation participating in this study is not held out to be representative of the sector, other than in broad business classification terms, it is thought to be generally fairly representative by an independent industry expert[3].

One of the features of the industry confirmed by this source was the mobility of managers within it. In this study, the turnover of members in the divisional management teams is estimated at 20-25% over the two year period. Incoming members were usually recruited from within the industry, which means that a number of participants in this study came from other organisations in the sector during that period. From what could be gleamed from the discourse at the corporate conference, most of the top 100 managers in this organisation had experience of working in other logistics companies, and approximately 40-50% had such experience within the last five years. The project risk constructs identified are therefore likely to be quite representative of those which may be found in the logistics sector generally.

The participants in the research demonstrated sufficient satisfaction with the process to suggest that it would work with managers in other sectors. However, the transferrability of the process model has a number of limitations, which may be drawn from the analysis of data and literature discussed earlier. They are dealt with under the headings of participants, project typology and the role of the researcher.

8.4.2 Participants

The majority of participants in this study demonstrated experience of the industry, their organisation and appraisal of strategic investment projects. However, the level of experience did vary, which led to some minor difficulties in executing this study, in

[3] The Head of Coopers & Lybrand (as it was then) Logistics Consultancy, responsible for compiling the top100 British Transport Companies survey (published in the Motor Transport magazine), now also Head of the Cranfield Centre for Logistics Research, was consulted informally in May 1996.

terms of the protracted length of some focus group meetings, and the ability of the less experienced teams to construe project risk. Kelly's 'range corollary' manifested itself in terms of the contribution that managers with limited 'ranges of convenience' could make to discussions (see appendix 1).

To a lesser extent the 'commonality' and 'sociality' corollaries necessarily limited the consensus capability of some teams (see section 8.3.1 above). The implication for the study is that for it to be replicated successfully, the experience of SIDs and the stage of development of the management teams would need to be ascertained in advance. Had this study started with a particular Continental Europe management team, the resulting construct system may have been somewhat different, and the process of elicitation more tortuous.

Other limitating aspects concerning the different personal and team characteristics of participants include the potential threat to a consensus based group process of a dominant personality, a language barrier, the size of the team and group dynamics. These features are similar to the constraints identified by Lewin in 1947 in his paper on group dynamics (Lewin, 1963, p193). These were discussed in sections 8.1.2 and 8.3.3 above.

Ideally for this process model to work well, groups of six to eight reasonably homogeneous managers (in terms of language, background and culture) are required. Fortunately for this study, business selection and training processes appear to create such teams rather well.

8.4.3 Project typology

This process model has only been tested on three types of project commonly found in logistics organisations, which may all be broadly described as business development, and due to the nature of logistics, most fitted a market penetration and segmentation strategy, involving organic growth. The slightly more rare project types of business acquisition and research and development projects have yet to be tested.

However, as outlined in section 8.2.1 above, the 'empty grid and matrix' (appendices 4 and 7) offer the potential to deal with these types just as effectively, but with the expectation that different constructs would emerge and different labels may be needed for the matrix. For example, shareholder value analysis (SVA) might be the primary financial appraisal technique in business acquisitions rather than a single IRR measure. An expected present value (EPV) based on probabilistic cash flow analysis might be the primary financial appraisal technique in complex R&D projects.

The key point is that project types should be identified early on, which accounts for one of the differences between the anticipated model set out in chapter 4, and that presented in section 8.2.1 above as the process model which emerged from the study.

8.4.4 Role of the researcher

The role of the researcher in this study was a demanding one, which is mainly due to the research design (which may be seen as self-imposed) and the interdisciplinarity of the topic as reflected in the literature and necessarily inherant in the context of the natural managerial setting. Such demands are often avoided, particularly by novice researchers, by mapping out a more tried and tested route to the discovery of knowledge. For example carrying out a survey which replicates an established instrument in a new environment, from a distance. One might argue that can be equally demanding in a different way, as it may call for high level mathematical skills (which this study did not), and many hours of computer-aided analysis.

What was called for here was a high level of consultancy skills to operate successfully at both divisional and group board levels in a dynamic business environment, and an affinity with people, both as a personality trait, and as developed through holding a number of managerial positions oneself, albeit in a different industrial sector from the participants. An ability to think on one's feet and respond appropriately to unexpected events, either human (e.g. conflict in the management team, or the unexpected early departure of a member) or technical (e.g. failure of the recording equipment) during a focus group session.

The conduct of a focus group might be likened to an experiment without a control group. It is difficult to control for all eventualities in a naturalistic setting, which may be seen as a limitation of this style of research. It is argued that the richness and depth of discovery more than adequately compensates. However, the role of the researcher may be seen as a controlling mechanism, in that group discussions are steered (though only loosely, especially at the elicitation stage), teams are briefed and debriefed (more thoroughly at the testing, training and implementation stages). The researcher must choose the level of briefing of participants and controlling of focus group discussions.

In this study the researcher was guided by Morgan[4], who provides some practical tips on 'moderating' focus groups, and the level of 'moderator involvement'. The rule of thumb, based on descriptive statistics of focus group research is for a high level of involvement (Morgan, 1997, p34). Where participants are strangers (both to each other and to the 'moderator', which is common), a high level of involvement may be needed to get the discussion started and keep it moving, and relevant. Morgan's experience is mainly with social groups drawn from the general community, who in the main would not be used to participating in this sort of discussion group. With business managers who are well used to, and often trained to work in teams, the role of the 'moderator' may be less disciplinarian.

The role was also influenced by the combination of focus group methods with the use of repertory grid techniques. Probing questions which are used in 'laddering' to clarify constructs and their place in the hierarchical structure of cognitive maps, are usually used in one-to-one RGT sessions (for clear illustrations see Rugg and McGeorge, 1995). The use in this study of group repertory grids and group discussion demanded a mix of interview management skills, and an ability to move along the low to high involvement continuum (in both directions) as situations arose. Given the group situation, Morgan was slightly more useful, as was the researcher's experience of facilitating learning sets and small group tutorials, in guiding the style of questioning.

[4] At the planning stage the 1988 (1st edition) was used. Later, the 2nd edition was used to guide the last few focus group discussions, and reflection (cited throughout thesis as Morgan, 1997).

A checklist, drawn from Morgan, was used by the researcher prior to each session. The researcher had to begin the first session with each team by trying to build a rapport with team members. The most useful practical tip from Morgan was to "avoid stifling discussion by asserting 'too expert a profile' at the beginning" (Morgan, 1997, p49). The researcher was used to asserting an expert profile in training and consultancy situations, but took care not to over-egg the academic pudding with these participants, many of whom had no formal academic qualifications themselves.

Whilst it was necessary to emphasise how the research would benefit the organisation to gain access, it was necessary to explain the incomplete knowledge about SIDs and need for participants' contributions for research purposes to pursuade the teams to co-operate, particularly with a tape-recorder in the room. At the first session, only minimal information was given to participants about the details of the research, as the researcher decided to attempt to get participants talking as soon as possible, and give an opportunity for questions about the research later. On reflection this appears to have been a good choice, as participants engaged in discussion about their projects readily, and found the session interesting enough to ask for more information about the research at the follow-up meeting.

A few ground rules were given, but the assumption the researcher worked on was that experienced managers ask if they are unclear about how to proceed (based on working with many DMS and MBA groups over the years). This assumption held in the main, though a few less senior or less experienced participants required more guidance. It was clear from preliminary discussions that there was a strong 'task culture' in the organisation, which called for task or activity briefs to begin each 'agenda item'. These were put up on a screen in the form of the aim of the task or a short question to focus on, and a brief suggestion as to how the team might approach it. An example being "What is the relative importance of these attributes ? - please rank in terms of their relative importance by assigning 100 to the most important and a number between 1 and 100 to the others"

Where teams consisted of eight or more members, as the first two did, the researcher suggested that they form two smaller groups for preliminary discussions (during which the researcher observed each subgroup and answered any questions raised), before pooling their ideas as a full team.

These 'subgroup' discussions took the pressure off the researcher for short periods, allowing notetaking and 'detached observation', which outweighed the disadvantage of poorer quality taped sections, and possible loss of whole team consensus. Contrary to the fear about lack of consensus, this tactic seemed to help, firstly in allowing more than one view to be voiced at a time, and in encouraging every member to participate.

These mini-brainstorming sessions were less formal than researcher-led full team discussions may have been, and with less obvious attention by the researcher, fellow participants (and the tape-recorder) to their comments, participants were placed into a 'comfort zone' early on. Working with smaller teams later on, the researcher did not attempt to split them, which may have contributed to the lower efficiency and therefore longer sessions, as well as to 'facilitation fatigue'.

On reflection, it might have been better if participants in these smaller teams had been asked to address each task individually for a few minutes and jot down their thoughts before beginning the group discussion. The researcher had overlooked this particular suggestion by Morgan on reading the first edition. It would be useful to test this approach if the research were to be repeated.

Key attributes of a successful field researcher in management include exuding a certain amount of confidence, perhaps more in the research design than in oneself, in order to build trust, and the open-mindedness and flexibility to deal with the unexpected. One of the joys of the role of researcher in the field is actually not knowing exactly what will be found, and making an unexpected discovery. Rather like visiting granny's house and discovering unknown treasures in the attic, it appeals to the child-like inquisitiveness which adults may not always display.

9 SUMMARY AND CONCLUSIONS

This chapter summarises and draws conclusions from the literature, from the results of the action research programme and on the methodology and limitations of the study, and suggests ideas for further research.

The literature reviewed in chapter 2 may appear to be quite extensive, but it is by no means 'complete', in that there are many more references which might have been included, especially if another researcher were to undertake a similar study, and view the literature from an alternative perspective. Each reader is likely to take a different view, as their prior knowledge and personal constructs relevant to the foci of the thesis will vary.

From chapter 2, the main conclusions are that risk and uncertainty are perceived differently by academics and practitioners. Practitioners talk about risk more from a causal perspective than as an effect on financial outcomes. Causal factors may be more difficult to analyse, but are potentially easier for managers to react to. Much of the literature, especially in the Corporate Finance area, defines risk as uncertain outcomes which may be measured in terms of effect and chance or probability of occurrence. Most attention, in terms of practical guidance, has been given in terms of cash flow forecasting and estimation of probabilities.

Each normative theory of SIA, criteria or risk return model makes assumptions which do not always hold, and prescribes a narrow discipline bound remedy, which at worst is unusable, and at best provides only a partial solution. It is unsurprising then that surveys report more use of multiple methods. Cynics might argue that normative theories have no use at all, as, even if organisations and the accountants in them purport to use such techniques, there is evidence that it is people, with their human information processing, who actually drive decisions. The conclusion reached here is not so extreme.

There is a place for financial appraisal techniques such as NPV and IRR, even CAPM and monte carlo simulations, where the type of project and context warrant their use. However, the study has shown that there is also a place for cognitive analysis techniques to supplement the multiple financial techniques available.

A mix, which Butler et al found suited their research subjects best. Most modern writers acknowledge the role of managerial judgement and human intuition in decision making, but few attempts have been made to capture and harness the conceptual or subjective side of management decision making in a way that complements the so called 'objective' techniques.

Whilst the textbooks may describe discounted cash flow techniques as 'objective', and rules of thumb or managerial judgement as 'subjective', this thesis suggests that in fact each may be both. In so far as subjective estimates are made about operational variables and assumptions which are input to the cash flow model, DCF may be seen as quite subjective. As this study, and others undertaken in a constructivist vein show, the qualitative aspects of investment projects, which concern managers, may be made more objective by introducing a framework for cognitive analysis.

Attempts have been made to bring the two together in some field studies, but few have been rigorously validated. There is a need for more practice based theory, which need not exclude the possibility of normative theory being applied, as managers tend to be pragmatists who will choose horses for courses. What is clear is that both normative and descriptive research needs to be developed, but perhaps from less of a narrow disciplinary academic system. Managers possess many skills, and use their collective experience in business to make decisions, which may not always be regarded as 'optimal' by finance academics, but may be seen as satisfactory by investors.

The literature viewed overall suggests that contrary to a theory practice gap existing, which rather puts the blame at practitioners doors, there is more of a theory theory gap, which offers academics ample opportunity to cross discipline boundaries, and go into the field in search of more and better theories which may be valued by managers.

The process model developed in this study is valued by the managers who participated in its development, but it is not the only organisational outcome. In addition to the project risk assessment grids and the decision matrix now in use company wide, with the aid of the user guide, the company has also received executive reports on a number of projects, and benefited from presentations to over 100 managers. The benefits of these action research outcomes which organisational participants perceive include:

* Raising the general Group-wide awareness of project risk and risk management
* Extra confidence in strategic investment decisions made
* Minimisation of time spent on planning potentially 'reject' proposals (by using the grid in early screening)
* Identification of key factors for control of projects (risk management)
* Extra efficiency of resource allocation (which should in turn drive the cost of capital down)
* Shared understanding of managers' views on projects proposed and undertaken
* Capturing and sharpening of managerial judgement exercised in decision-making

The model may be more practical than previous academics' (for example Wissema, 1985), and more theoretically based than practitioners' (such as Lefley, 1997; Morgan and Pugh, 1997), underpinned by personal construct theory (Kelly, 1955), and to some extent prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1974). It offers a flexibility which makes it potentially transferable to other organisational settings, though a suitably skilled and experienced facilitator would be needed at the development stage, preferably with appropriate knowledge of the underlying theory.

Many aspects of the findings of the study match those previously found in case study research (section 8.1), and thereby contribute to their validation. The insights offered by the description of the domain, the analysis of the context in terms of group dynamics etc. as well as the perceptions of participants, potentially contribute in a small way to many discipline areas. However, the main contribution is a new process model which captures managerial perceptions on the risk drivers affecting different types of capital project, as a basis for formalising managerial judgement.

The combination of methods and techniques borrowed from the social sciences proved fruitful. The weighting technique, which was drawn from Huber's multi-attribute utility theory examples, was less successful in this research design, and would not be recommended for any replication of the study. However, the use of group discussions suited this organisation's modern management style very well. This combined with the group RGT extremely well, and is now embedded in the organisation's SIA procedures. The potential of 'laddering' in RGT to help in the prioritisation of attributes was not fully explored, and may be pursued more in similar studies in the future.

In addition to applying this model (figure 8.1) to different organisations, market sectors and project types, there are other avenues which could be pursued to extend this research. A grounded theory (GT) approach could be taken to addressing the same research questions in a similar organisational setting, and the results compared. GT may be more appropriate if the target organisation had more highly developed project risk assessment methods, where the risk drivers and assessment criteria might emerge from participant observation.

Little of the constructivist literature on decision-making takes a group rather than an individual focus in the theory of choice. Group psychology experiments, traditionally undertaken in 'laboratory type settings' could make useful additional insights if set in 'live organisational decision-making' settings. The real options approach has a lot of potential in providing a theoretical framework for the evaluation of multiple decision point projects, such as R&D. There could be an interesting outcome if a cognitive framework like that developed here could be linked with financial analysis from options pricing theory.

Practitioners are often found to be both eclectic and pragmatic in their choice of methods. Perhaps because it can be extremely messy, it is not often mirrored in research designs. However, it is argued that great steps may be made in interdisciplinary research by learning from practitioners and researching with them.

APPENDIX 1

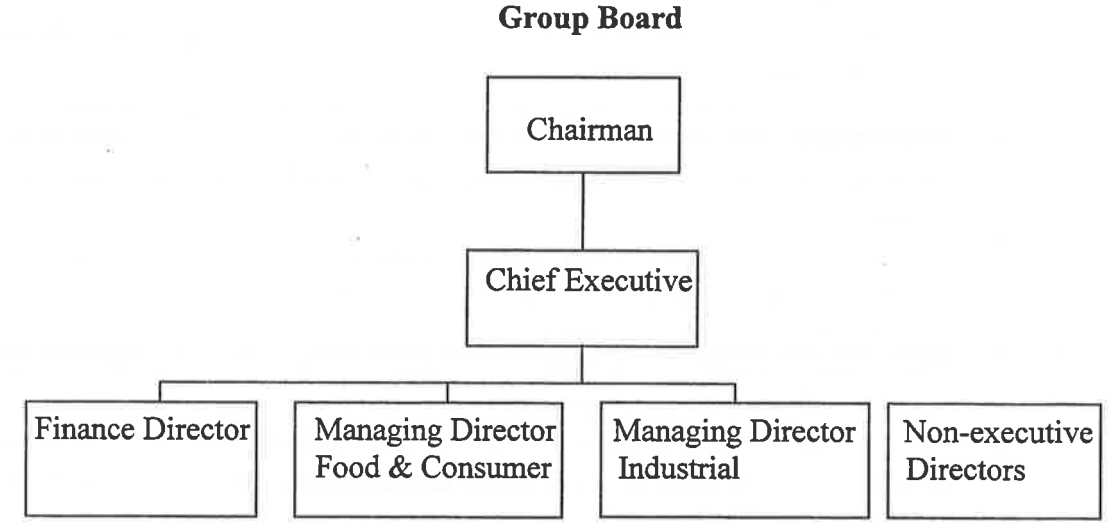
The Psychology of Personal Constructs: Summary of Assumptive Structure

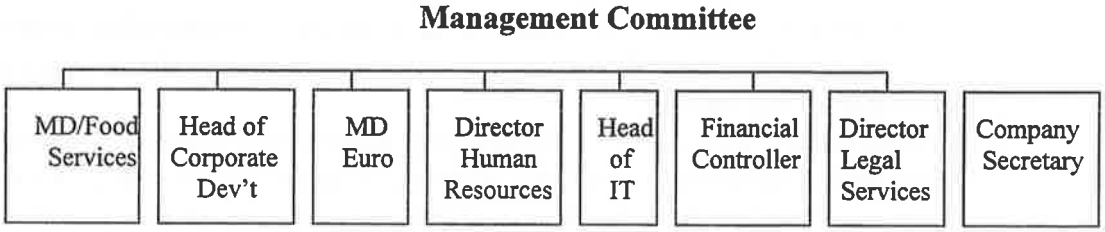
FUNDAMENTAL POSTULATE AND ITS COROLLARIES
a) *Fundamental Postulate*: A person's processes are psychologically channelized by the ways in which he anticipates events.
b) *Construction Corollary*: A person anticipates events by construing their replications.
c) *Individuality Corollary*: Persons differ from each other in their construction of events.
d) *Organization Corollary*: Each person characteristically evolves, for his own convenience in anticipating events, a construction system embracing ordinal relationships between constructs.
e) *Dichotomy Corollary*: A person's construction system is composed of a finite number of dichotomous constructs.
f) *Choice Corollary*: A person chooses for himself that alternative in a dichotomized construct through which he anticipates the greater possibility for extension and definition of his system.
g) *Range Corollary*: A construct is convenient for the anticipation of a finite range of events only.
h) *Experience Corollary*: A person's construction system varies as he successively construes the replications of events.
i) *Modulation Corollary*: The variation in a person's construction system is limited by the permeability of the constructs within whose ranges of convenience the variants lie.
j) *Fragmentation Corollary*: A person may successively employ a variety of construction subsystems which are inferentially incompatible with each other.
k) *Commonality Corollary*: To the extent that one person employs a construction of experience which is similar to that employed by another, his psychological processes are similar to those of the other person.
l) *Sociality Corollary*: To the extent that one person construes the construction processes of another, he may play a role in a social process involving the other person.

Source: Kelly (1955), p103-104

APPENDIX 2 - ORGANISATION CHARTS

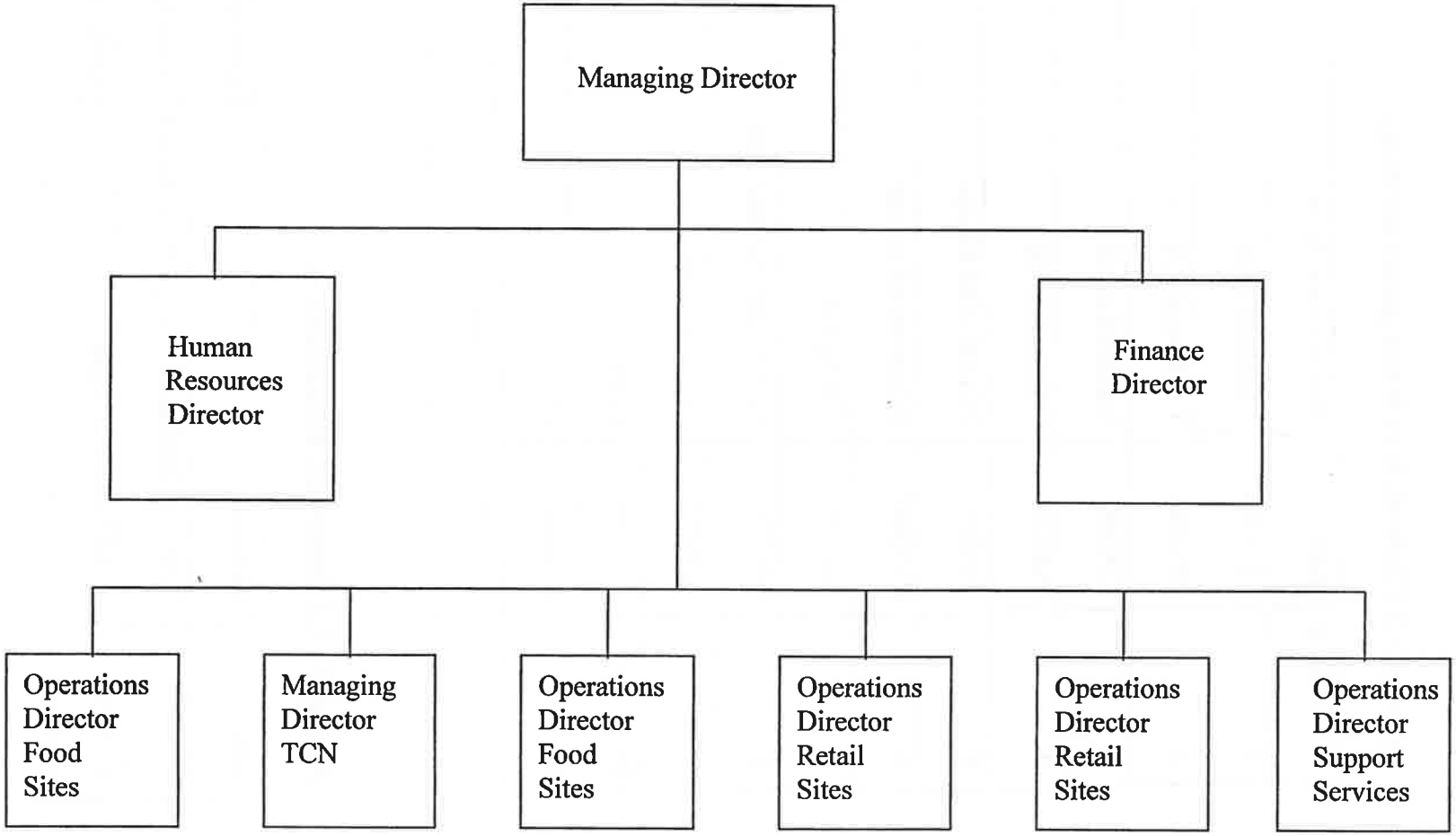
2.1 GROUP





2.2 DIVISIONAL LEVEL

FOOD AND CONSUMER DIVISION



APPENDIX 3 - MEETINGS AND PARTICIPANTS

Appendix 3.1 Schedule of focus group meetings

FG meeting	Date	Management team
1	22/08/96	1 Industrial, UK
2	29/11/96	1 Industrial, UK
3	27/03/97	1 Industrial, UK
4	05/06/97	1 Industrial, UK
5	24/07/97	2 Continental Europe
6	07/10/97	2 Continental Europe
7	19/11/97	3 TCN, UK
8	16/01/98	4 Food and Consumer, UK
9	20/01/98	5 Food Services, UK
10	13/03/98	6 France
11	09/04/98	7 Benelux
12	24/08/98	8 Germany

Appendix 3.2 Corporate presentations

Date	Audience	Location
14/10/97	Corporate Conference - Top 100 managers	Antwerp, Belgium
26/08/98	Group Executive Team	Northampton, UK

Appendix 3.3 Individual meetings

Meeting	Date	Title	Divisional team/Group
1	26/03/96	MD	Team 1
2	01/07/96	FD	Team 1
3	20/09/96	MD	Team 1
4	27/06/97	FD	Team 1
5	22/08/97	FD	Team 1
6	23/07/97	CEO	Group
7	03/09/97	FD	Group
8	01/10/97	FD	Group
9	06/11/97	MD	Group
10	11/12/97	Legal Director	Group

Appendix 3.4 Team 1 Participants

Managing Director

Finance Director

Operations Director

Personnel Director

Director of Business Development (UK)

Director of Business Development (Europe)

Network Operations Manager

Network Fleet Manager

Appendix 3.5 Team 1 Focus group meetings agendas

1 Risk constructs elicitation and initial raw scores for 3 projects.

2 Definition of Risk Attributes, Clustering etc.

3 Project typology and weightings of risk attributes, plus test on 4th project.

4 Timing of risk assessment and relating risk scores to project returns (way forward), plus test on 5th project.

Appendix 3.6 Team 2 Focus group meetings agendas

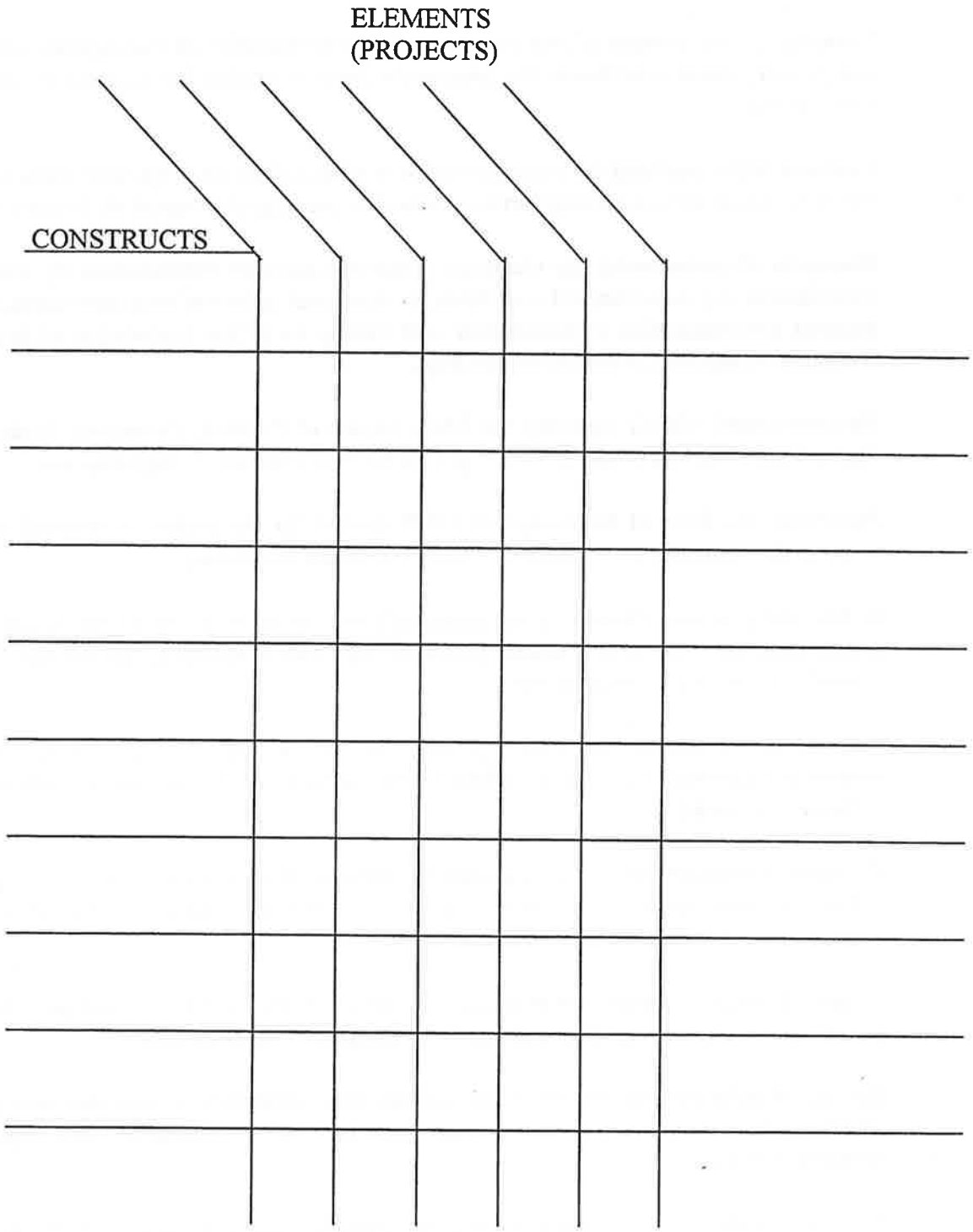
1 Presentation of UK research to Continental Europe Steering Group and discussion of applicability of findings (risk attributes and weightings) to European business units and their management teams (equivalent of team 1 agendas for meeting 2 and part of their meetings 1 and 4).

2 Project type 3, weightings and comparison of 3 test projects (equivalent of team 1 agenda 3 and part of 1 and 4).

Appendix 3.7 Continental Europe Steering Group (Team 2) Participants

Managing Director:	France	Finance Manager:	Continental Europe
Managing Director:	Germany	Managing Director:	Continental Europe
Managing Director:	Benelux	Logistics Manager:	Continental Europe
Operations Manager:		Continental Europe	
Business Development Manager:		Continental Europe	

APPENDIX 4 - REPERTORY GRID



Team.....

Date...../...../.....

APPENDIX 5 - DEFINITION OF ATTRIBUTES

Complexity: the number of and association between variables or assumptions inherent in a project, which complicates the company's ability to predict the outcome (1=simple, 5=complex)

Cultural fit (of parties): the potential match or mismatch in the corporate values beliefs and practices of the contracting parties involved in the project (1=good fit, 5=poor fit)

Demands of customer(s): the challenge posed by customer requirements, by business specification e.g. non-standard containers, or level and nature of customer contact e.g. frequent communication expected with staff having no or low knowledge of logistics (1=barely demanding, 5=highly demanding).

Environmental (PEST factors): the likely impact of Political, Economic, Social and Technological factors on the project, e.g. TUPE (1=low impact, 5=high impact)

Expertise: the level of knowledge and skill needed for the project to succeed which exists in the company. (1=relevant strength, 5=relevant weakness).

Image: the potential damage to the company's reputation or brand image which may derive from the project and related publicity, e.g. public sensitivity to product being carried (1=insensitive, 5=sensitive).

Negotiating strength: the power position of the company relative to the other contracting party(s), e.g. due to relative size, reputation, or competitive advantage (1=strong, 5=weak).

Planning timescale: the time available to research and develop a project proposal before a decision must be made and a contract signed to meet the required deadline for the project to proceed (1=long, 5=short).

Proposed contract terms: the evaluation of the likely contract terms, and potential to pass risk(s) to other contracting party(s) (1=favourable, 5=unfavourable).

Quality of information: the reliability, validity and sufficiency of base data and other relevant information available to form the basis for project assumptions and appraisal (1=good, 5=poor).

Size: the scale of the project relative to existing business, indicated by capital expenditure required, length of contract, and annual revenue predicted (1=small, 5=large).

Strategic fit: the potential contribution to corporate strategy as stated in published documents (e.g. mission statement) and in business plans (e.g. market segment penetration) of the project (1=good fit, 5=poor fit).

APPENDIX 6 - ILLUSTRATIVE CASE

*** CUSTOMER**

- **5th largest UK company**
- **137k employees (227k in 1991)**
- **£13.9bn turnover, £1.73bn profit (PAT)**
- **80-90% its UK market**
- **reacting to deregulation/globalisation**
- **driving down cost base**
- **own logistics activity very inefficient**

*** PROPOSITION**

- **preliminary discussions over 2 years**
- **we take over all distribution in time**
- **from customer's warehouses (until NDC ready)**
- **orders transported to 800 dead drops**
- **engineers collect orders next day**
- **we also deliver to high street shops**

*** PROJECT**

- **using Industrial Division core skills**
- **represented 20% growth for Ind.Div.**
- **could lead to more significant projects**
- **resource information provided by customer**
- **NDC required beyond existing capacity**
- **6 year contract (steady state after 2)**
- **£18m capital required inc.£15.5m fleet**

*** CONTRACT**

- **price adjustment for △ volume > ± 10%**
- **capped price for steady state period**
- **we to take over some of customer's employees**
- **customer indemnifies us against TUPE claims**
- **we wanted strike cover for fixed costs**
- **we wanted termination protection**

PROJECT RISK ASSESSMENT GRID - ILLUSTRATIVE CASE

RISK ATTRIBUTES	**ASSESSMENT** Score x	**WEIGHTING** Weight %	**WEIGHTED** Score wx
Corporate factors:			
Strategic fit	4	3	12
Expertise	4	14	56
Image	2	3	6
Project opportunity:			
Size	5	12	60
Complexity	5	13	65
Planning timescale	3	3	9
External/market factors:			
Cultural fit of parties	5	6	30
Quality of information	5	12	60
Demands of customer(s)	4	10	40
Environmental (PEST)	4	4	16
Competitive position:			
Negotiating strength	4	9	36
Proposed contract terms	4	11	44
	49	100	434
Total Σ wx / 100			**4.34**

APPENDIX 7 - PROJECT APPRAISAL MATRIX

PROJECT RETURN - FINANCIAL APPRAISAL	PROJECT RISK ASSESSMENT (weighted score)		
	LOW	MED	HIGH
HIGH	✓	✓	?
MED	✓	?	X
LOW	?	X	X

APPENDIX 8 - USER GUIDE CONTENTS

This guide is designed to help you use a risk assessment tool when proposing or appraising capital projects.

It is written in the form of brief notes, with an accompanying glossary to explain the terms used, and an explanatory note on the main types of capital project identified in your company.

The guidance notes have been organised as follows:

Contents			Page
1 OVERVIEW			1
2 RATIONALE			1
3 BENEFITS			3
4 PROCESS			3
5 USERS			5
6 TIMING			5
7 OTHER INFORMATION			6
APPENDICES	A	Glossary of terms	7
	B	Types of capital project and weightings	9
	C	Pro forma documents	11

LIST OF ABBREVIATIONS

AMT	Advanced manufacturing technology
ARR	Accounting rate of return
Ass't	Assessment
CAPM	Capital asset pricing model
CEO	Chief Executive Officer
CIMA	Chartered Institute of Management Accountants
DBA	Doctor of Business Administration
DCF	Discounted cash flow
DPB	Discounted payback
EAA	European Accounting Association
EPV	Expected present value
FD	Finance Director
GT	Grounded theory
HBR	Harvard Business Review
IRR	Internal rate of return
MAUT	Multi-attribute utlity theory
MCS	Management control system
MD	Managing Director
MIRR	Modified internal rate of return
NPV	Net present value
PCT	Personal construct theory
PEST	Political, economic, sociological and technological analysis
R&D	Research and Development
RGT	Repertory grid technique
ROCE	Return on capital employed
SEU	Subjective estimated utility
SIA	Strategic investment appraisal
SID	Strategic investment decision
SVA	Shareholder Value Analysis
TUPE	The Transfer of Undertakings (Protection of Employment) Regulations

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