Bournemouth University

Managerial Judgement and the Real Options Approach in the Investment Appraisal Process: Evidence from the British Automotive Components Manufacturers

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Abstract

While there has been extensive research on the use of financial appraisal techniques (Pay back, Return on Capital Employed, Internal Rate of Return and Net Present Value) in the Investment Appraisal Process (IAP), little research has been conducted on the role of the Real Options Approach (ROA) and Managerial Judgement (MJ) in the IAP. In an ideal world, prior to making Strategic Investment Decisions (SIDs), a detailed analysis of the benefits generated by the investments would be conducted. This would cover financial and non-financial benefits. In practice, however, many investments are undertaken on the basis of financial returns with little or no analysis of the growth options embedded in the proposed investments. The exploitation of these options contributes to the enhancement of the business strategy as financial returns do. Essential to considering these options in the IAP is the deployment of MJ in the IAP.

This thesis aims to make a sound contribution to the development of the emerging literature on capital budgeting. First, it provides a critical review of the existing investment appraisal literature. Second, it investigates whether or not British Automotive Components Manufacturers (BACMs) deploy the ROA and MJ in the IAP in order to accommodate the growth options. And finally, it presents an alternative perspective of the IAP by the development of a conceptual framework that integrates the ROA & MJ into the IAP, while taking account of project risk and business strategy.

This research draws on a 73-firm survey of finance directors in this industry enhanced by fieldwork (11 interviews) to set out the relative importance of the strategic approach (ROA informed by MJ) and financial analysis when making the SIDs. The findings from the survey show similar results to earlier studies in relation to the popularity of PB and the use of more than one financial technique in the IAP. However, in contrast to previous studies, DCF techniques seem to be less popular and higher usage of ROCE is evident, and no relationship is found between company size and the range and type of techniques used in the IAP. The main thrust of the findings of the statistical analysis is the absence of the formal adoption of the ROA in the IAP. However, the impact of the growth options regarding the deployment of MJ in the IAP appeared to be evident. The analysis shows that MJ is considered when assessing both investments with growth options and risky projects. The fieldwork provides insights into the context of the IAP and the factors that influence the deployment of the ROA and MJ in the IAP. Conclusions are drawn regarding the interrelationships between financial analysis and the ROA and MJ in the IAP. The integration of the ROA and MJ into the IAP appears to involve moving the focus of attention in the IAP away from financial analysis and a short-term perspective towards a more strategic perspective. More importantly, it contributes to bridging the gap between risk management and strategic analysis.

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Acknowledgement

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Thanks are due to finance directors at the British Automotive Components Manufacturing Companies for taking part in this study. I wish them every success.

I would like to express my gratitude to my family and friends for their endless support.

Oubay MAHMOUD

Dedication

This thesis is dedicated to the closest person to my heart,

My mother MOUTIA ISMAEL

Author's declaration

Extracts of this thesis have been presented at the British Accounting Association Annual Conference (3-5 April 2007, Royal Holloway College, University of London) and at the British Academy of Management Annual Conference (11-13 September 2007, Warwick Business School, University of Warwick, Coventry).

The thesis has 80,176 words, slightly over the limit recommended by the University of 80,000 words.

This thesis is entirely my own work.

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Abbreviations used in the text

BACMs: British Automotive Components Manufacturers.

CAPM: Capital Asset Pricing Model.

DCF: Discounted Cash Flow.

FAME: Financial Analysis Made Easy.

IAP: Investment Appraisal Process.

IRR: Internal Rate of Return.

MJ: Managerial Judgement.

MJOs: Managerially Judgement-Orientated firms

NMJOs: Non-Managerially Judgement-Orientated firms

NPV: Net Present Value.

PB: PayBack.

ROA: Real Options Approach.

ROCE: Return On Capital Employed.

SIDs: Strategic Investment Decisions.

SMMT: Society of Motor Manufacturers and Traders.

SPSS: Statistical Package for Social Sciences.

WACC: Weighted Average Cost of Capital.

Chapter 1

Research Overview

1.1. Introduction

The capital investment appraisal process, in general, and capital budgeting techniques, in particular, have been investigated extensively over the last few decades in different manufacturing settings*. While they are of great importance in judging the viability of the proposed projects, the increased use of some of these techniques (*i.e.* DCF techniques) does not confirm that they are the optimal tools. It is argued that DCF techniques exclude valuable options embedded within investments (Baldwin1991, Brealey & Myers 1988). Therefore, they may not accommodate strategic opportunities related to the proposed projects.

A relatively new approach has been presented to assess investments with growth options. This approach is known as the Real Options Approach (ROA). In this approach, a significant role is given to past experience, intuition and own judgement. These factors, known as Managerial Judgement (MJ), may recommend that firms postpone the investment for a while or undertake the project in stages (Kester 1984, Busby & Pitts 1998, Billington 2003).

The choice of which approach to adopt in the investment appraisal process (IAP) is largely dependent on the risk associated with new investment and its contribution to the achievement of the firm's business strategy. This research seeks to examine the extent to which risk associated with the project influences the Strategic Investment Decisions (SIDs) and the criteria used in the IAP.

This introductory chapter starts by demonstrating the significance of this research and identifying the research problem. This is followed by explaining the rationalization for integrating the ROA and MJ into the IAP and the industry in which this study is conducted. Before presenting the structure of this thesis, the aim and objectives of this research are explained.

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* See main studies reported in Chapter 2 (Table 2.2).

1.2. Significance of the study

The underlying common interest of all stakeholders is the firm's survival, survival requires a future investment plan that can ensure the enhancement of the shareholders' return and sustainable growth. This future investment plan is the lifeblood for the firm. But mere survival is insufficient, firms need to increase shareholder value and maximise their wealth as well. This can be achieved by the investment appraisal process which acts as a "filter" that rejects projects that do not create sufficient value to pay creditors and reward shareholders. Therefore, the investment appraisal process is of great importance for the survival of the firm as poor assessment of the proposed projects may prove disastrous, and result in unprofitable projects being undertaken and potentially good projects being rejected.

The investment appraisal process and its influencing variables have both practical and academic relevance. However, increased complexity and rapid changes in the business environment have affected this process substantially (Putterill *et al,* 1996) and created a gap between the academic and practical worlds. In theory, proposed projects need to go through a long process of calculations prior to the investment decision. However, in practice, sometimes, finance directors need to make a decision based on their experience and intuition when the financial analysis does not unambiguously support the investment decision, particularly in the case of strategic projects whose benefits cannot be expressed in terms of short-term cash flows. Lack of knowledge of how to evaluate such strategic projects in volatile business environments and in accommodating growth options in the (IAP) has contributed to this gap.

Furthermore, the capital budgeting literature lacks a comprehensive framework which incorporates strategic opportunities (growth options) into the (IAP). This makes it difficult for managers to evaluate the validity of investment proposals. For example, Sharp (1991) argues that formal investment appraisal procedures invariably omit important components of value, namely embedded options. Sharp (1991) argues that a formal procedure to guide managers' attempts to value the option component of investments could be a useful decision-making tool because many decisions critical to a company's competitiveness are of this type.

Therefore, the findings of this research are aimed at narrowing this gap through the introduction of an appraisal framework that takes account of both the financial returns and the

growth options that might be generated from the proposed projects. The central argument in this research is that, in the IAP, the ROA informed by managerial judgement (MJ) can widen the scope of the benefits attached to the proposed project and thus lead to a more informed investment decision about new investments which fit the firm's business strategy.

By focusing on the growth options embedded in the proposed projects, this research attempts to leverage insights from the ROA and MJ and integrate them with the tradition of investment appraisal research. By doing so, this research will argue that the existence of the growth options in any proposed project will prompt the use of MJ and override the financial techniques in the IAP. Such growth opportunities (growth options) will contribute to the achievement of the firm's business strategy and maximise shareholder value.

The importance of the real options embedded in the proposed projects has been stressed by Myers (1996) who argues that:

> *"Options are at the heart of the valuation problem in all but the most pedestrian corporate investments... it is hard to think of an investment project that does not include important real options."* [1996, p. 99].

Crucial to the capturing of these options in the IAP is executives' judgement and experience (MJ) as expressed by Kester (1984):

> *"The growth-option framework reaffirms the potentially valuable role that executive judgement and experience can play in the resource allocation process."* [1984, p.160].

However, despite the significance of real options in the IAP, little attention has been paid to them in the corporate finance literature. While some previous studies conducted in this field have ignored this element of the IAP*, other studies (*e.g.* Butler *et al.* 1991, Slagmulder *et al.* 1995, and Carr *et al.* 1994b) found evidence of the "subjective decision" regarding the assessment of strategic projects. However, no attempt was made to explain the context within which such a decision is made and how it can be linked to the ROA.

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* These studies are mentioned in details in Chapter 2.

This adds to the importance of this research since it is an early attempt to incorporate MJ and the ROA into the IAP.

1.3. The research issue

Since the aim of the IAP is to ensure an effective and value-enhancing exploitation of investment opportunities, the choice of the techniques to be used is a crucial matter. Over the last three decades, the dynamic economic context has had a significant influence on the IAP. The fast-moving business environment implies higher levels of risk attached to the proposed projects and less certainty regarding the expected outcomes.

However, and since risk is perceived as a discouraging factor when applying the common capital budgeting techniques [Pay Back (PB), Return on Capital Employed (ROCE), Internal Rate of Return (IRR) and Net Present Value (NPV)], a growing concern about the ability of these techniques in assessing risky projects has emerged.

In the literature (see Chapter 2), there is a strong argument that risky projects imply valuable investment opportunities. These opportunities are expressed in terms of growth options essential for the long-term survival of the firm. The failure of the capital budgeting techniques to consider options embedded within new investments is considered as a shortcoming of these techniques since this might lead to projects of great importance for the firm being rejected. Kester (1984), Sharp (1991), Butler *et al.* (1991), Amram & Kulatilaka (1999), and Covin *et al.* (2001) suggest that such projects require a different approach in the IAP. Therefore, investigating the problem of assessing projects with growth options in the IAP is the cornerstone for this study.

Insufficient attention has been paid to the way in which the ROA and MJ influence the IAP and how to integrate the long-term benefits from new investments into IAP. The interaction between financial techniques, the ROA, MJ, business strategy, and project risk is the focus of this study. This is thought to be a worthy avenue of enquiry for its potential contribution to a more coherent IAP.

Hence, the need for such investigation is prompted by criticisms of the capital budgeting techniques in this concern*. For example, Dixit & Pindyck (1995) insist that the NPV rule is not sufficient to aid intelligent investment choices, and managers need to consider the value of "keeping their options open". Copeland & Weiner (1990) claim that the use of options methodology gives managers a better understanding of uncertainty. Triantis (2006) argues that the real options hold a great potential to improve corporate decision-making while promoting better understanding of the role of uncertainty on investment activity. For that reason, taking account of the real options attached to proposed projects in the IAP is thought to be capable of resolving this problem. By doing so, a wider range of benefits related to the proposed projects are considered in the IAP and there is better chance of risky projects being accepted.

Consequently, and in contrast to the capital budgeting techniques that give an immediate "yes" or "no" decision, other decision alternatives become available (*i.e.* postponement of the investment decision, undertaking the project in stages, contracting out the project, and abandonment of the project). Therefore, the implications of incorporating the ROA and MJ into the IAP are drawn into the SIDs, and a sounder investment decision might be made regarding the proposed projects.

1.4. Integrating the ROA into the IAP

Having proposed considering real options in the IAP in order to resolve the research problem identified above, it is worth shedding some light on this approach and its impact on the IAP. In the literature, the application of the ROA for strategic capital investment has been advocated by many scholars [Cheung (1993), Dixit & Pindyck (1994), Benaroch & Kauffman (1999), and Anderson (2000)]. This is due to the fact that many capital budgeting projects have option-like characteristics (Megginson *et al.* 2007). **

The application of real options to business situations builds on the model developed for financial options by Fischer Black & Myron Scholes (1973) as modified by Robert Merton (1973), and also Cox *et al.* (1979).

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* These criticisms are illustrated in Chapter two: literature review.
** Asymmetry between financial options and real options is illustrated in section 2.7.

Myers (1996) argues that the Black-Scholes model could be used to value investment opportunities in real markets (the markets for products and services). Similar views are echoed by Leslie & Michaels (2000) who claim that the concept of real options developed in the financial market can be profitably applied to broader business operations, where it encourages much greater flexibility than the application of the NPV method. It is claimed (Triantis 2006, Copeland & Howe 2002) that capital budgeting techniques, unlike real options, fail to take account of the value of the project flexibility and the role of managerial flexibility to respond to new information over time. Hence, the real options allow for MJ more than financial techniques. Megginson *et al.* (2007) claim that the NPV can generate incorrect accept / reject decisions for projects with downstream options.

More recently, this approach has been the subject of a growing body of literature. Yeo & Qiu (2003) argue that the real options literature has fundamentally changed the way people think about investment opportunities. Until now, the ROA has been applied to different aspects of financial management and strategic management research, including multinational flexibility (Reuer & Leiblein 2000), governance structure (Folta 1998) and entrepreneurship development (McGrath 1999).*

McGrath *et al.* (2004) have ascribed the recent attention paid to the real options to inadequacy in the extant theories. They identified several contributions of the options reasoning. These can be summarised as follows:

- Keep costs down, when uncertainty is high, until major uncertainties are resolved,
- Approach development in stages and sequence investment,
- Pursue opportunities with significant upside potential,
- Design projects around key milestones,
- Re-assess projects' potential in a disciplined way.

Therefore, the central contribution of the ROA in the IAP is flexibility in reacting to business risk. With a real options lens, risk is perceived in a positive way and options are only valuable under uncertainty, if the future is perfectly predictable, they are worthless (Sharp1991).

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* Other aspects are mentioned in the literature review 2.7.2.

More importantly, volatility can be a source of shareholder value creation [McCormack *et al.* (2003), Buehler & Pritsch (2004)]. Given that the decision to take a risk implies embracing all that goes with this decision, especially the risk of possible failure (Miller & Reuer 1996), flexibility created by the ROA is of great importance in this situation as claimed by McGrath (1999):

> *"The key issue is not avoiding failure but managing the cost of failure by limiting exposure to the downside while preserving access to attractive opportunities and maximizing gains."* [1999, p. 16].

More interestingly, and unlike cash flows whose value may be positive or negative, option value can never be less than zero, because options can always be abandoned. Therefore, growth options represent real value to those companies fortunate enough to possess them (Kester 1984). Many scholars in the finance literature and the strategic management literature [*i.e.* Adner & Levinthal (2004), Garud *et al.* (1998), Miller (2002), Reuer & Leiblein (2000)] argue that it is a testament to the significance of the real options in strategy that critiques and refinements are emerging.

1.5. The scope of the study

This study is conducted within the British Automotive Components Manufacturers (BACMs) sector because of its importance to the British automotive industry which is a key sector of the UK economy. From research and manufacturing, through vehicles re-fuelling in use, to re-cycling at the end of a vehicle's life, the automotive enterprise and its complementary supply chain generates a diverse stream of income and jobs. The core manufacturing, distribution and servicing business in the UK directly generates a total turnover value in excess of £180 billion, supporting 230,000 jobs in manufacturing and 570,000 in sales, servicing and maintenance activities (SMMT 2005).

Between 1999 and 2004, roughly two-thirds of cars produced in the UK were exported. This percentage has increased over the last three years (2005-2007) with eight out of 10 models built in the UK now destined for export (Table 1.1). This reflects the changing balance of vehicle production and ownership in the UK. This, in turn, has had a direct impact on the automotive components manufacturing industry. For example, between 2003 and 2006, over three million engines were produced annually in the UK. This represented a 29% increase in

UK engine output since 1999 (SMMT, 2007). This increase in the automotive components volume was ascribed to the new shift in the motor industry which now consists of very large specialist firms and huge mass producers (Rhys 2005).

The significance of this sector was expressed by Society of Motor Manufacturers and Traders (SMMT) Chief Executive Christopher MacGowan in April 2005:

"We should also remind ourselves that the UK has some of the most productive plants and hosts more car makers than any other country in Europe." (SMMT 2005).

Table 1.1. Sales of UK-Produced Vehicles

Years	Total cars (passenger & commercial)	For Home	For Export
1999	1,972,561	759,162	1,213,399
2000	1,813,894	674,723	1,139,171
2001	1,685,238	694,800	990,438
2002	1,821,011	659,493	1,161,518
2003	1,846,429	599,753	1,246,676
2004	1,856,539	548,346	1,308,193
2005	1,803,109	487,725	1,315,384
2006	1,649,789	407,477	1,242,312
2007 (up to November)	1,633,140	409.190	1,223,950

Source: SMMT (2007)

As the table shows, the composition of UK producers has become increasingly export-orientated as the likes of BMW, Japanese-owned plants and Jaguar / Land Rover have increasingly taken over UK production volumes from Ford, Vauxhall and MG Rover. Ford stopped producing blue oval-badged cars in the UK in 2002 (SMMT, 2003). The direct and strong link between the car industry and the automotive components industry implies that changes in the car industry must affect the automotive components industry.

In the automotive industry, perhaps the best-known field study is the longitudinal study by Carr & Tomkins (1998). They used 78 case studies of strategic decisions taken by 71 vehicle component manufacturers based in Britain, USA, Germany and Japan. The findings confirmed the longer-term strategic orientation of German and Japanese companies and

Anglo-American short-termism. The short-term orientation in British and US companies reflects the preponderance of a strong financial control style and over-reliance, particularly in Britain, on "comfort factor" financial hurdle rates (Carr and Tomkins 1998). This short-term profit orientation also echoed Doyle's study in 1992 where only 27% of Japanese companies surveyed viewed "good short-term profits" as an objective compared to 80% in the USA and 87% in the UK.

While the present research could be considered as an extension of Carr & Tomkins' (1998) research in some respects, the scope of this research is different from theirs in a number of important dimensions:

- Firstly, the scope of the study is broader. Capital budgeting techniques, MJ, the ROA, project risk and business strategy are all to be examined in the IAP. This allows linking responses across areas and examining their effects on the SIDs. Subsequently, the interaction between these elements can be scrutinized and the impact on the IAP can be identified. This contextual dimension of the IAP was not tackled by Carr & Tomkins (1998). While they discussed the strategic benefits of the proposed projects, no mechanism was proposed as how to take account of these benefits in the IAP, what the link is between these strategic benefits and the ROA and MJ, the conditions that necessitate this strategic orientation, and how the type of proposed projects might influence the SIDs, and more importantly, how the decision regarding strategic projects is made.

- Secondly, the sampling process is different. Rather than comparing the SIDs within the automotive industry from different countries, this research focuses on BACMs. This provides the chance to study this sector in more detail, and examine whether different manufacturers respond differently to the risks associated with the proposed projects, and what the implications would be for the SIDs.

- Thirdly, and most importantly, is that this research extends the domain of the study. In addition to merely asking the frequency of use of the capital budgeting techniques, this research examines the extent to which the ROA informed by MJ is considered as an appraisal approach in comparison with financial analysis in the IAP, and how the

firm's business strategy, real options attached to a proposed project and project risk influence the deployment of MJ. This point, in particular, was not given detailed attention either in Carr & Tomkins's study in 1998, or in other studies in this field.

1.6. Motivation for the study

This study is motivated by an analysis of the automotive industry in Britain over the last three decades. The UK has now lost all its nationally-owned motor assemblers (*e.g.* MG Rover was the last to go in 2005). It is clear that the increasing foreign investments in this sector have further weakened the British car manufacturers which subsequently have been either taken over by new entrants or have collapsed. Yet, the UK hosts eight volume car manufacturers and more specialist car makers than any European country. While this indicates the importance of the UK as a key supplier to the world, it also reflects the competitive structure of the automotive sector in the UK. Particularly, after the arrival of the Japanese car makers*. The interesting point here is that, the majority of recent foreign investments in automotive components in the UK are motivated by incremental options opportunities, not current profitability (investments that provide the "foot in the door" without which future prospects are seriously jeopardise).

This competitive structure of the automotive industry has led to increased business risk which, in turn, seems to create a foundation for the application of the ROA and MJ**. Since risky investments are undertaken, the flexibility provided by the ROA (many options to be exercised) allows for MJ to determine the maximum downside risk associated with the investments, while the upside potential of these risky investments is potentially unlimited. Further more, determining which option to be exercised. It is claimed (*e.g.* Dixit & Pindyck 1994, McGrath 1999) that this is exactly the setting within which the ROA can be applied.

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* The impact of the Japanese automotive manufacturers on UK and the Europe is well documented in Kewley (2001).

** The business risk has been exacerbated by the increased competition from new EU members who are attracting automotive investments such as Poland, Czech Republic, Romania, and Slovakia (see Rhys 2004).

In addition to the competitive structure of this industry, many of the projects undertaken in this industry are of a strategic nature that involve high risk, intangible outcomes, and are implemented over a long period. Examples of such projects could be acquisitions, mergers, introduction of major new product lines, the installation of new manufacturing processes, shifts in production capacity [Mintzberg *et al.* (1976), Butler *et al.* (1991), Slagmulder *et al.* (1995), Slagmulder (1997)]. These types of projects are crucial in enhancing a firm's competitive capabilities.

In reality, some options have already been exercised. For example, the closure of the Peugeot factory in Coventry in April 2006 could be considered as exercising an abandonment option. The decision by Peugeot to move the factory to the Czech Republic is another option to initiate. Likewise, the closure of the MG Rover factory in 2005 is an abandonment option exercised by this company. The takeover decision by a Chinese company (NAC) is a growth option. The decision by Honda and Unipart (a large British automotive company based in Oxford) to start three joint venture companies in Oxford, Coventry and Kent in 1996 could be considered as growth options for both companies.

In one of the most detailed analysis of the future of the automotive industry (Nieuwenhuis & Wells 1997), chronic low profitability was seen as the primary source of pressure on the car industry. Carr & Tomkins (1998) have ascribed the failure of British car manufacturers to compete to their short-term policy that, unlike foreign companies, places less emphasis on the long-term benefits of new investments. Bearing in mind the changing context within which the automotive industry operates, what is the current situation? What are the future prospects for BACMs? Are they going to face the same destiny as car manufacturers or can they adapt to the new situation and survive? This study is designed to offer guidelines and attempts to contribute to the solution of this problem.

1.7. Research aim and objectives

This research sets out to make a significant contribution to the capital budgeting literature by trying to achieve the following general purpose:

> **"To investigate the viability of a framework of integrating the Real Options Approach (ROA) and Managerial Judgement (MJ) into the Investment Appraisal Process (IAP). This integration is expected to provide great opportunities for considering the growth options attached to a proposed project as well as the financial returns, thus helping finance directors in making appropriate Strategic Investment Decisions (SIDs)."**

To achieve this aim, three types of objectives were established:

1- Descriptive:

- To establish the prevalence of the ROA and MJ factors among BACMs in the UK. This is reflected both by the proportion of firms considering ROA and using MJ factors, and also in terms of the intensity of using MJ within the single firm to capture the real options (*i.e.* degree of rigour).

- To explore the prevalence of the orthodox capital budgeting techniques amongst BACMs and to update previous studies in this respect.

- To establish the relative importance of MJ factors compared with the capital budgeting techniques in the IAP when assessing projects with growth options.

- To identify the main benefits enjoyed by incorporating the ROA into the IAP.

- To identify the main difficulties associated with using MJ factors for assessing projects with real options.

- To describe the SIDs in the BACMs in order to identify the role of MJ factors in the decision-making process.

2- Analytical:

- To establish the relative importance of growth options embedded in the project compared with financial rewards in the IAP.

- To explore the extent to which finance directors recognise strategic benefits (growth options) as a key element of the investment when judging it.

- To identify the main elements in the context within which the IAP is undertaken that influence the deployment of MJ factors.

- To identify the extent to which the risk associated with the project influences the use of MJ factors in the IAP.

3- Theoretical:

- The study will try to extend the IAP to one which combines strategic and financial approaches.

- To develop a framework of the IAP based on the findings of the empirical study that enhances the ability of finance managers to make sound SIDs.

Drawing these objectives together, this research will investigate inputs into the strategic decision-making process.

1.8. Outline of the thesis

This introductory chapter has described the background to the research and defined its purpose. The importance of this research lies in the crucial role of the strategic approach (ROA informed by MJ) in capturing the growth options embedded in the proposed projects that are essential for long-term survival.

Subsequent chapters perform the following functions:

- Chapter two: literature review

This chapter discusses the theoretical and empirical literature on the IAP to construct a picture of contemporary practices in the field of management accounting. It focuses on the criticisms of the financial techniques and how taking into consideration the real options can contribute to more coherent IAP. This chapter also highlights the significant role of MJ factors in accommodating these options and how exploiting these options contributes to competitive advantage enhancement and shareholder value creation.

- Chapter three: research methodology

This chapter explains the research design selected in this study and the justification for choosing a positivistic approach. It illustrates the process by which the research hypotheses are postulated. A link is established in this chapter between the literature and the research design to reflect both the causal relationships between research variables and contrasting opinions about the role of the ROA and MJ in the IAP.

- Chapter four: methods of data collection, analysis and interpretation

This chapter explains the two data collection methods used in this research, questionnaire and interviews. It shows also the procedures followed in collecting two types of data required (quantitative and qualitative) as well as the techniques used in the analysis of these data (SPSS and Template Analysis).

- Chapter five: empirical evidence (1)

In this chapter, the empirical findings from the questionnaire survey are presented and discussed. The results from this analysis contribute to the answer of a substantial number of the research objectives.

- Chapter six: empirical evidence (2)

This chapter presents information gathered from a range of interviewees who have a direct involvement in the IAP in their companies. This qualitative analysis provides more insights into the IAP and the factors that affect the SIDs.

- Chapter seven: analysis of research results

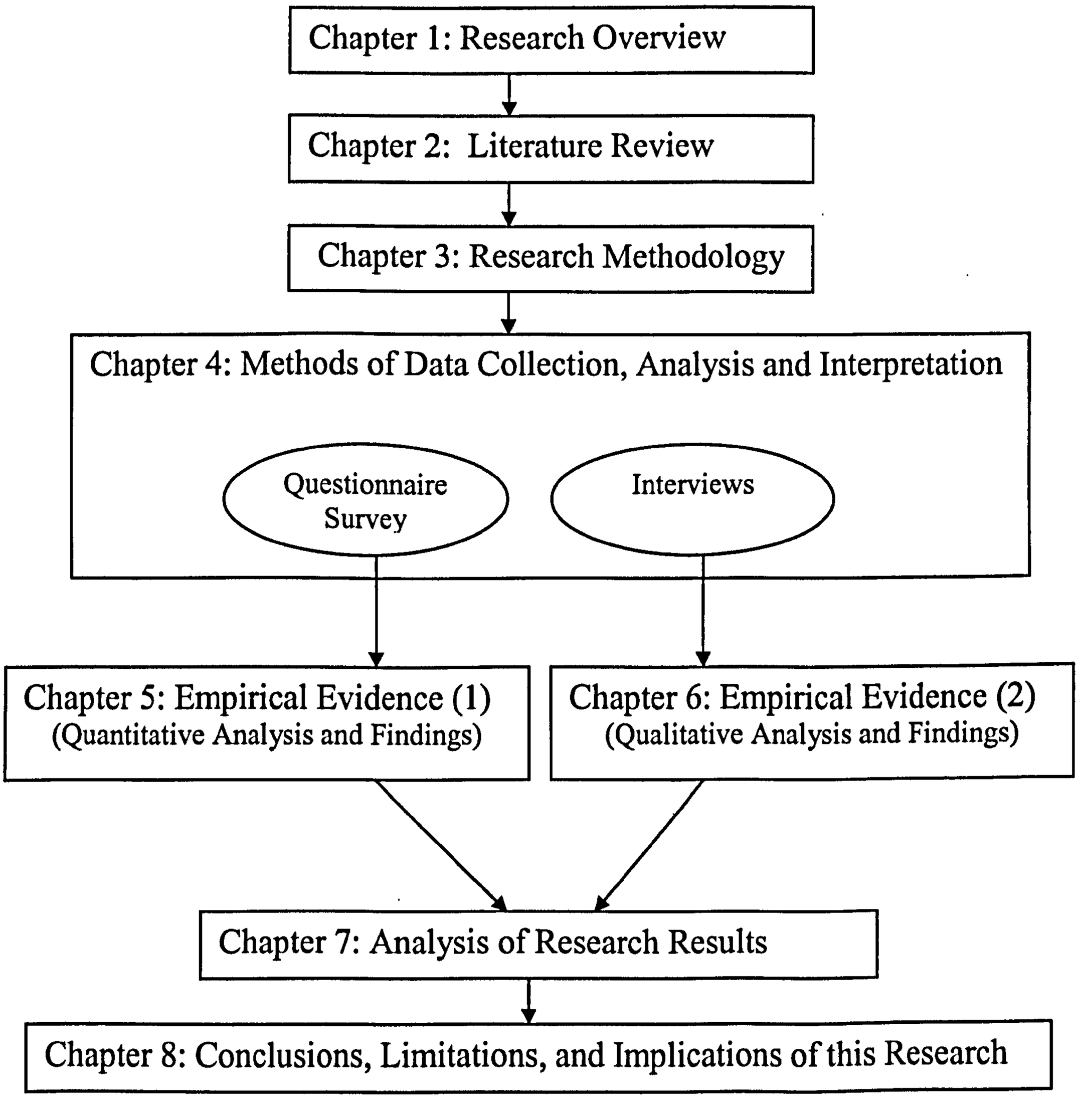
This chapter presents the inferences based on the research findings obtained in the preceding two chapters (Chapters 5 & 6). It presents concluding findings that contribute to the theoretical development of the IAP.

- Chapter eight: conclusions, limitations, and implications of this research

This chapter presents the general conclusions together with the limitations within which the research is conducted. The implications of this study for the relevant literature are explained. In addition, the importance of the research findings to managers in making sound investment decisions is also highlighted.

The structure of the thesis is illustrated in Figure 1.1

Figure 1.1. Thesis Structure



1.9. Summary

This introductory chapter provides a background for this research. The significance of this study for the finance management literature is explained. The failure of the orthodox capital budgeting techniques in taking account of the growth options embedded in the proposed projects in the IAP is considered to be the primary research issue. These growth options could be of equal or greater importance to the identified financial returns from proposed investments. The strategic approach (the ROA informed by MJ) is proposed as the key approach in resolving this problem. The rationale for choosing BACMs for empirical study is justified. The aim and objectives of this research are presented in the light of the research problem and the gap identified in the literature. A summary of thesis chapters is presented at the end of this chapter.

Chapter 2

Literature Review

2.1. Introduction

This chapter outlines the theoretical and empirical literature on the IAP. It begins by exploring the concept and the purpose of the IAP and traditional techniques in use by showing the results and findings of previous studies in this field. This is used as a starting point to establish a profile of the current evaluation mechanism of new projects in manufacturing industry and to identify the drawbacks in the current appraisal system.

Much of the criticism posed on the commonly and widely-used appraisal system revolves mainly around the failure of the financial appraisal techniques to accommodate strategic opportunities that arise from a high risk business environment. Consequently, risk and its implications for new investment proposals, and the way it can be tackled, are analysed. The important role of MJ in exploiting strategic opportunities, so as to enhance the competitive position of the firm, is highlighted. This is followed by a comparison between the strategic approach and the financial approach in the IAP.

Since the contribution that any project can make to the competitive advantage enhancement can come in different forms, the role of both appraisal approaches (financial analysis and the strategic approach) in this respect is illustrated. This is followed by explanation of the strategic approaches in the IAP that contribute to the fulfilment of the firm's long-term objectives. Given that the research is conducted in the manufacturing sector (BACMs), the important role of strategic analysis in manufacturing industry was emphasised. In addition, an example of a well-known longitudinal study in this specific industry (Carr & Tomkins 1998) is discussed.

Finally, the research contribution was presented through the introduction of an investment appraisal framework that takes account of the growth options embedded in the proposed investments in the IAP. This is done by integrating the ROA and MJ into the IAP while capitalising on the positive perception of business risk in the ROA.

2.2. The investment appraisal process (IAP)

Capital investment processes of companies have been under study in the accounting literature for a long time (Dean 1951, Copeland & Weston 1988). Large numbers of companies find the evaluation process confusing and without consensus on what constitutes coherent appraisal (Small & Chen 1995). Such opinions are not isolated and have also been echoed by Farbey & Targett (1993), Smithson & Hirschheim (1998), Remenyi *et al.* (2000), and Irani & Love (2001).

Hayes & Garvin (1982) identify the financial appraisal of capital expenditure proposals as a major stumbling block when intangible benefits are considered (*i.e.* the decision to acquire advanced manufacturing technology). Shortcomings allegedly include a bias against long-term investments enforced by cash flow discounting and by management attitudes, together with inability to reflect the value of the full range of improvements in operating methods.

These criticisms of the financial appraisal might be ascribed to errors in the investment appraisal procedures to which the investors should pay more attention such as: employing unreasonably high discount rates, failure to identify all the costs of new investment, neglecting crucial benefits from new investment, employing excessively short payback periods, adjusting inappropriately for risk and putting stress on incremental rather than global opportunities (Cole 1987).

These limitations of the financial appraisal open up a debate among academics and practitioners about the appropriateness of the financial appraisal in providing a reliable decision about new investment proposals as explained later in this chapter when discussing the defects of financial appraisal techniques.

2.2.1. The purpose of the Investment Appraisal Process (IAP)

It has been argued (*e.g.* King 1975, Cooper 1975) that the role of the IAP is to provide an acceptable pre-decision rationalisation of judgements which have led the sponsoring managers to recommend proposed capital expenditures.

In fact, this rationalisation is based on a comparison between the potential rewards of carrying out a project against the predicted costs (Maylor 1999). This will allow managers to assess how far the benefits appear to be attractive and attainable by the firm, and then, propose capital expenditure accordingly. In the capital investment literature, this optimality is linked to the financial returns from the proposed projects. For example, Stark (2000) argues that optimality is typically defined by reference to the NPV rule. Therefore, project proposals with a negative NPV are not acceptable.

However, Hirshleifer (1958) claims that NPV is at best only a partial indicator of optimal investments and, in fact, under some conditions (*e.g.* capital rationing), gives an incorrect result. While a first view reflects the financial (tangible) outcomes of proposed projects, the second one takes into account non-quantifiable (intangible) outcomes. Therefore, in the literature, despite the fact that there is a shared vision about the purpose of the IAP, there is no consensus about procedures that ensure the optimal investment.

2.2.2. The IAP within the capital budgeting system

Investment appraisal of a project is considered to be an important phase in the capital budgeting system where proposals must usually pass a series of tests in their progress towards final approval. Surveys have discovered that the capital investment process is normally a bottom-up procedure and investment ideas are screened before the proposals are prepared (Petty *et al.* 1975, Mukherjee 1987).

King (1975) offered a view which placed the IAP within the Strategic Investment Decisions (SIDs). 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? 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).

This framework is claimed (Harris & Emmanuel 2000) to represent one of the first attempts to recognise investment appraisal in the organisational context of the enterprise.

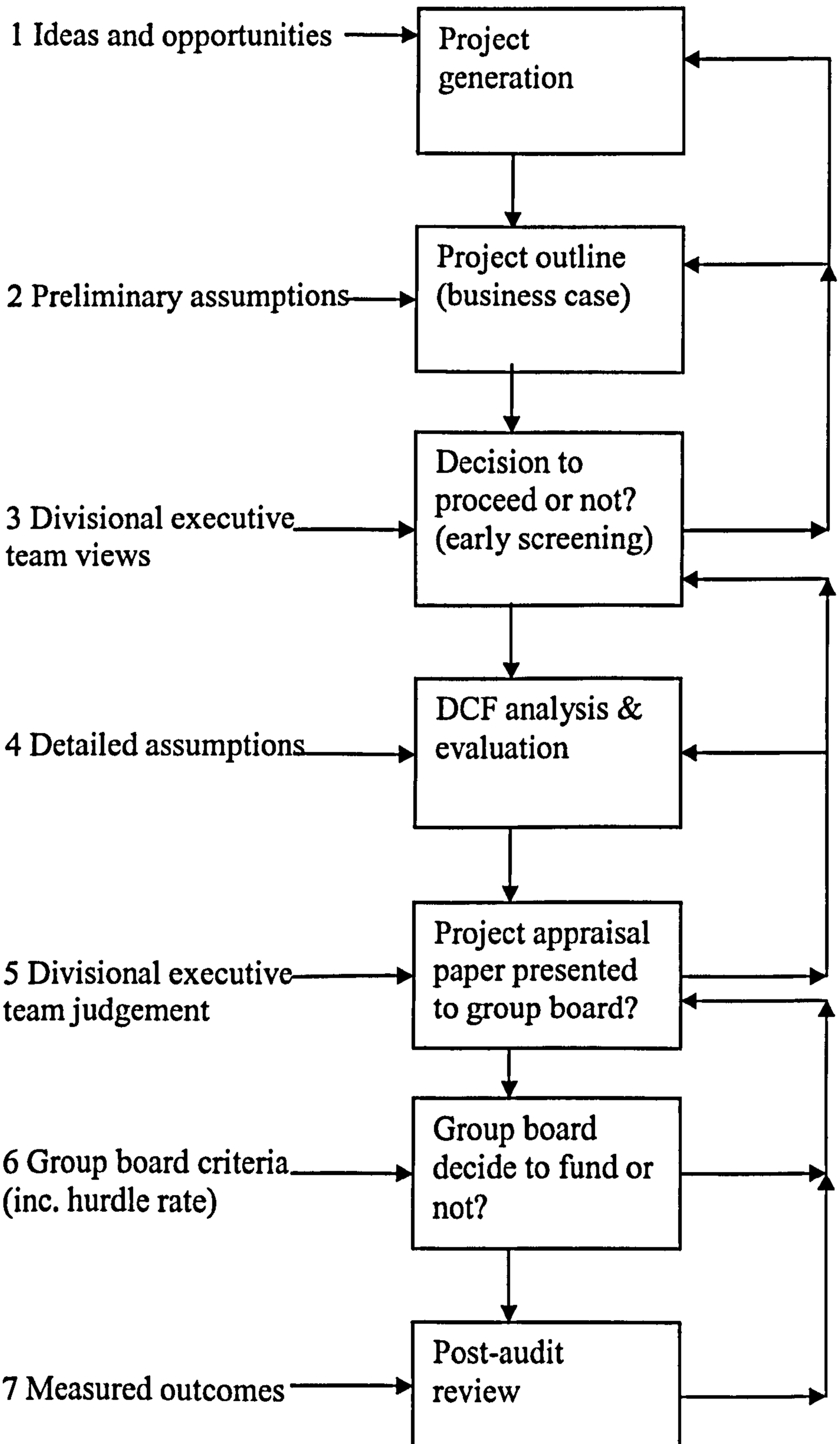
A further attempt to incorporate financial appraisal within the SIDs has been made by Dyson (1990). Six main stages in the strategic decision making process are suggested:

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.

According to this framework, the capital investment appraisal is claimed to be influential in the last two stages (stages 5 & 6).

Harris (1999) depicted the strategic investment appraisal process as a vertical sequence of seven stages of analysis / decision activity accompanied by different data entry at each stage with feedback loops. The financial appraisal process is carried out over two stages, 4 & 5, as shown in Figure 2.1.

Figure 2.1. Strategic Investment Appraisal Process



Source: Harris (1999, p. 352)

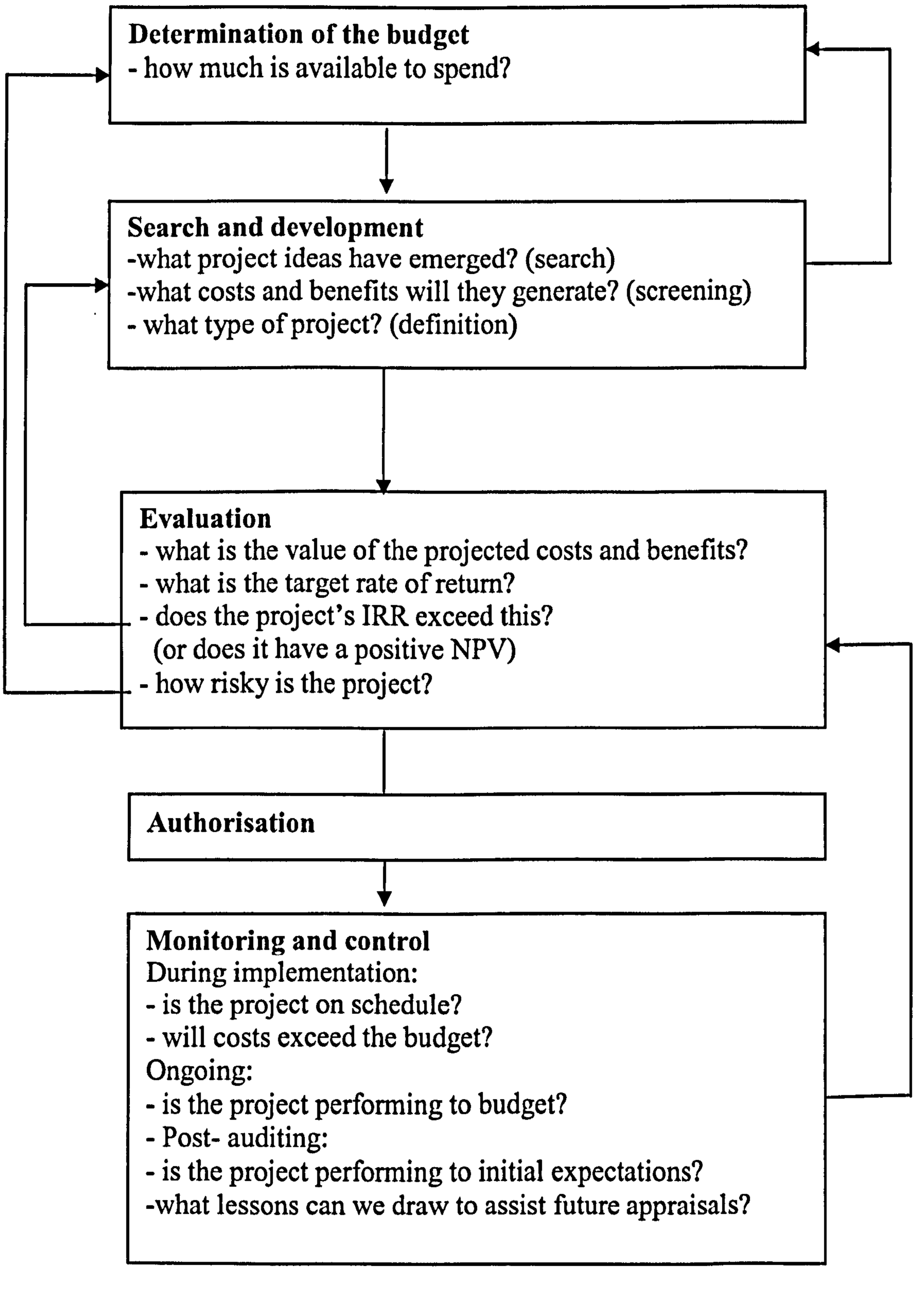
The interesting feature of this framework, which distinguishes it from previous ones, is the introduction of managerial judgement in the IAP. This is reflected in the involvement of the analysts and the decision-makers in the IAP. This involvement takes the forms of "team views" and "team judgement".

Another framework is developed by Pike & Neale (2006) that depicts a simple capital budgeting system as a five-stage process as shown in Figure 2.2. This framework allows a return from the evaluation stage to the search and development stage as one of four feedback loops.

In contrast to previous frameworks, the departure point in the IAP is the firm's resources and capabilities, not the business environment (searching for investment ideas available). The evaluation stage, the central of this research, must precede the last two stages authorisation, monitoring and control, and is dominated by financial appraisal techniques. The main characteristic of this framework is the focus on the financial techniques and tight control measures throughout the process.

Although there are loops to refinement refining in some stages, stages one and two could be interchanged. Moreover, the authorisation stage could be integrated into the evaluation stage since the outcomes of this stage (authorisation), which is a "yes / no" decision, is a revision of the IAP procedures by the board committee before implementing the investment.

Figure 2.2. A Simple Capital Budgeting System



Source: Pike and Neale (2006, p.183)

The main features of such frameworks are:

1- A tendency towards the financial focus of the IAP. Future growth opportunities associated with new investment proposals are omitted from the IAP and the *time dimension* is neglected. In other words, the project either can be approved or rejected at the time of the assessment. Therefore, the *postponement option* and the option about the time of embarking on the investment have not been considered.

2- Project outcomes are expressed in terms of expected monetary or "tangible" benefits. Very little concern is paid to assessing "intangible" benefits from the proposed investments. Therefore, *options embedded* within the proposed projects are not considered in the appraisal process.

3- The treatment of risk associated with new investment is uni-directional "*risk aversion*" where high hurdle rates are applied for projects with a high level of risk.

4- In many cases, (except the case of Harris 1999), the analysts are separate from the approval process and do not affect the investment decision-making process.

2.2.3. The role of the IAP in creating competitive advantage

The logic behind the "rationalisation process", mentioned earlier in this chapter, is to eliminate projects that would not add value to the company and would not contribute to its success. Porter (1980) defined competitive advantage as the difference between the worth of the company's output to its customers and the cost to the company of producing the output. From a financial standpoint, therefore, competitive advantage is really gross profit, the difference between revenues and cost of sales.

Taking account of the time dimension, a company creates competitive advantage when the long term value of its output or sales is greater than its total costs, including the cost of capital. This advantage can be achieved by providing superior value or lower costs to customers (Rappaport 1992).

However, creating cash flow values is not the only way to create competitive advantage. Another approach would be exploiting strategic opportunities which are not readily convertible into cash flow value (Chan *et al.* 2001). Major strategic benefits such as early entry to market, perceived market leadership, the ability to offer a continuous stream of customised products, and flexibility improvement, are extremely important for the growth and survival of the firm.

Companies should maximize their competitive advantage by utilizing a competitive strategy which means to move into those areas of business that hold out the potential of creating the greatest competitive advantage for the companies. These areas will be where the company can create "superior value" for its customers, either by charging a lower price than its competitors (because its cost of sales is lower) or by offering customers unique benefits that are not available from its competitors. Therefore, understanding of competition within the industry is a prerequisite of identifying the basis of, and opportunities for, competitive advantage (Grant 2002).

Since different projects with different outcomes can contribute to the enhancement of competitive advantage, the role of the IAP is crucial in evaluating projects with different outcomes. Therefore, the IAP needs to be flexible and able to accommodate not only the financial returns of the proposed projects but also the strategic opportunities that require investing in projects in order to sustain the cash flows in the long term.

Given that the capital budgeting techniques are the cornerstone in the IAP, it is worthwhile visiting these techniques to demonstrate how they work.

2.3. Financial investment appraisal techniques

The search for reliable techniques of project appraisal dates back decades. Since the 1950s, most of the work in financial appraisal has focused on the use of four financial appraisal techniques to justify capital expenditure. These techniques are well documented in the literature [*i.e.* Tombari (1978), Krinsky & Miltenburg (1991), Pike (1996), Kaplan & Atkinson (1998)] and summarised in Table 2.1.

Table 2.1. Pros and Cons of Financial Appraisal Techniques *

Techniques	Advantages	Disadvantages
1- PayBack method (PB)	- Reduced risk of severe cash flow in short term. - Increases liquidity in short term. - Safeguard against risk - Quick, simple and easy to understand	- No allowance for the time value of money. - Returns beyond the payback period are ignored.
2- Discounted PayBack (DPB)	- Takes account of time value of money.	- Ignores receipts after payback period.
3- Return On Investment (ROI)	- Reflects the market value of the company.	- Poor estimate of a company's cost of capital. - Fails to take account of the time value of money. - Wide-open field for selection of profit indicator might lead to misuse.
4- Discounted Cash Flow (DCF) techniques		
• Internal Rate of Return (IRR)	- Takes account of time value of money.	- may have multiple IRRs. - assumes reinvestment at the IRR.
• Net Present Value (NPV)	- Simple and clear. - Ease of data collection. - Takes into account the time value of money. - Theoretically superior to other traditional techniques.	- Conceptual weaknesses. - Inability to evaluate strategic investments with future growth opportunities. - Bias against long-term projects. - Inadequacy in evaluating soft projects such as R&D and ICT. - Neglects the timing issue of implementation when the environment is dominated by uncertainty. - Unable to capture the full complexity of the corporate investment decision.

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* For more details, see Arnold (2002), Lefly (1997), Smart *et al.* (2002), Drury & Tayles (1997), Kaplan (1986), Krinsky & Miltenburg (1991), Hayes & Garvin (1982), Ross (1986), Shank (1996), Lee (1988), Kaplan & Atkinson (1998), Arnold & Hatzopoulos (2000), Merret & Sykes (1980), Neale & McElroy (2004),Megginson *et al.* (2007).

A brief definition for each one is given below.

2.3.1. Non-discounted techniques

I. PayBack (PB)

The payback period for an investment refers to the amount of time it takes to recover the cash invested (Neale & McElroy 2004). Costs and income (or saving) are analysed over consecutive periods (typically years) until a point is reached where the forecast cumulative costs of the new project are balanced (paid back) by the cash inflows that the project is expected to generate (Lock 2000). According to this technique, projects with short payback periods are preferable to those with long payback period. It is highly recommended in industries where there is volatility of the product market and for corporations experiencing financial pressures (Kaplan 1984).

Since this conventional payback (PB) does not take into account the time value of money and ignores the returns after the payback period, Discounted PayBack (DPB) (Lefly1997) is introduced. While the DPB addresses the time value of money factor, it makes no attempt to address the second issue because it is not a measure of a project's profitability; it is a measure of liquidity and time risk (*ibid*).

II. Return on Investment (ROI)

This is also called the Accounting Rate of Return (ARR). In its basic form, it is calculated as the ratio of the accounting profit generated by an investment project to the required capital outlay, expressed as a percentage. A decision criterion is set in terms of a minimum acceptable level of ARR. The best project will only be accepted by the firm if it meets the set criterion, thus, profitability is the basis of the evaluation process (Lumby & Jones 1999, Lumby 1994). However, it is claimed (Sheridan 1986) that this technique does not link well into long-term strategy and market advantage considerations such as better quality and shorter lead times.

2.3.2. Discounted Cash Flow techniques (DCF)

III. Internal Rate of Return (IRR)

In the literature, the internal rate of return of a project in the general case is defined as the discount rate which reduces the stream of net returns associated with the project to a present value of zero (Hirshleifer 1958). Under the IRR method, in theory, a firm will accept all projects that offer a return more than the cost of capital (Drury 1988).

IV. Net Present Value (NPV)

This reflects the idea that any given sum of money earned or spent in the future has less present value than the same amount of money earned or spent today. A firm should, therefore, invest in capital projects only if they yield a return in excess of the opportunity cost of the investment. In other words, if the NPV is positive (that is, present value of inflows exceeds the present value of outflows), then the project should be accepted. When selecting one from a number of projects (having equal lives), the project with the largest NPV is selected (Krinsky and Miltenburg 1991).

Despite the superiority of the DCF techniques over non-discounted ones, they come under severe criticism relating to their ability to appraise investments with strategic opportunities. Myers (1984), Lee (1988), and Lefly (2000) argue that such investments need to be assessed on the basis of intuition, past experience and own judgement rather than by DCF techniques alone. Furthermore, discounted cash flow is criticised for its inadequacy to appropriately appraise soft projects, such as research and development (R&D) and information communication technology (ICT) which leads management to select such projects on intuition, experience and rule-of-thumb methods (Ross 1986, Shank 1996). In addition, timing issues of implementation when the environment is dominated by uncertainty and the failure to accommodate the current changes in business environment are widely reported as the main limitations of this technique (Lee 1988, Lefly 2000).

2.4. Research on project investment appraisal in the UK

Many studies have been conducted to investigate and present the usage of financial techniques in the manufacturing sector. Major recent studies are outlined in Table 2.2.

The general findings of these studies show the popularity of the payback technique among firms and the tendency towards deploying more than one technique in the IAP. In addition, these studies tried to link the use of these techniques with firm size and concluded that the importance and application of these techniques varies among firms of different sizes. The common features of these studies are the involvement of different companies from different industries (except the case of Carr & Tomkins 1998), and variable size definitions are used.

In addition to reporting the incidence of the financial techniques, these studies investigated the use of non-financial criteria in the IAP. In Pike's survey in 1975, 7% of firms claimed to have used non-financial criteria, In McIntyre & Coulthurst (1986), the percentage was 4%. In Arnold & Hatzopoulos' survey in 1997 (Arnold & Hatzopoulos 2000), 31% of firms involved claimed to have used non-financial criteria in assessing new investments such as "alignment with strategy" and "investments helps achieve strategic goals". This new shift in attitudes towards the intangible benefits is also reported in Burcher & Lee (1997) where a random sample was selected from the membership list of manufacturing practitioners of the Institute of Operations Management. The analysis was based upon 161 replies completed by personnel who ranged across several management levels. The surveyed firms ranked "obtaining competitive advantage" as their primary anticipated benefit and "reducing costs" was ranked second.

Table 2.2. Reported use of Financial Techniques in Manufacturing Industry *

Author	Date	Firms involved	Findings
Pike	Longitudinal survey between 1975-1992	100 large firms	-Substantial increase in the use of discounted cash flow techniques and risk appraisal techniques. - Tendency by the firms to use a combination of four different methods (PB,ROI,IRR,NPV).
McIntyre and Coulthurst	1986	141 small and medium firms	- Increased use of DCF but not at the expense of PB which continued to gain support.
Sangster	1993	Small and large Scottish companies	- PB is the most popular method, then IRR. - Use of more than one method. - Less usage of ARR. - High use of more sophisticated discounted cash flow techniques.
Drury and Tayles	1997	866 firms (small and large firms)	- DCF techniques are used far more extensively by the larger organisations. - 90% of the larger and 35% of the smaller organisations "often" or "always" used either Net Present Value (NPV) or Internal Rate of Return (IRR) discounting methods.
Carr and Tomkins	1998	71 vehicle component manufacturers based in Britain, USA, Germany and Japan.	- Longer-term strategic orientation of German and Japanese companies and Anglo-American short-termism. - The short-term orientation in Britain and USA companies reflects a preponderance of strong financial control style. - Amongst the UK firms, the most significant financial measure in the investment appraisal process is PB, then ROCE, then DCF techniques.
Arnold and Hatzopoulos	2000	300 firms (100 small, 100 medium, 100 large)	- Reduction in the use of PB but remains at a high level. - All large firms use either IRR or NPV. - Most small and medium-sized firms use IRR or NPV. - Most firms are using three or more methods.

* See: Pike (1996), Ho & Pike (1991), McIntyre & Coulthurst (1986), Arnold & Hatzopoulos (2000), Drury & Tayles, (1997), Sangster (1993), Carr & Tomkins (1998).

Although these studies have contributed to the capital budgeting literature, they can be criticised for being fairly superficial. Normally, only the results of the questionnaires and interviews are presented and the findings are seldom interpreted. The impact of the type of the project on the range and the intensity of these techniques has not been considered. Moreover, these studies did not consider the possibility that business strategy could have contributed to the differences they detected, their analysis may have been affected by the undetected influence of business environment and business strategy upon the choice of techniques selected.

These studies did not incorporate uncertainty and, as a consequence, cannot be thought of as capturing a full context of the IAP. Therefore, the circumstances under which the investment decision is made have not been considered.

The non-financial criteria reported in these studies actually are the objectives of the IAP. The achievement of these objectives is considered only through the deployment of financial techniques. Therefore, the main drawback of these studies is that they have not uncovered how strategic opportunities could be incorporated in the IAP in order to achieve such objectives.

2.5. The Discounted Cash Flow (DCF) dilemma

There is a significant divergence of opinion in the debate relating to the effectiveness of DCF techniques in assessing investment proposals. This falls, in the main, into two broad categories. Firstly, there are those, such as Cole (1987), Brealey & Myers (1988), Ashford *et al.* (1988), Kensinger (1988), Baldwin (1991), and Phelan (1997) who argue that DCF techniques are inherently biased against strategic investments, and exclude the valuable options embedded within the investment. Hayes & Garvin (1982) and Hayes & Abernathy (1980) suggest that the widespread use of these methods has led to a decline in the level of capital investment due to this bias.

The main criticism of DCF seems to revolve around the inability to evaluate the non-quantifiable benefits that are associated with proposed projects. Stainer *et al.* (1996) argue that:

> *"DCF is inadequate where important unquantifiable or intangible benefits occur, and this is likely to be the case when the project involves strategic dimensions."* [1996, p.82]

Thus, it neglects the value of flexibility which is management's ability to change its business plan when prices change or new information arrives. This is to say, it ignores the value of real options (McCarthy & Monkhouse 2003, McCormack *et al.* 2003).

Demski (1994) goes further and claims that the true NPV is unknown, therefore multiple methods should be used to assess investment proposals. In other words, assumptions underlying the NPV rule are not always met in practice (Arya *et al.*1998). Moreover, there are faulty assumptions (Dixit & Pindyck 1995). DCF techniques assume one of two things: either that the investment is reversible (in other words, that it can somehow be undone and the expenditures recovered should market conditions turn out to be worse than anticipated), or that, if the investment is irreversible, it is now-or-never proposition (if the company does not make the investment now, it will lose the opportunity forever). In both cases, this reflects the failure to capture the complexity of corporate investment decisions (Arnold & Hatzopoulos 2000).

Secondly, there are those, like Kaplan (1986) and Hodder & Riggs (1982) who proclaim that these techniques are not inherently flawed, but that the process of application can be defective. According to these authors, the technicians, not the techniques, are the problem. Discounting procedures are not inherently biased if management sets realistic hurdle rates and examines carefully its own assumptions. They argue that many DCF analyses of risky projects are overly simplistic and ignore three critical issues that managers and decision makers should consider: the effects of inflation, the different levels of uncertainty in different phases of a project, and management's own ability to mitigate risk. This highlights the need for well-experienced and trained managers.

Hence, managers who make strategic decisions (whether or not they understand finance theory well enough to use DCF analysis effectively) may not understand the logic of the

method deeply enough to trust it or to use it without mistakes, and they may also not be familiar enough with how capital markets work to use capital market data effectively. The use of unrealistically high discount rates is probably a symptom of this (Myers 1984). Similar views are echoed by Amram & Kulatilaka (1999) who argue that analysts, in a quest to justify their "gut feel" for strategically important projects, tend to manipulate the evaluation process, raising cash flows forecasts to unlikely levels. With regard to risk, it is claimed (Goedhart & Haden 2005) that analysts and business managers overestimate the risk premium, assign it to a levels that even substantial underlying risks would not justify. Therefore, discount rates, hurdle rates and other decision criteria are often set at levels higher than would be expected on the basis of underlying theory. For example, a study by (CBI & ACA, 1998) suggested that lower rates are used for appraisal of more everyday projects and there is a marked difference between typical IRR hurdle rates and typical NPV discount rates for which there is, at first sight, no theoretical justification. The former average at 17.1% while the latter average at 11.9%. Moreover, these discounting rates are proved to vary amongst countries. Scapens & Sale (1981) found that UK companies used rates varying between 5% and 32%. While US companies' rates varied between 10% and 40%.

From this discussion, it could be concluded that the main source for this dilemma stems from mishandling the impact of the business environment on the IAP. While some blame the techniques for failure to evaluate the whole benefits that might be generated from a proposed project, others question managers' competence in applying these techniques properly and sensibly under uncertainty. Therefore, it is important to discuss the implications of business risk for the IAP.

2.6. Business risk and capital budgeting techniques

A key feature of project appraisal is its orientation to the future. Management rarely has precise forecasts regarding the future return to be earned from an investment. Therefore, tackling the risk associated with proposed projects is an essential part of the IAP itself.

Risk describes a situation where there is not just one possible outcome, but an array of potential returns (Arnold 2002). A similar definition is given by CIMA (1996, p.101): *"a condition in which there exists a quantifiable dispersion in the possible outcomes from any*

activity". Vermeulen *et al.* (1996) have extended the concept of risk to include exposure to the possibility of economic or financial loss or gain, physical damage or injury or delay as the consequence of the uncertainty associated with pursuing a particular course of action.

Others (*e.g.* Kaye 1994, Knight 1921) distinguish risk from uncertainty by suggesting that risk can be identified and measured, whereas uncertainty is unpredictable and cannot be estimated in terms of probabilities. This distinction is essential to understanding and modelling projects. Risk is reflected in the standard deviation of the distribution of outcomes.

Since this research is concerned with the variability and certainty of the proposed project's outcomes, the definition that will be adopted is that suggested by Lumby (1994) where risk quite simply describes the situation where the future is uncertain. Therefore, a risky capital investment would be an investment whose outcome is uncertain with great degree of variability. Such definition is consistent with Dixit & Pindyck (1994).

Given that the financial outcomes from an investment project will be realised in the future, account should be taken of future uncertainties. This is done by discounting these outcomes at a discount rate which can be determined by two models:

I. Capital Asset Pricing Model (CAPM)

The CAPM is defined as a financial model explaining investor-required rates of return on the basis of the relative systematic risk of an asset, the risk premium investors demand on the market portfolio of assets, and the risk-free interest rate (Kaen 1995).

The CAPM defines the discount rate to be used after taking into account the risk associated with the project. The required return of project (R_L) can be calculated as follows:

$$R_L = R_f + B_L (R_m - R_f).$$

Where:

- $_L$ project,
- R_f risk free rate,

- R_m the average return on the market portfolio,
- B_L (beta the covariance between the returns of project L and the returns of the market portfolio).

As the unsystematic risk can be diversified away in balanced portfolios of investment projects, the risk premium should compensate only for the systematic risk that cannot be diversified away. The logic behind this is simple, investors require a greater reward for accepting a higher risk. The more risky the project, the higher is the minimum acceptable rate of return and the greater is the risk premium (Arnold 2002).

The beta, then, can be used to generate the appropriate discount rate having taken into account the systematic risk of the project. However, the single discount rate computed by the CAPM may not be appropriate for all time periods, whereas the discount rate required for a NPV calculation is a multi-time period rate of return. Lumby (1994) claims that the CAPM may not be the perfect way to estimate a project's discount rate, but it is the best way that we have available. To overcome this difficulty, Arbitrage Pricing Theory (APT) developed by Ross (1976), which is a multi-factor model, could be used. Thus, instead of just using a single beta value there is a whole set of beta values-one for each factor.

II. Weighted Average Cost of Capital (WACC)

In mixed capital structure companies, the discount rate that should be used for investment appraisal is the weighted average of the costs of all the individual components of the capital structure (WACC).

The weights that are applied to the individual costs of capital are the market values of each capital source, as a proportion of the company's total market value.

$$WACC\ (k_0) = k_e^* (v_e / v_0) + k_d^* (v_b / v_0)$$

Where:

- k_e cost of equity capital,
- v_e market value of equity,

- k_d the cost of debit capital,
- v_0 The market value of company,
- v_b market value of debt.

If the new project is an expansion of the existing business and financed in the same way, WACC would be an appropriate discount rate to use. However, if the project represents a move into a new area of business, then the existing WACC would not be the appropriate discount rate to use. While the CAPM takes account of the business risk, the WACC takes account of the finance risk. However, both are compatible. The k_e in the WACC is calculated by CAPM. Kaplan & Atkinson (1998) argue that discount rates can often be unrealistic or incorrect due to many factors such as inflation (if both costs and cash inflows are subject to the same level of inflation), risk increase (adding a few % to the discount rate is not an appropriate way to account for risks).

However, discounting the future outcomes is not the only way to incorporate risk into the IAP. Other techniques include: Simulation, probability analysis, sensitivity analysis, certainty equivalents, increase / decrease discount rate, require shorter / longer payback, conservative cash flow forecasts. In the literature, there are many studies that report the incidence of these risk techniques*. These studies report low proportions of respondents using sophisticated techniques (*i.e.* simulation, CAPM, certainty equivalents), a high percentage relying on adjusting the payback period (require shorter / longer payback) and seeking cautious conservative cash flow forecasts. The increased usage of sensitivity analysis by companies was evident in recent studies [*i.e.* Pike (1996), Abdel-Kader & Dugdale (1998), and Arnold & Hatzopoulos (2000)] if compared to earlier studies in this respect.

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* see for example: Drury *et al.* (1993), Ho & Pike (1991), Smith & Murray (1997) and Pike (1996).

While directors might have the theoretical grounding to apply risk techniques, their perception of risk is still limited. In a recent survey, Buehler & Pritsch (2004) showed that 36 percent of participating directors felt they did not fully understand the major risks their business faced. An additional 24 percent said their board processes for overseeing risk management were ineffective, and 19 percent said their boards had no processes. While this might imply the need for more training in diagnosing business risk, it also highlights the serious implications of using incorrect discount rates which might result in projects with good business cases being rejected or *vice versa*.

Given the drawbacks of financial appraisal techniques regarding strategic opportunities, exploitation and failure to incorporate business risk properly in the IAP, a more strategic perspective in the IAP has emerged and appeared to gather support across the business world. This approach, which is known as the Real Options Approach (ROA), offers insights into the economic logic as to how the IAP can be managed effectively.

2.7. Why integrating The ROA into the IAP

Recent interest in the problems of uncertainty and risk associated with new investments and resulting developments in finance theory have identified fundamental theoretical weaknesses in the use of financial appraisal techniques for strategy analysis. These techniques are claimed to exclude the valuable options embedded within the investments. Kulatilaka & Marcus (1992) claim that corporate investment projects often contain "embedded options" and the valuation of such options is difficult to accommodate within the conventional DCF framework. They argue that recent extensions of the option pricing theory have shown promise in overcoming the limitations of the DCF.

The ROA has been attracting considerable interest in recent times. This is manifested in the growing body of literature over the last two decades. It is claimed (Triantis 2006) that since the late 1990s, there are nearly 1,000 research papers that incorporate real options ideas. The motive for this interest seems to be driven by two main issues:

1- Extensive research into the effectiveness of the financial techniques (PB, ROCE, and DCF techniques) in the IAP, particularly, for assessing projects with growth options. This research, presented earlier in this chapter, revealed many limitations of financial analysis

regarding evaluating projects with strategic (intangible) benefits. The alleged shortcomings of the financial appraisal techniques are the failure to capture 'intangible benefits' of the strategic projects and taking account of the future flexibility embedded in these projects. *

A clear indication of these limitations is highlighted by Pike (1988) who claimed that surveys of capital budgeting practices suggest that, for many organisations, good investment decision-making is not necessarily synonymous with formalised capital budgeting procedures or the application of textbook appraisal techniques. Therefore, while DCF is considered the best rule for making the investment decision, the real options literature clearly indicates that this is not so as a general rule. Myers (1984) claims that:

> *"DCF is less helpful in valuing businesses with substantial growth opportunities or intangible assets. In other words, it is not the whole answer when options account for a large fraction of a business' value."* [1984, p. 135].

This is because, according to Broyles (2003), DCF does not provide the methodology for measuring the value of real options embedded in proposed projects. Myers & Turnbull (1977) observed that the presence of valuable growth options might lead to an overestimation of the appropriate hurdle rate for capital investment. They concluded that this created *"practical and theoretical difficulties"* (1977, p. 332). In fact, these difficulties confirm the failure of the capital budgeting techniques in assessing projects with growth options. Consequently, such projects are excluded from the IAP.

2- Increasing risk attached to the proposed project and the uni-directional treatment of this risk. As illustrated before (see 2.6), the main way of incorporating risk into the appraisal process is discounting the future outcomes more heavily as perceived risk increases. This "risk aversion" perception resulted in high risk projects with good business cases being kept out of the IAP. According to Thomas (2001), this is because DCF is inadequate for coping with the uncertainties of the environment.

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* These shortcomings are reported by many writers in addition to those mentioned in 2.5 [*i.e.* Pike *et al.* (1989), Carr & Tomkins (1996), Busby & Pitts (1997), Brookfield (1995), and Dempsey (2003)].

While risk is perceived as a negative factor in financial analysis, it is considered as a positive factor under the ROA. It is claimed (McGrath 1999) that the higher the variance in outcomes from making a real investment, the higher the option value of the investment. Hence, the riskier the project, the more valuable the growth options embedded within it. More importantly, the flexibility attached to the adoption of the ROA helps in mitigating the risk and is valuable, as Merton (1998) points out:

> *"The common element for using option-pricing here is... [that] the future is uncertain (if it were not, there would be no need to create options because we know now what we will do later) and in an uncertain environment, having the flexibility to decide what to do after some of that uncertainty is resolved definitely has value."* [1998, p. 339].

Having demonstrated the limitations of the financial analysis in the IAP, real options are important in the IAP because:

> *"They represent a portion of the value of future opportunities that cannot be explained by the present value of future cash flows."* [Lee *et al.* 2007, p. 258].

The key advantages of the inclusion of the ROA into the IAP are that it integrates capital budgeting with long-range planning (Kester 1984), and its direct tie to the goals of the firm (Meredith & Suresh 1986). Hence, capital budgeting becomes simply the execution of a company's long-range plan which necessarily implies the cultivation of particular investment opportunities, and can maximize the value of the company's equity.

Early interest in the concept of real options in the field of finance is often traced to Miller & Modigliani's (1961) observation that a firm's market value comprises two components. The first is the present value of those cash flows that will be generated by assets that are in place. The second is the present value of growth opportunities.

The idea of viewing corporate investment opportunities as "real options" dates back to Stewart Myers' use of the phrase in his well-known 1977 article. Therefore, Myers (1977) could be considered the first to adopt the term real options after the seminal work of Black & Scholes (1973), Merton (1973). Following the principles of the financial option valuation model developed by Fisher Black & Myron Scholes (1973) and Robert Merton (1973),

scholars (*e.g.* Dixit & Pindyck 1994, Myers 1984) began modelling investment under uncertainty using the analogy of financial options (as explained in Figure 2.3). Therefore, in this context, the focus of the real options is on the real business application of financial options (Bowman & Hurry 1993). In other words, the real options approach is the extension of option-pricing theory into managing real assets (Amram & Kulatilaka 1999).

The logic behind the real options approach is that many corporate real assets can be viewed as call options and real options offer the right or opportunity to invest in a "real asset"*. Exploiting the opportunity by making the investment is the way in which the option is exercised. Myers & Turnbull (1977) argue that the growth opportunities reported in Miller & Modigliani's (1961) study represent intangible assets or what they called *"options to purchase additional units of productive capacity in future periods"* [1977, p. 331].

2.7.1. Managerial Judgement (MJ) and the Real Options Approach (ROA)

While cash flows generated from an investment can be assessed by the financial techniques, the question remains as how to assess the growth opportunities (intangible outcomes) from the investment. In the literature, it is a common perspective to deploy real options analysis for projects with growth opportunities, or what are called strategic projects by some scholars (*e.g.* Sharp 1991, Kester 1984). However, recent debate on real options shows that there are many different points of view on real options and on what is meant by the "option" in the IAP (see 2.7.2). Moreover, different labels emerged for the same concept. The most common ones are: option pricing theory (Myers 1984), real options theory (Adner & Levinthal 2004, McGrath *et al.* 2004), real options approach (Dixit 1989, Copeland 2001, Broyles 2003), growth-option framework (Kester 1984), real options paradigm (Brennan & Trigeorgis 2000), real options analysis (Grant 2002), capital investment options (Pike & Neale 2006). In this research, these terms are used interchangeably. In essence, these concepts imply the same thing, the application of the real options logic to the IAP in order to exploit growth opportunities. By doing so, a wide range of options open up to the firm which might lead to other investments being undertaken, abandoned, or postponed.

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* Extensive literature deals with the use of options theory to evaluate real assets can be found in Dixit & Pindyck (1994), Trigeorgis (1997), Amram & Kulatilaka (1999).

This shift in thinking to view investments as options substantially changes the theory and practice of decision making about capital investment (Dixit & Pindyck 1995). The role of MJ in the IAP becomes more prominent. Studies in this respect (*e.g.* Morone & Paulson 1991, Northcott 1995) showed a significant role of the "executive judgement" and cognitive analysis in the IAP. This involvement of MJ is claimed to lead to more persuasive decision (Clarke *et al.* 2003).

Kester (1984) argues that many companies have turned to methods other than financial techniques-for example, isolating and evaluating strategically important projects **qualitatively.** Such analysis rests heavily on the **intuition** and **own judgement** of key senior executives. The isolation of strategic projects is helpful to the extent that valuable **executive experience** is brought into play and truly important investments are not routinely rejected by simplistic quantitative techniques (*ibid*). Similar views are echoed by Sharp (1991) with regard to appraising strategically vital projects:

> *"If they (managers) follow control system requirements, they will reject projects that may be strategically important because the NPV analysis excludes options. If they follow their* ***instinct and experience****, they must override the formal, quantitative NPV analysis with the nebulous justifications that the project must be undertaken 'for strategic reasons.'"* [1991, p. 69]

He argues that such an approach allows managers to assess new investments on the basis of past experience, intuition and judgement, so identifying whether strategic benefits outweigh any shortfalls in cash flow value. Amram & Kulatilaka (1999) claim that:

"Because a large gap exists between what managers want to do and what their tools were designed to do, managers often make decisions without relying on a quantitative analysis." [1999, p. 13]. They claim that mangers often discard the tools and the important decisions are made by ***"managerial charisma"***.

Triantis (2006) argues that the existence of such managerial flexibility is the key underpinning of real options. McDonald (2000) stresses the importance of intuition in realising the options embedded in an investment project:

> *"Although managers may not use formal models to evaluate the options associated with an investment project, these options can be economically important and their effects grasped* ***intuitively****. Firms that make decisions ignoring these options should on average be less profitable than firms that somehow take them into account."* [2000, p.14].

Similar views are echoed by Amram & Kulatilaka (1999) who argue that: *"Managers* ***intuitively*** *know that they must undertake and proactively manage investments by changing subsequent plans in response to market conditions."* [1999, p. 4]. Moreover, they identify situations where standard financial tools do not work while MJ is more appropriate (*i.e.* for strategic investments, for transaction valuations, and for strategic vision).

Therefore, the deployment of these factors (past experience, intuition and own judgement), which are known as **Managerial Judgement** factors, in the IAP is linked to the existence of the options embedded in the proposed investment. MJ appears to be of great importance in realising these options. This importance is demonstrated by the fact that the recognition of these options will make the firm more willing to invest than it would be under calculations that result from the capital budgeting techniques that assume the project continues for its physical lifetime, must be started now or never and ignores these options.

A clear example of strong association between MJ and the ROA is explained by McGrath *et al.* (2004) who argue that the central concern of options reasoning is what they called ***"sense-making activities"*** that cause decision makers within a firm to recognize that a potential opportunity exists. More importantly, they stress that options reasoning is often found to be more consistent with the pattern of choices made by organisations than are other investment alternatives (typically discounted cash flow models). For example, the NPV rule dictates the discount rate but cannot judge on choices such as time of embarking on the investment, the postponement decision, and the abandonment decision (RO factors). Such decisions are solely made by managers on the basis of **past experience, intuition and own judgement.** The link between MJ and the ROA in the IAP was emphasised recently by Megginson *et al.* (2007) who claim that:

> *"The NPV approach fails to capture the value of this managerial flexibility as the passing of time resolves uncertainty surrounding a particular investment. Mangers*

> *usually have the option to abandon or to expand an initial investment, and that flexibility often adds to a project's value above and beyond its NPV. Smart managers understand this* ***intuitively****"* [2007, p. 709].

Similar views are expressed by Amram & Kulatilaka (1999) who argue that the real options approach goes beyond the tool kit and is **a way of thinking.** Actually, previous research in this respect (*i.e.* Dixit & Pindyck 1994, Barwise *et al.* 1987, Kemna 1993, and Howell & Jagle 1997) indicated that **intuitive decisions** by managers are in closer agreement with real options theory than with more traditional capital budgeting techniques which are now known to be incomplete.

Myers (1984) has linked such investment behaviour to good management practices:

> *"The option value of growth and intangibles is not ignored by* ***good managers*** *even when conventional financial techniques miss them. These values may be brought in as 'strategic factors', dressed in non-financial clothes"* [1984, p.136].

Having explored and established the strong link between MJ and the ROA, in this context, the ROA is considered as "way of thinking". This perception of the ROA (as a way of thinking) is a prerequisite to the next stage in the real options analysis (modelling the options), where the calculations of the value of options take place. Such concept of the ROA (as way of thinking) has been used by many managers in their organisations. A study by Triantis & Borison (2001) found that there were significant differences in the ways in which managers were using real options in their organisations. For many firms, real options served primarily as a conceptual tool for strategic planning and framing of decision problems (the one adopted in this research). However, for the majority of firms in their sample, real options valuation techniques (real options modelling) were being used to evaluate investment opportunities. They concluded that this reflects differing interpretations of the term "real options". Amram & Kulatilaka (1999) ascribed the slow adoption of the real options approach to the fact that *"the introduction of the real options approach have overly focused on the technical aspects of modelling, neglecting that real options is a way of thinking"* [1999, p. 5]. This might justify the findings of the recent study conducted by Alkaraan & Northcott (2006) where more than 50% of respondents rated the ROA "not important" as a strategic appraisal method. It could be the case that the respondents perceived the ROA in technical terms (modelling the options)

whereas the ROA (as a way of thinking) might well exist amongst these companies. Given that the concept of the ROA (as way of thinking) has not been given considerable attention in the practice compared to the other concept of the ROA (modelling the options), the focus of this research is on the former concept whereas the latter concept is beyond the scope of this research.

In the context of the ROA as explained above and adopted for this research, the option is the ability, but not the obligation, to take advantage of opportunities available at a later date that would not have been possible without earlier investment (Sharp 1991). Along these lines, the option is the right, but not the obligation, to take action in the future (Folta & O'Brien 2004, Amram & Kulatilaka 1999). By analogy with financial options, the opportunity to invest is a call option-a right but not an obligation to make the investment. To invest is to exercise the option (Dixit & Pindyck 2000). In this context, real options give the company the right to make follow-on investments (Myers 1977). What makes options strategic is that, they create a platform for potentially valuable opportunities in the future (*ibid*). In this situation, it is claimed (Bowman & Hurry 1993) that the linkage between investment decisions over time becomes both cognitive and economic.

It is claimed that part of the appeal of options models is that they allow for judgement under uncertainty rather than risk (Rumelt 1987). Therefore, it is very important for managers to assess risk associated with the investments. Sharp (1991) argues that:

> *"If they (managers) understand the circumstances under which they would exercise them (the options), then their estimate of the options' value is likely to be at least as good as formal calculation using the "exact" Black-Scholes formula or its derivatives."* [1991, p.70].

Hence, risk attached to the proposed project is a crucial factor for allowing the deployment of MJ and the ROA. This is because options increase in value when environmental uncertainty increases (McGrath *et al.* 2004, McDonald & Siegel 1986, Amram & Kulatilaka 1999). The impact of the risk on the adoption of the ROA is illustrated in section 2.8.

2.7.2. Taxonomy of real options

McGrath *et al.* (2004) claim that there is a fundamental problem with the real options theory as it stands, namely, little consistency regarding what is meant by the term "real option" and the nature of the option in question. They identified four different concepts in the real options literature, summarised below (McGrath *et al.* 2004):

1- Option value as a component of the total value of the firm: an option construct is considered as set of undefined growth opportunities possessed by a firm that stems from its bundle of resources and capabilities.

2- Specific investments with option-like properties: confining the application of options analysis to decisions regarding a single project.

3- Choices that might pertain to one or more proposals: in another approach to defining options, researchers focus on the decisions or choices that executives might make as the option, rather than the asset or resource about which the choice is being made.

4- Options reasoning as a heuristic for strategy: a final way that options are defined in the literature is as a heuristic process for understanding the economics of sequential resource investment choices. Key to this perspective on options is the premise that resources create the future potential for decision makers to act in ways that could not have been foreseen at the time a specific investment decision was made.

Another classification of real options is offered by Sharp (1991) who identified two types of real options:

1- Options that are incremental in nature: these options provide the firm with opportunities down the line to undertake profitable incremental investments. This type of option requires additional investment and virtually all investments contain options of this type.

2- Options that are generated by flexibility: flexibility options make use of investments already in place, such as changing a project's cost structure by moving production, or creating capacity in excess of immediate requirements at a second plant location.

Copeland & Keenan (1998) offered three types of real options:

- **Investment / growth options:** opportunities to make an initial or follow-on investment respectively.
- **Disinvestment / shrink options:** opportunities to abandon an operation completely or to sell off part of it.
- **Timing / learning options:** the possibility to defer exercising the above real options in order to wait for better circumstances or obtain more information.

This classification is similar to Trigeorgis' (1993) classification of options. He describes the following as real options: the option to defer, the option to stage and sequence investment, the option to alter operating scale, the option to abandon, the option to switch inputs or outputs, growth options, and multiple interacting options. Triantis (2006) considers the preceding classifications of real options as ways of creating valuable options but they are not options themselves.

Reviewing these classifications, three common characteristics can be identified:

1- Most options entail spending money now in order to create decision rights.
2- They are to some extent conflated concepts.
3- They are based on three issues: the firm's resources, the nature of the proposed project, and the growth options embedded in the project.

Basic comparison between these types of options reveals many common features, however, under different labels. In McGrath (2004)'s taxonomy, the option number 3 is very similar to Trigeorgis' (1993) classification, also to the last two types of options identified by Copeland & Keenan (1998), and to some extent, to the second type of option defined by Sharp (1991). Actually, these types of options are usually referred to as "flexibility" which is the main feature that distinguishes ROA from the orthodox financial analysis. This flexibility ensures

diversity of options available for firms in order to mitigate uncertainty (a feature that financial analysis does not offer when dealing with uncertainty). An example of this flexibility is subsidiaries of multinationals. Kogut & Kulatilaka (1994) emphasised the importance of such flexibility through focusing on increasing the breadth and number of options. The subject of this flexibility could be one project (type two in McGrath *et al.*'s 2004 classification) where options could be exercised to a single project (*i.e.* deferring, abandoning, scaling, staging), or could be multi-projects depending on the firm's resources and capabilities (type one in McGrath *et al.*'s 2004 classification) where multiple projects with multiple options could be exercised to each of them.

The incremental options identified by Sharp (1991) are similar to the first type of option identified by Copeland & Keenan (1998) and also to the first and fourth types suggested by McGrath *et al.* (2004). Such options are known as growth options (Folta & O'Brien 2004, Kulatilaka & Perotti 1998). This type of option emphasizes the need to invest incrementally in organisational assets such as joint ventures (Reuer & Tong 2005).

Subsequently, decisions regarding such options are actually best understood as a sequential "option chain", involving the recognition by managers that an option exists, and sequential investments, each investment conferring preferred access to a subsequent investment opportunity (Bowman & Hurry 1993). McGrath *et al.* (2004) have demonstrated the basic assumption behind the formation of this "option chain". They claim that in conducting empirical work, scholars in this tradition typically theorize that a decision sequence is consistent with options reasoning, forming a prediction of what is likely to occur if the decision maker is using options reasoning. They then examine whether the actual decisions appear to conform to the theorized sequence.

Given the overlapping features of these options, for this research, two main types of options were used. These two options reflect the classifications presented above:

1- Growth option: growth opportunities that require incremental investments (including creating additional capacity).
2- Flexibility: that include: option to defer, scale (expanding or contracting), abandon, stage, the proposed investment.

The subject of these options is a single proposed project (specific investment) because investment models in the field of finance often confine the application of options analysis to decisions regarding a single project (McGrath *et al.* 2004). In the real options literature, many studies have assessed discrete projects, such as a specific investment in R & D or in an asset with uncertain payoffs. For instance, the right to drill for oil or develop land [Dixit (1992), Majd & Pindyck (1987), Triantis & Hodder (1990), Williams (1991), and Dixit & Pindyck (1994)].

McGrath *et al.* (2004) claim that such a definition of a real option as a specific investment has been widely used in the management literature, and is the definition most commonly employed in empirical studies, such as growth options (Kester 1981), diversification (Kim & Kogut 1996), joint ventures (Kogut 1991), venture capital investments (Hurry *et al.* 1992), governance choices [Folta (1998), Folta & Miller (2002)], project abandonment option [Brennan & Schwartz (1985), Dixit (1989)] and option to defer (Folta *et al.* 2006). In these studies, option value is related to the preservation of choices, meaning that a firm can take a variety of actions (scale up or down, abandon, change direction, or delay) when more information is available, rather than make a full commitment to a given path at the outset of the project or initiative (McGrath *et al.* 2004). This definition is exactly the one adopted in this research.

2.7.3. Calculating the value of the real option

It is claimed (Grant 2005) that the technical details of valuing real options are complex. However, the underlying principles are intuitive. As explained earlier, after the development of the Black-Scholes option-pricing model, some scholars [*e.g.* Dixit & Pindyck (1994 and 1995), Myers (1984)] advocated the application of the principles of financial option valuation to real business opportunities (options). The rationale behind this is the alleged asymmetry between financial options and growth options.

Early explanation of this asymmetry was offered by Kester (1984) who demonstrated that securities options give the owner the right to buy a security at a fixed, predetermined price (called the exercise price) on or before a fixed date (the maturity date). By way of analogy, a discretionary opportunity to invest capital in productive assets like plant, equipment and

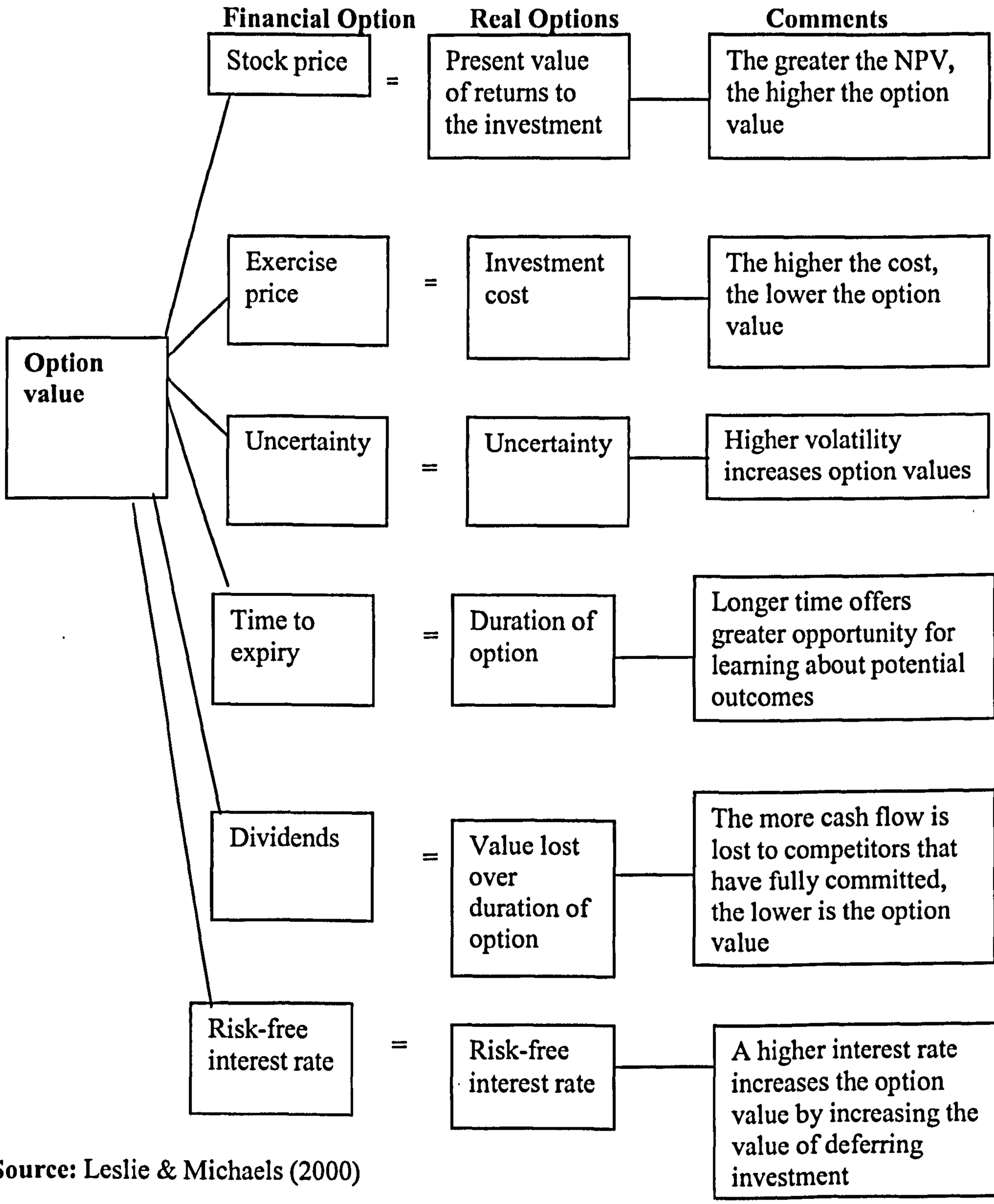
brand names at some future point in time is like a call option on real assets, or a "growth option". The cost of the investment represents the option's exercise price, the value of the option is the present value of expected cash flows plus the value of any new growth opportunities expected through ownership and employment of the assets. The time of maturity is the amount of time available before the opportunity disappears. Another illustration of this asymmetry is offered in more detail by Leslie & Michaels (2000). Based on this asymmetry, they argue the possibility of calculating the growth option's value in the same way used for financial options.

The well-known Black-Scholes option-pricing model provides a formula for pricing financial options. The value of securities options was shown to depend on six variables: the price of the security, the exercise price of the option, uncertainty, time to expiry, dividend payments, and the risk-free rate of interest. More recently, Leslie & Michaels (2000) have shown that the same factors that determine the value of a financial option also determine the value of a real option as explained in Figure 2.3.

However, there is a strong debate in the literature about the validity of the Black-Scholes option-pricing model in valuing growth options. Instead, different models are introduced to value such growth options. Triantis (2006) argues that in virtually all corporate investment evaluation situations, even if there are some variables that can be accurately assessed from financial markets, other variables will need to be **subjectively** estimated.

Sharp (1991) claims that the theory of option pricing rarely offers a simple answer to how to value project options and managers should recognise that their **experience and wisdom** are the best tools for judging the value of opportunities and flexibility. He suggests some simple guidelines. First, the value of options increases with uncertainty. When the environment is predictable, options have no value because all decisions can be made at the time of investment. Similarly, flexibility options are most valuable when uncertainty is high. Second, all other things being equal, value increases with the duration of the option. For flexibility options, the longer the plant is expected to operate, the greater the value of flexibility. The life of an incremental option is finite, no longer than the time it takes the firm's fastest competitor to catch up. Third, it is possible to place limits on option value. The lower bound is zero.

Figure 2.3. The Six Levers of Financial and Real Options



Source: Leslie & Michaels (2000)

The upper bound is the NPV of the most profitable alternative. In the case of an incremental option critical to the firm's survival, the value is very high; failing to acquire that option could cost the entire value of the firm. In this context, MJ is also considered as important for determining the value of the options.

A similar argument is introduced by Kester (1984) who argues that no single formula can embody growth option value reliably. As the first step, the company should classify projects more accurately according to their growth option characteristics. An appropriate classification begins by distinguishing between projects whose future benefits are realised primarily through cash flows (simple option) and those whose future benefits include opportunities for further discretionary investment (compound option). A simple growth option requires only that the company evaluate cash flows according to the NPV or IRR methods. The complexity of compound options, their role in shaping a company's strategy, and even their impact on the survival of the organization all demand a broader analysis. A company must consider these projects as part of a large cluster of projects, or as a stream of investment decisions that extends over time.

McKinsey & Company (2000) offer a routine to value the options where the basic process is logical and straightforward.

1- Apply a standard DCF analysis without taking account of any flexibility options.

2 -Model uncertainty in the project using event trees (the chances for each stage of the project, under different outcomes for each of these uncertain DCF values can be calculated).

3– Identify the key managerial decisions that can be made at different points of the project's development so as to convert the event tree into a decision tree (defer the project, expand or contract the scale of the project, the ability to abandon the project).

4 - The total project with managerial flexibility can then be valued using what is known as the "replicating portfolio" approach. This approach replicates the cash flows of the project by a portfolio of priced securities and equates the value of the project to that of the replicating portfolio.

These different approaches reflect the diverse nature of the options that might be embedded in a project and also the attitudes towards the uncertainty attached to that project. Therefore, when the information needed to value the option is available given that uncertainty is not high, the value of the option could be calculated according to Leslie & Michaels' (2000) model. However, when the uncertainty is high, other models could be adopted until the

uncertainty is resolved by obtaining more information while applying the option. In this case, the option is valued constantly in conjunction with its contribution to firm's strategy. Therefore, when more information becomes available, many scenarios could be followed since all options are still available. For example, if the results of the early stages in adopting the option turned to be unfavourable due to incoming information, the firm still has many options available to exert depending on the situation (*i.e.* abandonment, defer, scale, and other options might arise from the situation).

2.7.4. Flexibility attached to the ROA

Although the classification of the options presented earlier implies different types of options, they are, actually, different indicators of the same term "flexibility" generated when considering the ROA in the IAP. This flexibility is claimed to be at the core of real option theory [Brekke & Schieldrop (2000), Cornel (1993), Trigeorgis (1988 & 1997), and MacDougall & Pike (2003)]. This might justify the use of both terms interchangeably. For example, Werner (2004) claims that the real option is equivalent to the flexibility to react to different future outcomes of uncertainty. Likewise, Broyles (2003) describes real options as features of a project that provide flexibility that enable the firm to optimally respond to a changing scenario characterised by uncertainty.

Busby & Pitts (1998) use the term 'real option' for 'situations of flexibility in irreversible investments in real assets, such as factories and production lines'. They assert that flexibility provided by real options in investments appears in many guises:

- **Timing:** options to embark on an investment, to defer it or to abandon it.
- **Scale:** options to expand or to contract an investment.
- **Staging:** the option to undertake an investment in stages.
- **Growth:** options to make investments now that may lead to greater opportunities later, sometimes called 'toe in the door' options, or technical importance of the project.

These guises are considered as "types of options" by other scholars as explained before. The rationale for this flexibility is that, instead of committing to an entire project there is a virtue in breaking the project into a number of phases, where the decision of whether and how to embark on the next phase can be made in the light of prevailing circumstances and the learning gained from the previous stage of the project (Grant, 2002). Therefore, the options to delay, modify, or abandon the project are retained. Kulatilaka & Marcus (1992) argue that the flexibility that arises from such options increases the expected value of projects when they are first being contemplated.

A former CFO of Merck (Nichols 1994), an early adopter of the ROA, stressed the significance of the flexibility option by claiming that when a firm makes an initial investment in a research project, it means paying an entry fee for a right, but the firm is not obligated to continue that research at a later stage. Thus, all business decisions are real options, in that they confer the right but not the obligation to take some initiative in the future.

Trigeorgis (1993) claims that the interaction between these options makes flexibility more valuable than just being the sum of the separate options value:

> *"Real-life projects in most industries often involve a collection of various options, both upward-potential enhancing calls and downward-protection put options present in combination. Their combined option value may differ from the sum of separate options value, i.e., they interact."* [1993, p. 204]

Amram & Kulatilaka (1999), Billington (2003) explained the importance of flexibility in manufacturing industry through allowing firms to switch manufacturing lines to other products, alter product configurations, and change locations of activities or to temporarily shut down activities. Another form of flexibility (staging option) was also illustrated in manufacturing industry by Luehrman (1998) who stressed the possibility of breaking down investments into smaller modules that can be deployed in a discretionary way.

Therefore, this flexibility could be regarded as an advantage of the ROA over financial techniques not only in the IAP but also in the decision-making process. The options to invest, wait or divest in response to new information are not available under orthodox financial analysis.

2.7.5. Best practices in managing real options on the basis of MJ

Some of the most successful applications took place in the most uncertain field, namely, oil and gas development. This could be considered as a sign of the suitability of both MJ and the ROA for risky investments.

A good example is what happened during the1990s when a number of western oil majors (Chevron, ENI, BP, and Mobil) made multi-million-dollar investments in oil and gas projects with negative NPVs in certain former Soviet republics. The aim was to make later investments in oilfield development, pipelines, and downstream facilities that would be needed to exploit any oil and gas fields. These opportunities were options for the companies (Grant 2005). This is considered to be typical example of the incremental options (growth options). Such initial investments opened a wide range of choices (options) to be exercised later in the future. Thus, these companies have actually bought the right to exercise these options in the future on the basis of MJ. In the same field, another example of a successful story of applying MJ to business options is illustrated by Leslie & Michaels (2000). They explained how the adoption of the ROA and MJ under uncertainty has contributed to stronger competitive position and higher returns to shareholders of two UK companies, BP and PowerGen.

Between 1990 and 1996, BP increased its market value from $18 billion to $30 billion, representing a total return to shareholders of 167%. Over the same period, PowerGen raised its market value from $1.4 billion to $3.8 billion, a return of almost 300%. BP's exploitation of the North Sea oil and gas field development options took place against a background of falling reservoir sizes and volatile oil and gas prices. PowerGen has had to deal with barely rising demand, a saturated market and increasing competition to build new capacity. Both companies managed to earn extraordinary returns in unfavourable environments.

However, the successful applications of the ROA and MJ in the IAP were not confined to the oil and gas field. The increased interest in the options attached to the proposed project has led to many studies being conducted, some mentioned earlier (2.7.2), across different disciplines. In manufacturing industry (the field of this research), some successful applications were evident. For example, options analysis and MJ were used to determine whether the additional

cost of building in switching capability is likely to be worthwhile (Merton 1998). In another analysis, Baldwin & Clark (2000) assessed whether the investment to create modularity in production is worth the additional complexity of the design. In these studies, the aim was to determine the effects of making different choices on valuation.

Therefore, the application of MJ and ROA (strategic approach) is not confined to a specific industry. It could be applied whenever the proper context exists. The crucial element that triggers this appears to be a high risk business environment.

2.7.6. Drawbacks with applying MJ for real options

The distinction between financial and strategic projects has led to different approaches in the IAP. While the financial analysis is used for projects whose financial returns can be predicted, subject to a margin error, strategic approach is used for strategic projects whose returns cannot be expressed in terms of financial returns but in terms of growth options. Kester (1984) argues that this breakdown of analytic discipline may result in decisions made on blind faith or by force of personality. "Strategic" importance can become a much-abused rationale for the acceptance of weak projects. By separating strategic projects from others, the company may foster the belief that investing to increase its stock price is a different activity from investing to generate growth. One of these must be sacrificed when resources are limited (*ibid*). Therefore, as is the case in the financial techniques, MJ could be subject to abuse.

Another shortcoming of MJ in the IAP is highlighted by Kakati & Dhar (1991) who claim that evaluating projects purely on the basis of past experience, intuition and judgement has two main drawbacks:

- Firstly, projects might bring a return far below the hurdle rate and might lead to insolvency.

- Secondly, there are no quantitative data to back up the argument to convince the board.

With regard to the ROA, The ability of this approach to contain the downside risk while maintaining access to potential gains has been questioned in some cases. Some studies found little support for predictions emerging from option theory. For instance, Reuer & Leiblein (2000) found no containment of downside risk as a result of firms' decisions to operate internationally, as might have been expected from options theory. They conclude that there is less flexibility in international expansion investments than might be anticipated.

The second weakness in the ROA is that the real options, particularly growth options, are not held exclusively or completely by just one company (Triantis 2006). The options might be available to many firms who operate in the same industry. If these firms have exercised the options this might lead to reduction in the value of the option. The ability of the firms to exercise the option is dependent on issues such as entry barriers, availability of experienced staff, funds.

2.8. Business risk and the Real Options Approach (ROA)

It is a matter of fact that all investment decisions look into the future and the future is never certain. Consequently, aspects of uncertainty and risk are ones which are germane to any investment decision (Wright 1990).

Recent interest in the problems of uncertainty and resulting developments in finance theory have identified fundamental theoretical weaknesses in DCF approaches to strategy analysis (as explained earlier, *i.e.* in 2.5, 2.6. and at the outset of 2.7). The result has been the development of a whole new approach to valuing investments and strategies using real option analysis (Grant 2002).

Crucial to this shift in the IAP is the risk attached to the proposed project. Risk is treated as a threat that influences adversely the value of the expected cash flows when applying the financial techniques. Paradoxically, under the ROA, it is considered as an encouraging factor that increases the value of the growth options embedded in strategic projects. Triantis (2006) argues that:

> *"Rather than treating risk as something to be avoided, real options thinking encourages managers to view volatility as a potential source of value, with profound implications for the design of projects and corporate strategy."* [Triantis, p. 78]

Kester (1984) claims that risk is a positive factor in the determination of a growth option's worth. The riskier the project, the more valuable is the growth option. This is because of the asymmetry between potential upside gains and downside losses when an option matures. Large gains are possible if a project's NPV increases. However, losses can be cut by simply choosing not to exercise the option whenever the project's NPV is negative (*ibid*).

Therefore, the value stemming from the presence of real options could be enhanced or diminished by exercising the proper options. McGrath *et al.* (2004) offered the rationale underlying the asymmetry between substantial upside potential and downside loss containment:

> *"Valuable options possess an asymmetrical performance distribution, skewed toward the upside. This is achieved when the options-oriented investor pursues opportunities that appear to have significant upside potential in a manner that permits costs (downside risk) to be contained."* [2004, p. 89].

Similar views are echoed by Pike & Neale (2006):

"The corporate managers can create options-actions to mitigate losses or exploit new opportunities presented by capital investments. Managerial flexibility to adapt its future actions creates an asymmetry in the NPV probability distribution that increases the investment project's value by improving the upside potential while limiting downside losses" [2006, p. 311].

Hence, by possessing the real assets under uncertainty, the firm increases the upside value and decreases the downside risk (risk of failure or undershooting) because the presence of many options in an uncertain environment allows the organisation to exploit an uncertain environment (Bowman & Hurry 1993, Kogut & Kulatilaka 1994). This allows the organisation to capitalize on uncertain environments by reducing the risk of operating in an uncertain environment. Bowman & Hurry (1993) and Gavetti & Levinthal (2000) claim that

this is the basic intuition behind the recent interest in the idea of "real options" in the business strategy literature.

Therefore, it could be argued that uncertainty influences the value of the real option in the same way as in the financial option. In financial options, as uncertainty increases, upside potential increases while downside risk remains fixed (Fama & Miller 1972). McGrath (1999) have extended this logic to real options by arguing that the higher the variance in outcome from making a real investment, the higher the option value of the investment. Such positive relationship between volatility and investment was advocated by many scholars in the past (*i.e.* Hartman 1972, Abel 1983 & 1984).

Consequently, ROA seems to play a significant role in bridging the gap between risk management and strategic analysis. As the option value actually increases with uncertainty and project duration, omitting options in the evaluation process is most harmful for high risk, long-term projects (Sharp, 1991). The point here is that, for the firm, it is more valuable under uncertainty to be flexible by having options to pursue after the situation changes. As more information becomes available about the options, a suitable decision could be made regarding these options (*i.e.* abandonment, continue, defer, scale).

Though risk associated with the project might increase the chances of rejecting the proposed project when applying financial techniques, it is one of the best reasons to preserve, not reject the project when considering it under the strategic approach (ROA and MJ) because a risky business environment is considered to increase the value of the options and allows for MJ factors to be deployed. Mintzberg (1987, 1994) claims that intuition and creativity remain vital ingredients (of the assessment process), particularly in conditions of less stability. This is why McGrath *et al.* (2004) support the use of the ROA under uncertainty:

"Real options reasoning is poised to occupy a central conceptual position in the development of theory that offers guidance for strategic decision making under uncertainty." [2004, p. 86].

Therefore, if new growth options are involved, high risk projects might be preferable to low risk ones. Moreover, importantly, in the light of the beneficial impact of risk on growth option value, companies should hold options on projects whose value swings widely rather than only

slightly over time. Nevertheless, Brealey & Myers (2000) stress that a company should invest in a range of projects of differing risk levels.

2.9. Strategic orientation versus financial orientation

Having reviewed alternative appraisal approaches namely financial analysis and the strategic approach (ROA informed by MJ), the question remains which of these is most valid and under what circumstances? Should managers pursue risky projects that offer below-target rate of returns but that could create valuable strategic opportunities later? Or should they stick with a less risky and more immediately profitable bet? Insights into the answers to these questions could be extracted from the previous discussion, nevertheless, a straight comparison between both approaches is thought to be helpful in this respect.

In the financial management literature, it is claimed (*e.g.* Byrne 1995) that due to the rise in the use of DCF techniques, many managers have become too absorbed with DCF to the extent that practical strategic directional considerations overlooked. This resulted in managers facing an increasingly difficult choice in evaluating complex investment decisions related to strategic investments whose benefits cannot be expressed in terms of cash flows (Kester 1984). Kester (1984) claims that the difficulty with DCF techniques is that future investment opportunities are discretionary and they try to reflect their worth in a present value calculation. Similar views are expressed by Meredith & Suresh (1986) who argue that complex decisions simply cannot be reduced to a single number and still contain the essential information needed for the decision.

Given this situation, Dixit & Pindyck (1995), and Myers (1984) conclude that DCF is found to be incomplete and may lead to decisions that destroy the value of the firm. Instead, real option theory is proposed for such types of investment since the present value of an investment's cash flows excludes the valuable options embedded within the investment.

As explained before, strategic analysis, which implies the employment of the ROA and MJ in the IAP, rests heavily on the intuition and judgement of key senior executives. Therefore, the isolation of strategic projects is helpful to the extent that valuable executive experience is brought into play and truly important investments are not routinely rejected by simplistic

quantitative techniques. However, this approach is claimed to be complex, demands enormous computational work and requires additional data [Cheung (1993), Akalu (2003)]. Consequently, some academics (*e.g.* Levy & Sarnat 1994) prefer not to deal with strategy at all, and continue to assume that decisions will be made based on economic evaluation alone.

Myers (1984) links the use of either of these approaches with a firm's strategic objectives. He argues that when low NPV projects are "nurtured" for strategic reasons, the strategic analysis overrides measures of financial value. Likewise, Kester (1984) argues that such projects with a negative NPV can be valuable "out-of-the-money" growth options if the company can put off the investment decision for a while. Conversely, projects with apparently positive NPVs are passed over if they fit the firm's strategic objectives. Carr & Tomkins (1996) reveal no inconsistency between both approaches:

"There is, of course, no necessary incompatibility between strategic and capital budgeting techniques such as NPV, since strategic analysis logically precedes capital budgeting techniques, no finance director would want to accept cash flow projections not predicated on sound business logic." [1996, p. 200]

Such a complementary status of these approaches is also echoed by Peskett (1999) and Rupert (1999) by emphasizing that the use of real options allows managers to take into account intangible factors such as strategic issues. Therefore, it provides a complementary approach to the traditional DCF analysis, which is primarily quantitative. Carr *et al.* (1994a), however, claim that these approaches are not just complementary but also interrelated. They claim that, in practice, a strong financial orientation often drives out more elaborate strategic analysis and *vice versa*. A recent study, by Alkaraan & Northcott (2006), about appraising strategic capital investments, found a commitment to the role of intuition and judgement in assessing how the strategic dimensions of capital investments connect with their financial outcomes.

Based on the arguments presented above, a firm can classify proposed projects into three types: short-term projects with no or few strategic options, long-term projects with strategic options and low immediate cash flows, and projects with a close combination of both. Financial analysis would be most appropriate for the first, a strategic approach for the second, and an integrated approach for the third where strategic analysis compensates for shortfalls of the traditional techniques and *vice versa*.

2.10. Appraisal approaches and shareholder value creation

Since the aim of the IAP is to select projects that add value to the firm and its shareholders, it is important to explain how appraisal approaches contribute to the achievement of this aim. In the financial management literature, two main sources of shareholder value can be identified. The first one is via achieving free cash flows, the second one via exploiting growth opportunities.

The first approach is straightforward where value creation occurs when the financial market value of the new project's cash inflows exceeds the company's cost of investment (Arnold & Shockley 2003). This is because the positive NPV will repay the outlay and the financing costs, and will raise the shareholder wealth by the amount of the positive NPV. This logic forms the basis of the shareholder value analysis, one of the many techniques developed for measuring shareholder value, which draws upon the principles of DCF analysis commonly used for purposes of investment appraisal (Rappaport 1986).

Others (*e.g.* Arzac 1986) explain this source with regard to the ROCE and argue that the company creates value by maintaining a positive spread between its ROCE and its cost of equity capital (that is, it generates profits that exceed what investors require from companies in the same class of risk). Therefore, the financial analysis is of great importance in the IAP as it drops projects with a negative NPV, or with a low ROCE, from the IAP.

However, financial returns are not the only source of shareholder value. Kester (1984) argues that the project's value comes not so much from cash flows directly attributable to the new plant as from growth opportunities. Therefore, growth options embedded in the projects also contribute to the enhancement of shareholder value. According to this approach, the company creates value from investing in projects with growth opportunities. It is claimed (Myers 1984) that projects bringing intangible assets or growth opportunities to the firm have correspondingly higher NPVs. Along this line, Kester (1984) explains that in the ROA, the opportunity to undertake a project is worth at least the present value of the project's cash inflows less the present value of its outflows. But the opportunity to invest can be worth even more than the project's NPV. How much more depends on the length of time the project can be deferred, project risk and the level of interest rate (*ibid*). McDonald (2000) argues that real

option considerations can be a significant component of value, and firms that approximately take them into account should outperform firms that do not. However, the strategic approach also contributes to shareholder value creation by allowing for projects with growth options to be undertaken. Such projects otherwise could be rejected by using financial analysis due to the high risk attached to them. Examples of two successful companies operating in highly uncertain markets that exploited real options to create shareholder value were explained in 2.7.5.

Accordingly, these two approaches are equally important in creating economic value and enhancing shareholder value. While the first one focuses on the economic returns, the second focuses on the future opportunities that are not directly convertible to cash flows in the short term. However, despite the differences between these approaches, McGrath *et al.* (2004) argue for the complementary status of these approaches in the IAP:

> *"We do not see the two at odds with one another, in fact, we see them as entirely different constructs that are, in fact, complementary."* [2004, p. 98].

This means the strategic approach implies an "economic sense" for justifying the projects with growth options.

2.11. Finance theory and strategic planning

The links between financial and strategic analysis have been emphasised recently by some academics within the finance field [*e.g.* Mills (1994), Tomkins (1991), Ward (1993)]. Mintzberg (1994) has attributed this interest to the development of business strategy as a newer discipline than accounting and finance. The term "strategic" used in this context implies investments that involve high levels of risk, produce intangible outcomes, and have a significant long-term impact on the firm's performance [Marsh *et al.*(1988), Ghemawat (1992), Butler *at al.* (1993)].

In the strategic management literature, strategic planning entails deciding on three main issues: where are we now? (Current situation of the firm), where do we want to be? (Future objectives), and how are we going to get there? (Policies and procedures to be adopted to

achieve future objectives). This context forms the basis for the development of the firm's financial plans. Hence, criteria deployed in the IAP need to ensure that the required outcomes, in terms of tangible and intangible benefits from a particular investment opportunity, are consistent with the firm's business strategy.

Advocates of financial analysis in strategic planning argue that maximising of shareholder value, as a financial goal, is a proper basis for strategy formulation. In this situation, cash flows and economic profit are considered better indicators of creating shareholder value. For instance, Grant (2002) offers four steps in applying shareholder value analysis to appraise business strategies as follows:

1- Identify strategy alternatives.
2- Estimate the cash flows associated with each strategy.
3- Estimate the implications of each strategy for the cost of capital.
4- Select the strategy that generates the highest NPV.

Bromwich & Bhimani (1991) argue that option pricing methods hold great promise for strategic analysis. According to their model, the first step is to review a project's strategic plan to see how this new investment can be used to exploit strategic opportunities and remedy weaknesses. Once the headquarters understands that some of the strategic benefits of investments are valuable options on future growth, it becomes clear that such investments add to the value of the company's equity just as do projects that yield immediate cash flows. The only difference is that value comes initially in the form of growth options rather than cash flows (Kester 1984). The introduction of strategic opportunities (non-quantifiable returns) in the assessment process of a proposed project is claimed (Myers 1984) to eliminate one reason for the gap between finance theory and strategic planning.

Recently, Leslie & Michaels (2000) demonstrated four ways in which the discipline of applying real options analysis to every investment possibility will improve a company's strategies:

1- **By emphasizing opportunities:** a real-option strategy emphasizes the logic of strategic opportunism. It forces managers to compare every incremental opportunity arising from existing investments with the full range of opportunities open to them.

2- **By enhancing strategic leverage:** real-option strategies promote strategic leverage, encouraging managers to exploit situations where incremental investment can keep their company in the game.

3- **By maximizing rights:** acquire and maximize a right to an opportunity.

4- **By minimizing obligations:** minimising managers' obligations in situations characterised by uncertainty and irreversibility.

Therefore, projects with growth options contribute to business strategy achievement just as projects with financial returns do. Consequently, the IAP entails an integrated approach that ensures the alignment of the proposed project's outcome (whether strategic opportunities or financial returns) with a firm's business strategy.

2.12. Strategic approaches in investment appraisal

In the literature, a distinction is made between three kinds of strategies (Grant 2002):

- **Corporate strategy** which defines the scope of the firm in terms of the industries and markets in which it competes. It comprises the definition of the objectives of the business, how they are to be achieved, and the resources that will be required.

- **Business strategy (competitive strategy)** is concerned with how the firm competes within a particular industry or market.

- **Functional strategy** is the elaboration and implementation of the business strategies through individual functions such as production, HR, R&D, marketing.

The success of these strategies is heavily reliant on the IAP. Therefore, great concern is paid to consistency between the proposed projects and the firm's strategy.

Meredith & Suresh (1986) identify four main strategic approaches:

1- **Technical importance:** this approach is based on the concept of technical importance which means the project is a prerequisite for a crucial follow-on activity. It may have negligible returns or even disadvantages but later, more desirable work cannot be attempted without implementing this activity first.

2- **Business objectives:** justification of a project because it directly achieves the firm's business objectives.

3 - **Competitive advantage:** in the competitive advantage justification approach, an opportunity may exist for the firm to gain a significant advantage over its competitors by implementing this project. The opportunity may have arisen from a unique set of circumstances, or may be an outgrowth of a slight competitive advantage the firm already holds.

4- **Research and development:** treating a project as R&D investment admits that it may fail but that it holds sufficient strategic promise to justify the investment.

The main feature of these approaches is their consistency with the concept of the ROA. The emphasis on the incremental options (technical importance) and over-riding financial techniques in order to achieve strategic goals and competitive advantage are considered strong justifications for undertaking strategic projects.

Since these approaches provide the general justifications of undertaking a project (why a project is needed), they could be considered at higher levels of strategy development (*i.e.* corporate strategy and business strategy) because the firm sets the strategic plan at those levels.

Another strategic approach is suggested by Porter (1980) at the operational level of strategy (functional strategy). It provides the mechanism for achieving the business strategy (how strategic objectives are to be achieved). The main guidelines in this strategic approach are explained below:

1- **Broad product differentiation** where the company tries to specifically differentiate all its products across the complete range from those of its competitors, looking to add unique benefits (such as better quality or greater convenience).

2- **Narrow product differentiation** where the company aims for product differentiation in a very narrow, specialised product range.

3- **Broad-based cost leadership** where the company drives towards creating superior value by concentrating on minimizing operating costs over its complete product range.

4- **Focused cost leadership** where the company looks to specialise in a very narrow product range and pursue maximum scale economies and production cost efficiency.

The link between financial analysis and strategic planning explained previously has contributed to the development of these strategic approaches in the IAP. Therefore, projects could be undertaken for purposes other than achieving near-in-time cash flows or financial returns.

2.13. Manufacturing strategy

Manufacturing strategy and the process by which it is developed is well-known (see for example, Hayes & Wheelwright 1984, Porter 1980, Skinner 1978). It is defined by Krinsky & Miltenburg (1991) as the set of plans and policies by which manufacturing seeks to provide six manufacturing outcomes: cost, performance, quality, delivery, flexibility, and innovativeness, at target levels, to the rest of the organisation.

In this context, the IAP becomes an integrated part of this manufacturing strategy as it ensures the alignment of the proposed projects with the manufacturing outcomes stated above. Though most of these outcomes are intangible, the role of the ROA informed by MJ could be significant in approving strategic projects whose outcomes are expressed in terms of consolidating the existing activities and the impact would be on the firm value as a whole. For example investments in advanced technology such as numerically controlled machines (NCM), computer aided design (CAD), flexible manufacturing systems (FMS) are strategic

ones and their full impact on the firm is not estimable in terms of cash flows alone. The argument in the literature is that, when such strategically important investments are evaluated using financial techniques, most of these intangible and strategic benefits may be ignored in the capital budgeting process because of inadequate means for quantifying them [Dugdale & Jones (1995), Adler (2000)]. Therefore, what constitutes a sound investment (Finnie 1988) needs to be measured by its contribution to the agreed corporate strategy and not only by how well it meets the criteria laid down by a set of accounting rules and evaluations. The increasing interest in the strategic projects that entails the deployment of the ROA and MJ in the IAP is thought to dramatically change established theories. This is suggested by Merton (1998) who argues that *"(the options) may even lead to a revisiting of the industrial-organisation model."* [1998, p. 343]. Likewise, Amram & Kulatilaka (1999) argue that:

> *"Real options is an important way of thinking about valuation and strategic decision making, and the power of this approach is starting to change the economic "equation" of many industries."* [1999, p. 3].

A widely-recognised model in manufacturing strategy integration was introduced by Wheelwright & Hayes (1985). They defined four stages of manufacturing strategy integration. These stages are summarised as follows:

1- **Internally neutral:** the goal is minimisation of manufacturing's negative impact.
2- **Externally neutral:** the goal is to follow industry practice. Capital investment used to achieve scale advantages.
3- **Internally supportive:** the goal is support of business strategy with a formulated manufacturing strategy.
4- **Externally supportive:** the goal is provision of strategic manufacturing capabilities resulting in corporate-level strategic opportunities.

Recent studies show that the manufacturing strategic map (Krinsky & Miltenburg 1991) can be used to simplify the strategic analysis. Thus, appropriate plans and policies are designed for some or all decision areas (*e.g.* production capacity, facilities, process technology, supplier relations, planning and control, measurement, work force, quality and structure policies) within manufacturing (Chan *et al.* 2001).

2.13.1. Research on integrating strategic analysis into manufacturing industry

One of the most well-known studies in this concern is the longitudinal study conducted by Carr & Tomkins in a single industry (motor components industry), the same industry in this study. They compared SIDs practices in several countries. In 1994, a comparison was made between SIDs practices in two countries, the UK and Germany (Carr *et al.* 1994b). They found that UK companies in this industry placed roughly three times more emphasis than the German companies on formal financial analysis, slightly less emphasis than the Germans on cost driver analysis and half as much emphasis as the Germans on value chain and competitive advantage. Furthermore, the Germans were much better, compared to the British, at integrating strategic concepts with financial aspects.

With regard to the deployment of the financial measures used on strategic investments, this study showed that, at least in this industry, DCF was not extensively used as a financial decision tool. Payback was the major investment appraisal tool. They found only 54% of the UK sample utilised DCF on any types of investment decisions, compared with 84% of large UK companies surveyed in 1986 (Butler *et al.* 1993, p. 56). The study suggested that companies in the UK were using such techniques more extensively than is the case in advanced competitor countries such as Germany.

This study also reported that strategic analysis of a formal kind (*e.g.* strategic portfolio analysis) was not extensively employed. German firms seemed more strategically orientated than UK firms, but informally accumulated knowledge and experience seemed to influence investment decision-making process more than strategic analysis. However, having identified the importance of the informal accumulated knowledge and experience in the investment decision-making process, no attempt was made to link these factors to the IAP and investigate the implications of considering such factors in the IAP and under what conditions.

Carr & Tomkins (1996) reported fifty one cases in the UK, US and German companies. They found that the most successful group of companies devoted most of their attention to value chain and competitive advantage analysis, and they actually paid somewhat less attention to any financial calculus. Compared with poor performers, they devoted a third as much attention to value chain issues, twice as much attention to analysis of competitive advantage

and also of fundamental cost drivers, whilst correspondingly, they devoted only about a quarter as much attention to any financial calculus. Therefore, strategic analysis seems to be more important than financial calculus in the assessment of the strategic investments. It is claimed (Hayes & Abernathy 1980, Hayes & Garvin 1982) that a more strategic approach has been thought to have characterised successful German and Japanese companies. Hence, the deployment of the ROA for strategic investments is deemed to be vital since risk attached to such projects is relatively high as they are undertaken over a long period.

Similar results to those obtained in the 1994 study were also reported in a 1996 study regarding the financial orientation of British firms and the strategic orientation of the German firms. This study reports that companies in the UK are, on average, placing three times as much emphasis on the financial calculus as those in Germany. German companies, on the other hand, place nearly twice as much emphasis on ensuring that their investments really do secure competitive advantage. US firms have similar attitudes to those in the UK in focusing on the financial calculus more than strategic analysis when considering strategic investments.

In two further studies conducted in 1998 (Carr & Tomkins 1998) and in 2006 (Carr 2006), two more countries were included, Japan (1998) and Russia (2006). The findings of the 1998 study, which drew upon 71 companies from four countries, showed that German and Japanese firms are more strategically orientated than UK and US firms who focused more on the financial calculus and short-term profit. Such similarities in investment behaviour have been reported by Doyle's (1992) study who found that the German approach is close to the Japanese one where the short-term profits objective is considered to be far less important by Japanese motor companies compared with UK and US companies.

The demand for higher shorter-term profit returns by the US and UK firms, a phenomenon referred to as short-termism*, was ascribed to pressure imposed on these firms generated by higher costs of capital and more aggressive financial markets compared with other countries (Carr 2006). However, Carr & Ng (1995) note that the Japanese company Nissan does use DCF techniques on minor, internally-orientated investment decisions such as whether to

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* See Ball (1991), Barwise *et al.* (1989), Carr *et al.* (1994a), Hayes & Abernathy (1980), Hayes & Garvin (1982), Jacobs (1991), Marsh (1990), and Porter (1992).

lease or buy relatively small items of equipment, but deliberately avoids NPV technique on major investment decisions. This supports the findings obtained by Hodder in 1986 who found that financial analysis has not been disregarded by Japanese. Carr's most recent study in 2006 showed that financial influences on US and UK companies' SIDs were markedly greater than in Germany or Japan between 1989 and 1998. British companies' financial orientation in 2002 was slightly greater than that for typical UK companies. US strategic decisions have become somewhat more short-term and financially oriented in the last ten years.

A substantial proportion of German and almost all Japanese SIDs, used much longer payback periods (either explicitly or implicitly) than would be allowed for in the US, UK and Russia. They (German and Japanese companies) remained long-termist in orientation. Russian firms' SIDs are heavily influenced by externally determined economic planning.

2.14. Research contribution

Having reviewed the literature, the following conclusions can be drawn:

1- Although extensive attention has been paid to the use of financial appraisal techniques in the IAP, less is known about their role in the IAP in relation to more strategically-oriented approaches such as ROA, particularly, when risk associated with the proposed investment is high.

2- As the financial appraisal techniques consider the quantitative returns from the investment proposed in the IAP, not enough weight is given to the value of strategic opportunities embedded in that investment due to difficulties in expressing these qualitative benefits in financial terms. Therefore, no clear mechanism was introduced as how to take account of these intangible benefits in the IAP.

3- A limited number of research efforts have focused on developing an in-depth understanding of the IAP with regard to strategic opportunities that arise from proposed investments and their impact on the SIDs. In addition, the role of business risk in determining the appraisal approaches to be utilised in the IAP has not been investigated in the previous

studies in this field. Such an important topic has not yet been adequately documented in the literature.

4- Despite the recent increasing interest in valuing the growth options associated with the proposed project, the financial management literature lacks a comprehensive model that clearly and formally acknowledges the importance of the managerial judgement (managers' experience, intuition, and own judgement) in assessing projects with growth options.

Consequently, deriving a new investment appraisal model which integrates the ROA and MJ into the IAP is the main aim of this research. This strategic approach allows the assessment of the strategic projects (projects with growth options) that otherwise may be rejected by the deployment of the financial appraisal techniques in the IAP. Both approaches - the strategic approach (ROA informed by MJ) and the financial analysis (four financial techniques) - are incorporated to provide a sound justification for undertaking an investment proposal. This new model of the IAP developed in the following chapter (Ch 3) allows the assessment of a wide variety of proposed projects with different outcomes (financial returns or strategic opportunities or a combination of both).

Such a model would contribute to satisfying managers' need (as identified by Sharp 1991) for a practical, formal procedure to support their intuition to accept highly uncertain and apparently unprofitable, but strategically important, projects. Therefore, while control systems will encourage them to err on the side of caution and reject investments that fail to meet NPV criteria, even though they make good business sense. This model encourages them to initiate strategic projects with growth options.

By doing this, the research is expected to be a step towards filling the void in the investment appraisal literature. It adds a stage to the appraisal process in which managers analyse and identify the benefits (financial and strategic) that might be attached to the proposed investment. Therefore, they take account of both in determining the value of the proposed project. Thus, the value of the proposed investment is defined not only in terms of financial returns but also in terms of improved long-term competitiveness. So, strategically important investments which would have been rejected by relying on the financial techniques alone, now have a better chance to be undertaken. This integration of the strategic (intangible) and financial (tangible) considerations in the IAP, expressed by the introduction of a new

appraisal framework in this study, would contribute to the answer to numerous calls made for a more coherent appraisal approach that supports the strategic investment projects [*e.g.* Slagmulder *et al.* (1995), Shank (1996), Lefly (1996), and Adler (2000)].

It is expected that examining the extent to which use is made of the ROA and MJ in practice, and the context under which are adopted, will contribute to the development of a better understanding of their role in the IAP. Although this research can be interpreted, to some extent, as an extension of studies mentioned earlier about capital budgeting techniques, it can also be seen as a unique attempt to consider the ROA and MJ as essential components of a strategic approach in the IAP. Despite strengths and good arguments in previous studies and models, the integration of the ROA and MJ into the IAP has been overlooked in most of them.

2.15. Summary

Companies need to allocate funds to the most attractive and rewarding projects in order to maintain sustainable growth and create value. The allocation of resources is determined by the IAP where projects are assessed and refined according to their alignment with firms' objectives and strategies. However, the suitability of the proposed projects is not defined solely in financial terms. Projects, sometimes, can be undertaken even though their financial returns do not appear to be attractive in the short-term.

For a long time, most studies of investment appraisal have systematically focused on the prevalence of investment appraisal techniques and risk techniques and neglected the growth opportunities associated with the proposed projects that cannot be captured by these techniques. More recently, as the risk associated with the proposed projects grows and the importance of the strategic benefits becomes more prominent, the need for a more strategically-orientated appraisal approach has emerged.

The strategic approach (ROA informed by MJ) is thought to be a suitable approach to exploit the strategic opportunities while mitigating the impact of uncertainty. Both approaches were explained and the most appropriate conditions for the deployment of each of them in the IAP were highlighted. In addition, the contradictory perspective of risk treatment by both

approaches was illustrated together with the different contribution that both approaches can make to firms' business strategy achievement.

The importance of this research and the extent to which it contributes to closing the gap identified in the literature is explained in the light of the limitations of the previous studies in the IAP. This contribution is introduced in terms of integrating the ROA and MJ into the IAP in order to capture the growth opportunities embedded in the proposed investment. The strategy adopted for the achievement of this contribution is illustrated in the following chapter.

Chapter 3

Research Methodology

3.1. Introduction

Having reviewed the research problem and objectives, this chapter now introduces the contrasting research methodologies and approaches for conducting research. The two main research paradigms and related concepts are defined and explained. The appropriateness of positivism (research philosophy) and deduction (research approach) for this research is justified.

Based on the research problem and objectives, a suitable research design is selected to examine the research problem and achieve its objectives. The research design suggested by Collis & Hussey (2003) was adopted. The research problem and objectives are identified and a theoretical framework is developed after reviewing the relevant literature.

In this theoretical framework, the main factors and themes identified as important to the research problem were assembled in a diagram showing the interaction between them. Their logical interrelationships were highlighted. Based on this theoretical framework, seven research hypotheses were postulated and an operational definition was given to each research concept.

After explaining the research design, the chapter moves towards discussing the main research strategies and data collection methods. The aptness of the survey strategy to conduct this research was considered. Two research methods were deployed: questionnaire and interview. This converging line of enquiry is expected to consolidate the credibility and validity of the research findings.

3.2. Research problem

Essential to the exploitation of the investment opportunities arising for companies, is the quality of the investment decision in selecting the investments that increase the company's market value and maintain a sustainable growth. Due to the dynamic economic context within which the firm operates, decision-makers are confronted with complex situations and feel under pressure to ensure effective and profitable exploitation of these market opportunities.

Financial appraisal techniques can play a vital role in this concern. However, the role of financial techniques in the IAP was questioned by many writers in the past [*e.g.* Brealey & Myers (1988), Stainer *et al.* (1996), Lee (1988), Lefly (2000)], particularly, their inability to take into account valuable options embedded within the new investments proposals or so-called "strategic dimensions" *.

Therefore, this research focuses on the current context of the IAP carried out by the British Automotive Components Manufacturers (BACMs), examining the extent to which growth options are taken into account when assessing new investments and the role of MJ in this concern, and analyses the impact of business risk on the adoption of specific approaches or techniques. The main assumption in this research is that the longer the period over which the project is expected to operate, the higher is the risk associated with it and the greater the value of the growth options embedded in that project. This assumption is based on the strong argument presented in the literature about the link between business risk and the value of growth options (*i.e.* Sharpe 1991, Kester 1984, Black & Scholes 1993).

3.3. Research aim and objectives

Having defined the research aim and objectives in Chapter 1, the aim of the proposed research can be further illustrated in terms of finding out the extent to which growth options embedded in the proposed project are seen as plausible justification for approving it and the extent to which they affect MJ deployment in the IAP.

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*See Chapter 2 for more explanation about the argument for and against the use of financial techniques for projects with strategic opportunities.

In other words, whether the future opportunities that might be generated from a project are considered in the investment decision-making process to validate the proposed project is discussed. Hence, this study will aim at defining the relationships between growth options and the use of MJ factors (past experience, intuition and own judgement) on one hand and identifying the impact of project risk on the SIDs on the other hand. In order to achieve this aim, certain objectives must be fulfilled:

1- To identify the opinions of the managers in BACMs towards both appraisal approaches and the order of preferences (priorities) when they make a decision about new investments?

   - Financial: represented by the financial analysis of the project's monetary outcomes.
   - Strategic: expressed by the use of MJ factors and the ROA in order to incorporate the growth options in the IAP.

2- To examine the relationship between the deployment of either of these approaches and both long-term strategy and market advantage considerations.

3- Developing a framework that can help finance directors to get a clear picture as a basis for judging the validity of new investments and reduce the risk of making wrong decisions.

3.4. Research paradigms (philosophies)

When conducting research, one of two main research paradigms or philosophies will need to be adopted. These paradigms represent the way in which the phenomenon under investigation is approached and the stance of the people conducting the research (*i.e.* independent and external to the phenomenon, or participative and immersed), in this context, about how the research should be conducted (Collis & Hussey 2003). The two main paradigms in business research are the positivistic paradigm and the phenomenological paradigm, also known as quantitative and qualitative respectively *.

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* For more illustrations about the assumptions underlying the main paradigms refer to Collis & Hussey 2003.

3.4.1. The Positivistic paradigm

This approach suggests that management research is essentially similar to that used in the natural and physical sciences. Consequently, the study of human behaviour should be conducted in the same way as in the natural sciences. It is, therefore, *"the philosophical stance of natural scientists"* (Saunders *et al.* 2000, p. 85).

According to this paradigm, laws provide the basis for an explanation, permit the anticipation of the phenomena, predict their occurrence and, therefore, allow them to be controlled (Collis & Hussey 2003). It was argued that the Scientific Method is assumed to be the best way of reaching the truth in a positivist approach (Jankowicz 2005).

In this approach, the main focus is on facts and causal relationships between different variables to explain the phenomenon in question. It has been claimed (Alvesson & Deetz 2000) that this positivist approach remains predominant in management research where the researcher develops a theoretical framework that will lead to hypotheses that, in turn, are tested. For that reason, a highly structured methodology is required to facilitate replication (Gill & Johnson 1997).

3.4.2. The Phenomenological paradigm

In this paradigm, the emphasis is on gaining understanding and revealing more insights into a phenomenon. To do this, the researcher participates and involves closely in the phenomenon under scrutiny in order to understand human behaviour from the participant's viewpoint. Therefore, it is argued that Phenomenology is most suitable when the objectives of the study demand in-depth insights into a phenomenon (Ghauri & GrØnhaug 2002) because rich insights into the complex world are lost when adopting positivism (Saunders *et al.* 2000).

In contrast to the positivistic paradigm, there might be no hypotheses to be tested. Instead, research questions are constructed which will be modified, refined and set within a theoretical context (Collis & Hussey 2003). Since the focus here is on the meanings of research rather than measuring a phenomenon, this paradigm cannot provide an absolute answer to what is true (Jankowicz 2005). A comparison of the main features of these two paradigms is illustrated in Table 3.1.

Table 3.1. The Main Characteristics of the Research Philosophies

	Positivism	**Phenomenology**
Basic beliefs:	• The world is external and objective. • The observer is independent. • Science is value-free.	• The world is socially constructed and subjective. • The observer is part of what is observed. • Science is driven by human interests.
Researcher should:	• Focus on facts. • Look for causality and fundamental laws. • Reduce phenomena to simplest elements. • Formulate hypotheses and then test them.	• Focus on meanings. • Try to understand what is happening. • Look at the totality of each situation. • Develop ideas through induction from data.
Preferred methods include:	• Operationalising concepts so that they can be measured. • Taking large samples.	• Using multiple methods to establish different views of phenomena. • Small samples investigated in depth or over time.

Source: Easterby-Smith *et al.* (1991)

For the purpose of this research, a positivist philosophy was adopted since it helps in achieving the objectives of this research in finding out the causal relationships between variables that influence the IAP, and the development of a framework that contributes to the investment decision-making literature.

3.5. Deductive and inductive research

The logical sequence of the research process can be deductive-or inductive-orientated or a combination of both.

3.5.1. The deductive approach (testing theory)

Deductive research entails the development of a conceptual and theoretical structure prior to its testing through empirical observations (Gill & Johnson 1997). Thus, particular instances are deduced from general inferences (Collis & Hussey 2003).

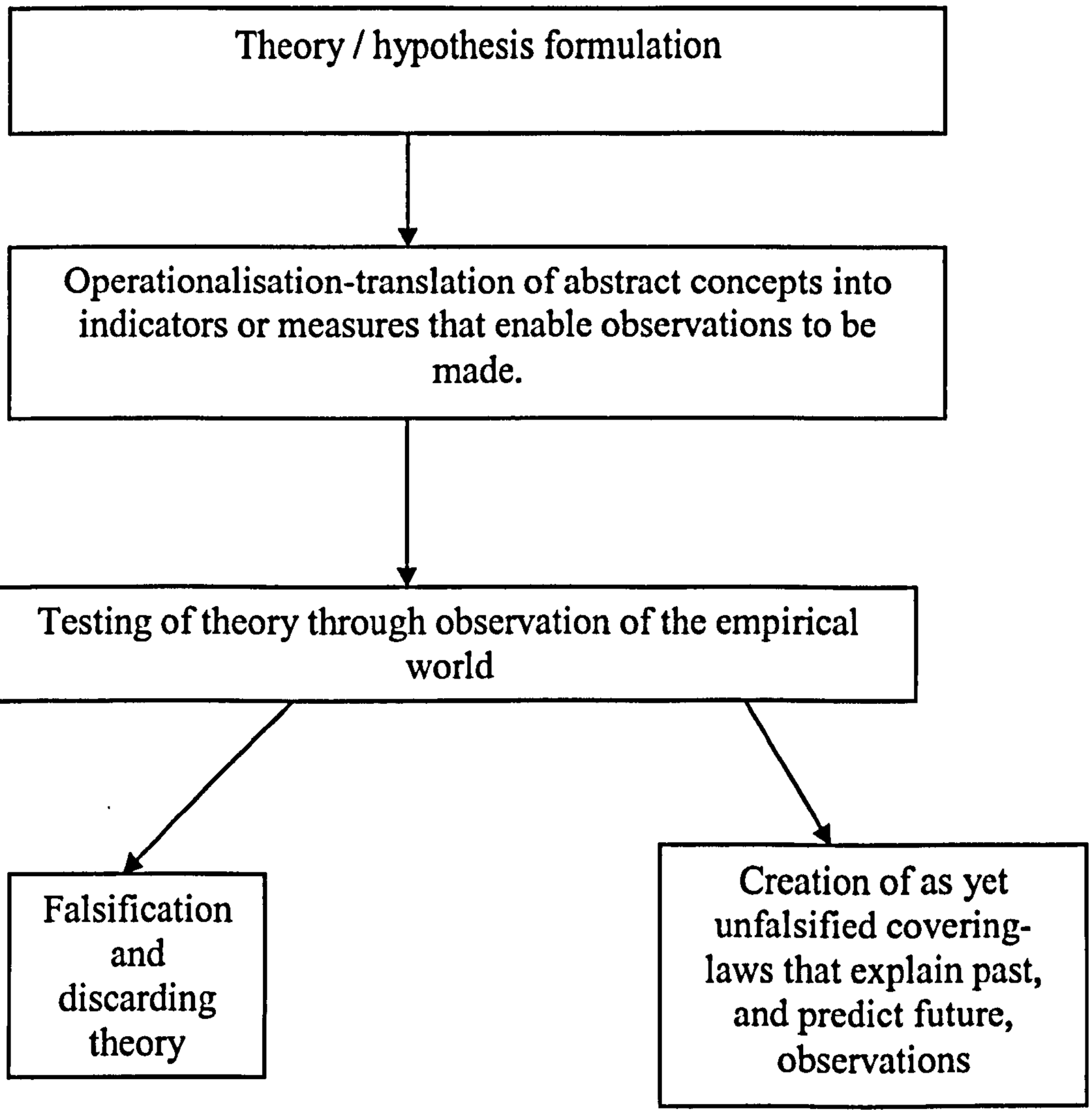
This type of research is the dominant research approach in the natural sciences (Hussey & Hussey 1997). Data and facts are collected to explain causal relationships between different variables and to confirm or disprove hypothesized relationships among variables that have been deduced from propositions (Ghauri & GrØnhaug 2002).

The adoption of this approach requires a highly structured methodology and the researcher should be independent from what is being observed. Furthermore, concepts need to be operationalised in a way that enables the facts to be measured quantitatively, and generalisation of the findings is crucial (Saunders *et al.* 2000).

The design of empirical research in the deductive approach attempts to provide a blueprint that enables the researcher to structure a research question or problem in such a way that the outcome is the production of valid, objective and replicable answers.

This initial structuring process entails four basic steps: identifying the theoretically dependent variable, identifying the theoretically independent variables, operationalizing both (monitoring and measurement of any variation in both), and neutralizing, or controlling for extraneous variables (Gill & Johnson 1997). The deductive approach is summarized in Figure 3.1.

Figure 3.1. Deductive Research Design



Source: Gill & Johnson (2002)

3.5.2. The inductive approach (building theory)

Induction is defined as the process of observing facts to generate a theory. While undertaking research, propositions are formulated after observing the relationship between different variables of the study (Ghauri & GrØnhaug 2002).

In sharp contrast to the deductive approach, in which hypotheses are developed and tested to form a theory, theory is the outcome of the inductive approach. Collis & Hussey (2003) argue that theory is developed from the observation of empirical reality, thus, general inferences are induced from particular instances. The logic behind this approach is that data are collected in

order to develop theory as a result of data analysis. This developed theory is subsequently related to the literature.

Research using the inductive approach takes into account the way in which humans interpret their social world, and would be particularly concerned with the context in which events take place. Therefore, the study of a small sample of subjects may be more appropriate than a large number as with the deductive approach (Saunders *et al.* 2000). A comparison between these two research approaches is presented in Table 3.2:

Table 3.2. Differences between Deductive and Inductive Approaches to Research

Deductive	**Inductive**
• Scientific principles. • Moving from theory to data. • The need to explain casual relationships between variables. • The collection of quantitative data. • The application of controls to ensure validity of data. • The operationalisation of concepts to ensure clarity of definition. • A highly structured approach. • Researcher is independent from what is being researched. • The necessity to select samples of sufficient size in order to generalise conclusions.	• Gaining an understanding of the meanings humans attach to events. • A close understanding of the research context. • The collection of qualitative data. • A more flexible structure to permit changes of research emphasis as the research progresses. • A realisation that the researcher is part of the research process. • Less concern with the need to generalise.

Source: Saunders *et al.* (2003)

3.5.3. Which approach is more valid?

In the research methods literature, there is a tendency to suggest that the deductive approach belongs to positivism and inductive approach belongs to phenomenology. However, it is claimed (Saunders *et al.* 2007) that such labelling is potentially misleading and of no practical value. They argue that business and management research is often a mixture between positivism and phenomenology and neither approach is better than the other. They are "better" at doing different things, and which is better depends on the research questions to be answered (*ibid*).

Creswell (1994) suggests a number of practical criteria to choose between these two approaches. Perhaps the most important of these is the nature of the research topic. A deductive approach is most appropriate for topics on which there is a wealth of literature. On the other hand, the inductive approach is most appropriate for topics which are new, exciting much debate, and on which there is little existing literature.

Since the aim of this research is to seek evidence about the current investment appraisal practices, it is thought that a deductive approach is appropriate for this type of study. The substantial literature about capital budgeting created a sound basis for the development of hypotheses that reflect the link between study variables. The study concepts were operationalised and an operational definition was attached to indicators that represent each concept. A detailed explanation of the research strategy is outlined in the following paragraph.

3.6. Research approach

The literature review identified a number of previous research studies in the use of the investment appraisal techniques in management decision-making [Pike (1996), McIntyre & Coulthurst (1986), Arnold & Hatzopoulos (2000), Drury & Tayles (1997), and Sangster (1993)].

The dominant approach, as in many areas of management research, is positivistic (Alvesson & Deets 2000, Saunders *et al.* 2000) where a theoretical framework is developed which will

lead to a set of hypotheses that can be tested for their explanatory or predictive qualities. As the aim of the research is to identify whether growth options are considered in the IAP and the extent to which this affects the deployment of MJ and the ROA in the IAP, a similar research approach is considered appropriate for this research.

The general approach adopted for this research is the deductive approach suggested by Gill & Johnson (2002) which is previously illustrated in Figure (3.1). This approach to research is initially bound up with what is often termed "positivism" (*ibid*). According to this approach observations are made by the researcher who should be independent of, and neither affects, nor is affected by, the subject of the research (Remenyi *et al.* 1998). This is followed by a preliminary information-gathering process for theory formulation and hypothesizing. This is followed by further scientific data collection and data analysis and, finally, a deductive process.

Having identified the research approach, a research design was established to ensure the achievement of the research objectives. The research design suggested by Collis & Hussey (2003) was adopted. This design can be summarised in two main stages: identification of the research problem and objectives and the development of a theoretical framework prior to hypotheses testing. This kind of research design, known as the scientific method, is preferred as a goal for researchers in accounting (Abdel-Khalik & Ajinkya 1979).

The secondary questions about how and why the appraisal techniques are used require data from a number of users. Previous related studies have used large samples (typically 150-800) with the data being collected through a one - off questionnaire. Longitudinal studies do exist trying to identify changes over time, such as the increase or decline in the use of particular techniques (*e.g.* Pike, 1996), and there have been firm or industry-specific case studies (*e.g.* Carr *et al.* 1991, Carr & Tomkins 1996 & 1998).

The current state of the development of MJ and the ROA suggests that there is a lot to be learned from understanding the prevalence of firms adopting MJ for assessing projects with growth options, especially, how MJ contributes to capturing the strategic opportunities and the achievement of the business strategy. In this research, a one - off questionnaire is utilised and followed by fieldwork to generate rich data that provide a fuller picture about the role of MJ and the ROA in the IAP.

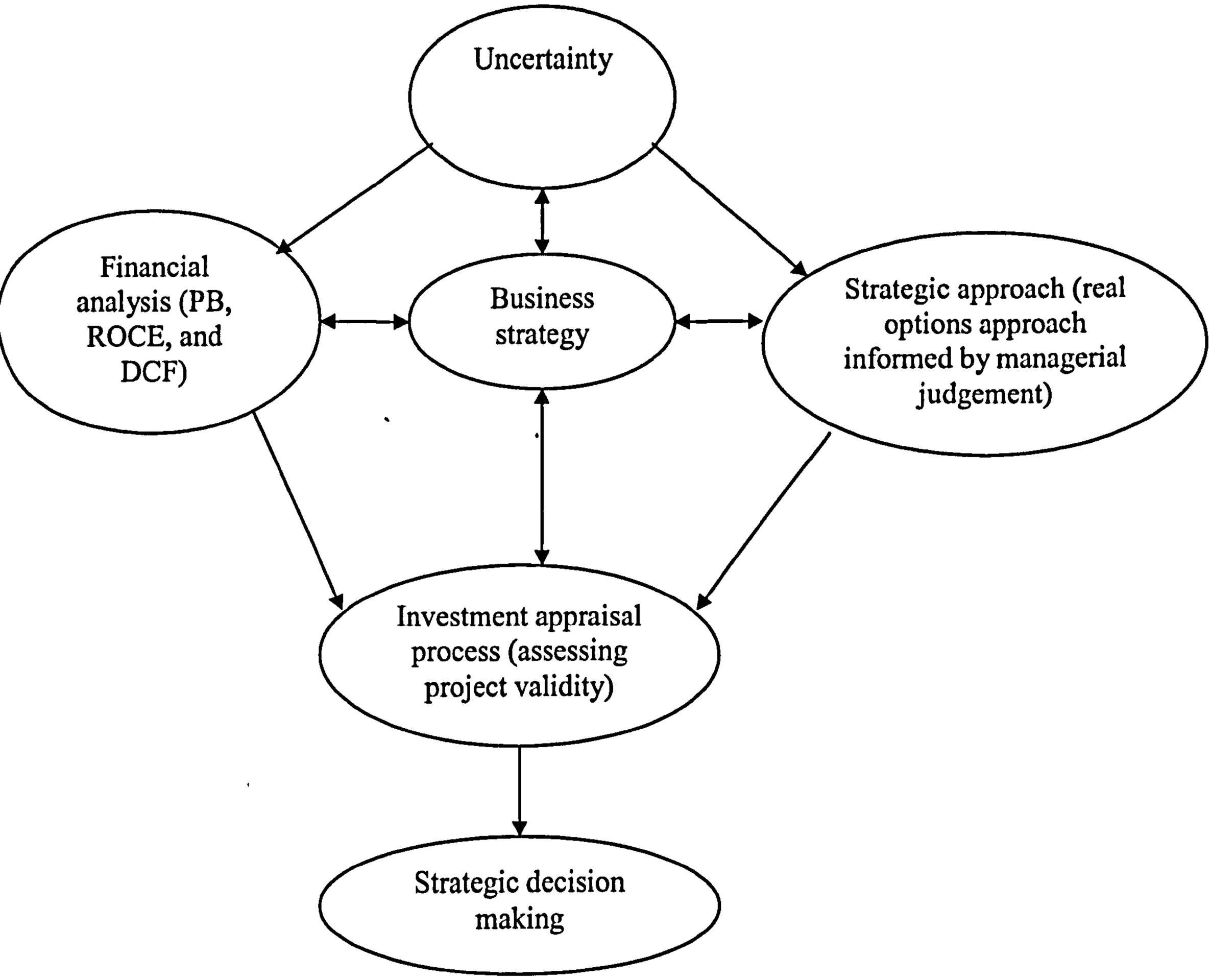
3.6.1. The theoretical framework

Reviewing the related literature about IAP, a theoretical framework is developed (Figure 3.2). In this theoretical framework, the main factors and themes that have been identified as important to the problem are assembled, and the logical sense of the relationships among them is highlighted.

Consequently, research hypotheses are postulated to reflect both the causal relationships between these factors and contrasting opinions about the role of the ROA and MJ in the IAP and how this might affect the use of financial appraisal techniques. Most of these hypotheses are preceded with a theoretical background to highlight the argument from which they have been developed.

This conceptual framework shows the link between the main themes in the literature in a logical sequence. It starts with the influence of the business environment (risk and uncertainty) on both appraisal approaches (financial analysis and strategic approach). Since the risk could be perceived as either an encouraging or a discouraging factor for investment, this means that there are two routes of appraisal. Central to the choice is the business strategy because the main aim of the firm is to survive through the achievement of its business strategy. Therefore, the strategic dimension of the investment decision is depicted.

Figure 3.2. The Strategic Investment Appraisal Process



Key: Two way influence ⟷ One way influence →

- **Explanation of the strategic investment model**

This model of investment appraisal comprises four stages as explained below:

1- Uncertainty analysis: having scanned the business environment for investment opportunities, in this stage, an estimate is assigned to the degree of risk attached to each investment proposal. These estimates could be "low risk", "fairly high", "very high". This distinction is crucial in determining the appraisal approach in the next stage (whether financial or strategic or a combination).

2- Refining process: this stage consists of two main filters through which each investment proposal is entered. These filters are: financial analysis that shows the expected cash flows from this project and the strategic analysis that demonstrates the growth options embedded in this proposed project. In this stage, a continuous comparison is conducted between the project's outcomes (whether financial or strategic) and the business strategy in order to ensure alignment of the project's outcomes with firm strategy. In other words, whether the proposed project contributes to the enhancement of competitive advantage and the creation of shareholder value. In this stage, financial techniques (PB, ROCE, NPV and IRR) are deployed in the financial analysis and MJ factors (past experience, intuition, and personal judgement) and the ROA are deployed in the strategic analysis. These two analyses could be carried out simultaneously for the same project to check whether the growth options outweigh any shortfalls in the financial analysis or *vice versa*. The two approaches could well be used in an integrated format. In other words, after the valuation of the cash flows, managers identify and evaluate critically the options embedded in a given investment, then consider business risk and business strategy. After that, managers judge whether the aggregate value of the options sufficiently outweighs any shortfall in the project's cash flow value. This stage is important as it identifies more precisely what managers have to take into consideration in addition to the financial techniques in the IAP.

3- Conducting the IAP: having assessed the expected financial and strategic benefits generated from the project, directors assign weights to each of these benefits. Then a total score could be given to each project. If there are competing projects, a comparison is made to select the project with the highest total scores after checking consistency of the project's outcome with the firm's business strategy in this stage. Crucial to this stage are the resources available for the firm to conduct a project. These resources are of two types: skills required to carry out the project (including well-experienced people) and financial (availability of funds).

4- Strategic decision making process: in this stage, decision criteria in both approaches are weighed depending on the results of the analysis conducted in the preceding stages. Therefore, the single value resulting from financial appraisal is considered in this stage alongside MJ factors (intuition, past experience, and personal judgement) and the value of the growth options. Consequently, a decision is made about the investment proposal. This final decision would be one of the following possibilities:

- Carry out the investment (positive decision, full commitment) where the proposed project scores high on either approaches or both (having ensured alignment with business strategy). In this case, the firm might commit the whole funds to this project.

- Carry out the initial stages of investment (positive decision, partial commitment) where the proposed project scores high on the strategic approach (having ensured alignment with business strategy). In this case, the options are worth more than the shortfall in the financial analysis. Therefore, the firm might allocate part of the funds that are assigned for this project and keep the options open (deferring, scaling, staging, and abandoning). The decision as to which option to be exercised is based on the information that becomes available while executing the initial stage.

- Postpone the time of undertaking the investment (delay) where the proposed project's scores on either of these approaches or both do not give sufficient justification for undertaking the project. In addition, none of these approaches seem to have precedence over another. Therefore, directors need to wait until more information becomes available which might help in the decision on such project.

- Do not carry out the investment (negative decision) where the proposed project scores low on either approach or both. This is the abandonment option.

The integration of the ROA and MJ into the IAP has transformed not only the IAP itself but also the SIDs. Hence, rather than making a decision based on a single value (financial approach), there are now four possibilities. Moreover, rather than carrying out the investment now or not at all (financial approach), there are other options that enable the firm to keep hold of future opportunities without incurring financial losses (deferring, scaling, staging, and abandoning). Therefore, this model could be considered as a step forward in the development of a coherent investment appraisal process for a wide range of proposed projects.

This model emphasises that the final decision about a proposed project is made after a process involving choices and decision points. A comparison between this and other models presented in Chapter 2 reveals that this one brings together several strands of previous models. While it emphasises the financial analysis [*i.e.* models developed by King (1975), Pike & Neale

(2006)], it also supports Harris' (1999) model with respect to the importance of the managerial judgement in the IAP.

3.6.2. Development of hypotheses

Based on the preceding theoretical framework, a number of hypotheses are developed which reflect the relationships between the dependent variable: Managerial Judgement (MJ) and the following independent variables: the level of risk associated with the proposed investments, firm size, ROA factors which lead to growth options, and financial analysis. The main assumption in this research is that growth options increase with project risk (risky projects mean high growth options). A brief description of these variables is illustrated in Table 3.3:

Table 3.3. Description of the Research Variables

The variables	**Description**
Managerial Judgement (MJ)	The extent to which MJ factors (past experience, intuition and own judgement) are considered in the decision-making process about proposed projects with growth options.
Risk	The level of risk associated with the proposed investments.
Firm size	Expressed by turnover.
ROA factors	The extent to which ROA factors are considered in the IAP: 1- Timing (time of embarking on the project, delay the investment decision). 2- Technical importance (establishing a strong base for supporting other investments). 3- Staging (implementing the project in stages). 4- Flexible capacity (create additional capacity for future).
Financial analysis	The use of financial techniques in the IAP: 1- Payback period (PB). 2- Return On Capital Employed (ROCE). 3- Net Present Value (NPV). 4- Internal Rate of Return (IRR).

As the deductive approach (testing theory approach) is considered appropriate for this research, data and facts are collected to explain the causal relationships between the different variables and to confirm or disprove hypothesized relationships among variables that have been deduced from propositions (Ghauri & GrØnhaug 2002).

Many authors [*e.g.* Myers (1984), Ross (1986), Shank (1996), Cole (1987), Brealey & Myers (1988), McCormack (2003), Baldwin (1991), Stainer *et al.*(1996), McCarthy & Monkhouse (2003), Dixit & Pindyck (1995)] suggest that financial analysis techniques are inappropriate in evaluating investments with significant growth options because they exclude the valuable options embedded within the investments. Therefore, MJ factors are now more important than financial analysis techniques in capturing these growth options.

Others *e.g.* Kaplan (1986), Hodder & Riggs (1982) proclaim that financial analysis techniques are not flawed but that the process of application can be defective.

Triantis (2006) argues that the NPV technique works quite well if the project's risk is similar to that of the overall firm and if there is little option value embedded in the project (either because the project is a now-or-never opportunity or there is little flexibility to alter the course of the project over time)

These preceding judgements lead to the development of the following hypotheses:

H1: Companies rely more on MJ factors for assessing strategic investments with future growth options than on financial techniques.

H2: Financial appraisal techniques are applied to investment proposals regardless of the growth options embedded within them.

H3: More emphasis is placed on financial appraisal techniques than on MJ factors for assessing investments with no or few growth options.

Advocates of the ROA [*e.g.* Krinsky & Miltenburg (1991), Busby & Pitts (1998), and Meredith & Suresh (1986)], in addition to those mentioned earlier in hypotheses 1, 2 & 3, based their arguments on valuable options associated with investments with growth options.

These options are crucial in dealing risk and are overlooked by the financial techniques. These ROA factors are: timing, scaling, staging, and technical importance. Therefore, the following two hypotheses will be tested:

H4: ROA factors will explain the variation in the application of MJ for investments with growth options.

Since these ROA factors mentioned above are difficult to quantify (Grant 2002, Cheung 1993), this leads to the following hypothesis:

H5: Investments with growth options are difficult to justify because of the complexity of quantifying the ROA factors.

The IAP needs to take into account the risk associated with a proposed investment. Some authors [*e.g.* Sharp (1991), Kester (1984)] suggest that options are only valuable under uncertainty and their value increases with uncertainty. Given the strong link between MJ and the ROA (as explained in section 2.7.1), the following hypothesis is developed:

H6: The use of MJ factors increases with the level of risk of the investment project being evaluated.

Since every firm comprises a unique set of resources, capabilities, structure, and vision, this leads to the following hypothesis:

H7: The deployment of MJ factors for assessing new investments will vary depending on the size of the firm.

These hypotheses are all in the alternate form. The link between these hypotheses and the relevant literature is illustrated in Table 3.4:

Table 3.4. The Link between Research Hypotheses and Related Literature

Underlying theme	Relevant literature	Hypotheses
• The existence of growth options in an investment shifts the analysis required from financial methods to more strategic evaluation. (The argument for and against the use of financial appraisal techniques for assessing strategic investments).	Myers (1984), Ross (1986), Shank (1996), Cole (1987), Brealey & Myers (1988), McCormack *et al.* (2003), Baldwin (1991), Stainer *et al.* (1996), McCarthy & Monkhouse (2003) , Dixit & Pindyck (1995), Kaplan (1986), Hodder & Riggs (1982), Triantis (2006).	**H1:** Companies rely more on MJ factors for assessing strategic investments with future growth options than on financial techniques. **H2:** Financial appraisal techniques are applied to investment proposals regardless of the growth options embedded within them. **H3:** More emphasis is placed on financial appraisal techniques than on MJ factors for assessing investments with no or few growth options.
• ROA factors are ignored when financial analysis is used. (How important are these factors to justify the use of the ROA and MJ?). • Difficulties to back the decision to justify the use of MJ for projects with growth options.	Krinsky & Miltenburg (1991), Busby and Pitts (1998), Meredith & Suresh (1986). Grant (2002), Cheung (1993)	**H4:** ROA factors will explain the variation in the application of MJ for investments with growth options. **H5:** Investments with growth options are difficult to justify because of the complexity of quantifying the ROA factors.
• Option value increases with uncertainty (How important are MJ factors for assessing risky projects?).	Sharpe (1991), Kester (1984).	**H6:** The use of MJ factors increases with the level of risk of the investment project being evaluated.
• Large companies have the resources and the capability to exploit growth options.		**H7:** The deployment of MJ factors for assessing new investments will vary depending on the size of the firm.

3.6.3. Operational definitions of the research concepts

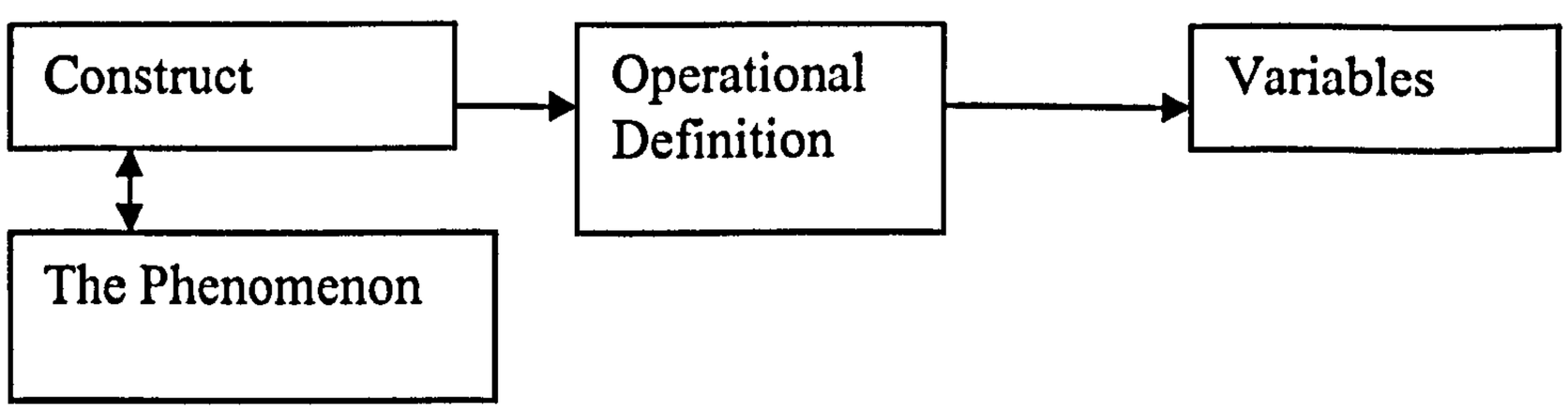
In order to assess the validity of a hypothesis, it is necessary to develop measures of the constituent concepts. This process is often referred to as operationalisation. This is the translation of the concept into variables, that is, attributes on which relevant objects differ. Bryman & Cramer (2005) argue that the measurement of the concepts can be achieved through administration of a questionnaire (questions in a questionnaire), through observation of people, or through the analysis of the existing statistics.

One of the earliest approaches in measuring a research concept was developed by Lazarsfeld in 1958. In his approach to the measurement of concepts, he viewed the search for underlying dimensions of the concept as an important ingredient. These dimensions of a concept are the different aspects or components of that concept (Bryman 2001). Lazarsfeld (1958) suggested three stages outlined below:

Concept ⇒ Underlying dimensions ⇒ Indicators.

While maintaining the same logical steps, Balnaves & Caputi (2001) developed a similar approach as shown in Figure 3.3:

Figure 3.3. Operationalisation Process of Research Concepts



In this approach, two more stages were added. They considered constructs as indicators, the phenomenon is a combination of the concept and underlying dimensions.

Measuring the concept and its indicators needs to be accompanied with clear definition of each of them. Bryman & Cramer (2005) argue that the concepts embedded in the research hypotheses are the products of our reflections on the world. Therefore, when a concept is

refined and specifically defined, this leads to the generation of the concept indicators (constructs). These indicators are the ideas the researcher holds about the phenomenon (concept) to be measured (Balnaves & Caputi 2001) and will stand for that concept. It may be that a single indicator will suffice in the measurement of a concept, but in many instances, it will not (Bryman & Cramer 2005).

Having defined the concept's indicators, the last stage in the measurement process is to operationally define these indicators or constructs. This involves developing an instrument for measurement or a defined quantifiable characteristic whereby each indicator entails a statement in relation to which the respondent has to answer. This is expressed as the extent to which s/he agrees with the statement on a five-point scale, or other scales (Bryman & Cramer 2005).

Kerlinger (1986) identifies two types of operational definitions, measured and experimental, which are given more meaningful names related to their roles as variables: observed and manipulated. Observed operational definitions are concerned with characteristics of the subjects that are measured such as intelligence, attitudes, observed behaviour. Manipulated will be used for things that happen to subjects that are operational definitions of the construct (hypothesized dependent variables) such as reinforcement in the classroom (positive, neutral or negative). So in experimental studies, researchers may want subjects to experience different levels of construct, and as a consequence, they will manipulate conditions to generate these (Black 1999).

Following this approach, research concepts in this study are refined and operational definitions are established for each indicator (Table 3.5). The measurement of the concepts was achieved through administration of a questionnaire (Appendix 1).

It was claimed that:

> *"Questionnaires for quantitative research in the social sciences are usually designed with the intention of being operational definitions of concepts, instruments that reflect strength of attitudes, perceptions, views and opinions. This involves trying to measure and quantify how intensely people feel about issues, as opposed to what they know or can do."* [Black 1999, p. 215].

The research variables and the operational definitions were reflected in the questions through inclusion of statements about the indicators. This yielded different levels of measurement, nominal and ordinal, that allowed statistical analysis and therefore, hypotheses testing.

Table 3.5. Operationalisation of Research Concepts

Concepts	Constructs (Underlying Dimensions)	Operational Definitions
Managerial Judgement (MJ)	1- Past experience 2- Intuition and own judgement.	Statements included in different questions in the questionnaire. Five- point Likert scale measure.
RO factors	1- Timing 2- Technical importance 3- Staging. 4- Flexible capacity	Statements included in different questions in the questionnaire. Five- point Likert scale measure.
Financial analysis	1- Payback period (PB) 2- Return On Capital Employed (ROCE). 3- Net Present Value (NPV) 4- Internal Rate of Return (IRR)	Statements included in different questions in the questionnaire. Five- point Likert scale measure.
Firm size	Turnover	Nominal scale
Uncertainty	Risk	Statements included in different questions in the questionnaire. Two levels of measurement: low-high.

Since the study concepts and constructs are defined clearly and precisely, this resulted in each construct being expressed in one indicator. It is argued (Bryman 2001) that in much, if not most, quantitative research, there is a tendency to rely on a single indicator of concepts. For many purposes, this is quite adequate. It would be a mistake to believe that investigations that use a single indicator of core concepts are somehow deficient (*ibid*).

3.6.4. Research strategy

In order to answer the research questions and test the hypotheses developed, an appropriate research strategy or a combination of research strategies needs to be adopted.

The different research strategies are well defined and illustrated in research methods textbooks [*e.g.* Saunders *et al.* (2007), Gill & Johnson (1997), Collis & Hussey (2003), Robson (1993), Eisenhardt (1989) and Scapens (1990)]. These strategies are: Experiment, Potential experiment, Survey, Case study, Grounded theory, Ethnography, Action Research, Participative Enquiry, Cross-Sectional and Longitudinal Studies.

According to Yin (2003), the choice of research strategy depends on the following three conditions:

(a) The type of research question posed,
(b) The extent of control an investigator has over actual behavioural events, and
(c) The degree of focus on contemporary as opposed to historical events.

Most studies conducted in the management accounting field have made use of a survey strategy when determining finance directors' beliefs, attitudes, and perceptions of the investment appraisal techniques [*e.g.* Dugdale & Jones (1991), Pike (1996), McIntyre & Coulthurst (1986), Arnold & Hatzopoulos (2000), Drury & Tayles (1997), Abdel-Kader & Dugdale (1998), Sangster (1993), Graham & Harvey (2001), and Busby & Pitts (1997)]. In other studies, a case study strategy together with in-depth interviews has been utilised [*e.g.* Angelien (1993), Dugdale & Jones (1994), Lumijarvi (1991)]. Others *e.g.* Carr & Tomkins (1998) have used both strategies.

- **Survey strategy**

Survey research is defined as:

> *"the collection of data on a number of units and usually at a single juncture in time, with a view of collecting systematically a body of quantifiable data in respect of a number of variables which are then examined to discern patterns of association."* [Bryman 1989, P.104]

It is argued that it is an effective tool to get opinions, attitudes and descriptions as well as for getting cause and effect relationships (Ghauri & GrØnhaug 2002). In this strategy, a sample of subjects is drawn from a population and studied to make inferences about the population. The sample can be selected by many techniques* (systematic sampling, stratified sampling, cluster sampling, multi-stage sampling, snowball sampling, judgemental sampling, and natural sampling). This, consequently, allows the collection of a large amount of data from a sizeable population in an economical way, is easily understood, is based on a questionnaire, and as data are standardised, it allows comparison and gives control over the research process (Saunders *et al.* 2000).

The surveys can be classified into two types (Ghauri & GrØnhaug, 2002):

1- Analytical or explanatory survey

This kind of survey attempts to test a theory by taking the logic of the experiment out of the laboratory and into the field. It belongs to deductive enquiry by its emphasis on reliability in data collection and the statistical control of variables in place of the physical controls of the laboratory (Gill & Johnson 1997). The focal interest in this type of survey is to determine whether there is a relationship between different variables.

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* For the definition of these sampling techniques refer to Gill & Johnson (1997).

2- Descriptive survey

This is concerned primarily with addressing the particular characteristics of a specific population of subjects (Gill & Johnson 1997, Ghauri & GrØnhaug 2002) and identifying and counting the frequency of a specific population.

Given the explanatory nature of this research, it is believed that a survey strategy is the most appropriate way to tackle the research problem. This strategy is claimed to be associated with the deductive approach (as adopted for this research) and it is a popular and common strategy in business and management research (Saunders *et al.* 2007). Moreover, it is the most suitable strategy to answer questions of the type "who, what, where, how many, how much?" (Yin 2003).

The instrument usually used in the survey, "the questionnaire", is claimed to be simple, reliable, cheaper and less time-consuming than conducting interviews. Furthermore, a very large sample can be taken to facilitate the generalisability of the results (Collis & Hussey 2003).

Therefore, a survey strategy is used in this study to answer the descriptive part of the research objectives and contribute to the analytical one through the use of an analytical survey alongside the descriptive one. A structured questionnaire is designed to collect data from the sample members (see Chapter 4).

In order to get a more detailed view from individual finance directors on the usefulness or otherwise of MJ and the ROA in the IAP, it was decided to supplement the survey strategy with field work. This involved conducting several interviews (11 interviews) with directors directly involved in the IAP and SIDs. This not only provided the opportunity to engage in a dialogue with practitioners and explore the context of the IAP, but also allowed the retention of the holistic and meaningful characteristics of real-life events (Yin 2003).

Generally, the interviews focused on the following questions:

- Description of the IAP.
- Beliefs about appropriate assessment criteria for evaluating investment proposals.
- Perception of MJ factors and ROA factors.
- Perceptions of the difficulties associated with using MJ for investments with growth options.
- Perceived problems in the investment decision-making process.
- Techniques of formal strategic and financial analysis.

Hence, the questionnaire survey is used to provide quantitative data and the in-depth interviews to gain insights about the IAP context, and a better understanding and interpretation of MJ and the ROA involvement from the finance directors' perspective. These two research methods are explained in detail in the following chapter (Ch 4). The use of multiple resources is expected to help in developing converging lines of inquiry. This combination of research methods was claimed to provide a useful triangulation of the results (Easterby-Smith *et al.* 1991), allowing a broader and often complementary view of the research problem or issue (Collis & Hussey 2003). Consequently, any findings or conclusions are likely to be much more convincing and accurate since they are based on several different sources of information (Yin 2003). In addition, the extent to which triangulation produces similar results can be used as a measure of confidence in the findings and the validity of the underlying theory (Abdel-Khalik & Ajinkya 1979).

3.7. Research design

Yin (2003) defines research design as the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusion. Likewise, Collis & Hussey (2003) view research design as a set of planning procedures that are used to guide and focus the research.

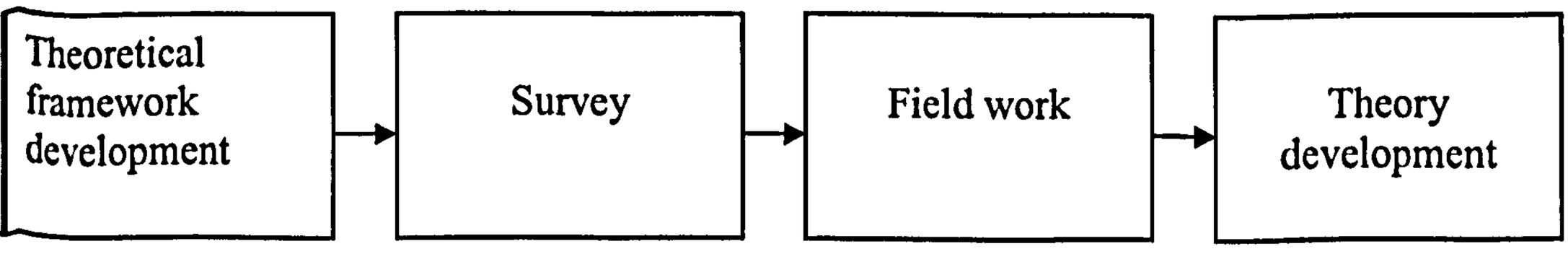
The choice of research design can be conceived as the overall strategy to get the information wanted (Ghauri & GrØnhaug 2002), and depends mainly on the research problem and its purpose (Jankowicz 1991).

Depending on the research questions and the purpose of the research, a study can be explanatory, exploratory, or descriptive. Given the diverse objectives of this research, particularly those related to investigating the link between MJ and other factors in the IAP, it was felt that explanatory design is effective in producing the required information that allow for these relationships to be tested. It is claimed that this kind of design is suitable for studying a situation or a problem in order to explain the causal relationships between different variables (Saunders *et al.* 2000). This involved data collection via a survey mailed to senior finance executives of automotive firms listed in Financial Analysis Made Easy (FAME) database using the standard industrial classification (SIC), UK-code 2003 (access March 2005) in order to test the hypotheses developed and subsequently, ascertain the relationships between study variables.

Having established the causal relationships between MJ and other factors in the IAP, the research moved towards exploratory design. At this stage, interviews were conducted to discover in more depth the assumptions underlying the role of MJ in the IAP. This is thought to be appropriate since the aim is to find out 'what is happening, to seek new insights, to ask questions and to assess phenomena in a new light' (Robson 1993). Given the fact that there is little known about MJ in relation to the ROA in the IAP, this is exactly where exploratory research fits best. It is claimed that exploratory research is conducted into a research problem or issue when there are very few or no earlier studies to which one can refer for information about the issue or problem (Collis & Hussey 2003).

The research design takes the following sequence.

Figure 3.4. Research Design



3.8. Research credibility

According to Silverman (1993), the two central concepts in any discussion of rigor in scientific research are "reliability" and "validity".

3.8.1. Research reliability

Reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions (Hammersley 1992). Others [*e.g.* Partington (2002), Lewin (2004)] have linked research reliability to the measurement instrument and claimed that reliability is the capacity of a measurement instrument repeatedly to give the same result in the same conditions, time after time. Therefore, great attention should be paid to designing the research instruments to ensure the reliability of the research results.

However, the reliability of the research instrument itself appears to be insufficient to ensure the reliability of the research. Bryman (2001) extended the definition of the research reliability to include reliability of the conceptualization process (process of defining the concept's indicators) and reliability of the operationalization process (operationally defining the concept's indicators). He argued that reliability refers to the consistency of a measure of a concept and claimed that there are three prominent factors involved when considering whether a measure is reliable:

1- Stability: whether a measure is stable over time.

2- Internal reliability: whether the indicators that make up the scale or index are consistent. In other words, whether respondents' scores on any one indicator tend to be related to their scores on the other indicators.

3- Inter-observer consistency: whether there is a lack of consistency in the decisions of different observers.

Hence, the main concern here is whether the research procedures are reliable and are not affected by the research context (people, time, and situation). Robson (2002) highlights four threats to reliability which are: subject error, subject bias, and observer error and observer bias. To minimise the risk of these threats, it is claimed (Raimond 1993) that the researcher should be asking: 'will the evidence and my conclusions stand up to the closest scrutiny?'. Therefore, if the research findings can be repeated by another researcher using the same subjects and the same research design under the same conditions, this indicates that the research findings are reliable.

3.8.2. Research validity

Validity is the extent to which research findings accurately represent what is really happening in the situation. It measures the degree to which the research achieves what it sets out to do (Smith 2003), in other words, the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure (Brewerton 2001). Coolican (1992) argues that 'an effect or test is valid if it demonstrates or measures what the researcher thinks or claims it does'.

With regard to the validity of any research findings, the three tests that might be used in evaluation are as follows:

- **Construct validity**

This is concerned with establishing correct operational measures for the concept being studied. Construct validity is necessary for meaningful and interpretable research findings and can be assessed in various ways (Ghauri & GrØnhaug 2002):

1- Face validity: refers to the extent to which the measure used seems to be a reasonable measure for what it purports to measure.

2- Convergent validity: refers to the extent to which multiple measures of and / or multiple methods for measuring the same thing yield similar (comparable) results.

3- Divergent validity: refers to the extent to which a construct is distinguishable from another construct.

- **Internal validity**

This criterion refers to whether or not what is identified as the 'cause(s)' or 'stimuli' actually produces what have been interpreted as the 'effects' or 'responses' (Gill & Johnson 1997).

With this criterion, the causal relationships between different variables are studied and the crucial point here is to take account of all factors that affect the phenomenon being studied. Failure to do so will be a threat to the internal validity.

- **External validity**

This criterion refers to what extent the research findings can be generalised to particular persons, settings and times (Ghauri & GrØnhaug 2002).

Yin (2003) has distinguished between two types of generalisation.

1- **Statistical generalisation** or so-called **population validity** (Gill & Johnson 1997) where an inference is made about a population or universe on the basis of empirical data collected about a sample.

2- **Analytic generalisation** in which a previously developed theory is used as a template with which to compare the empirical results of the case study.

Added to those is **ecological validity** (Gill & Johnson 1997) which is concerned with the possibility to generalize from the actual social contexts in which the research has taken place and data thereby gathered, to other contexts and settings.

To ensure a convincing external validity, it is argued that great attention should be paid to the following factors (Ghauri & GrØnhaug 2002, Collis & Hussey 2003):

1- History, where specific events external to the study occur at the same time and may affect the response.

2- Maturation, where the test effect indicates that the test / experiment itself affects the observed response.

3- Selection bias (self-selection) is a serious threat to validity when the subjects are not (or cannot be) assigned randomly.

4- Faulty research procedures.

5- Poor sample selection and inaccurate or misleading measurement.

3.9. Summary

This chapter illustrated the different research methodologies and how they can be used for different types of research. There is no ideal methodology, each methodology is most appropriate for different types of research. Bearing in mind the research aim and objectives, a positivistic approach was selected to tackle the research problem. The conflicting opinions and views about the validity of the financial analysis in assessing projects with growth options, illustrated in the literature, formed a sound basis for the development of a theoretical framework that reflects the interrelation between the different elements of the IAP.

This, in turn, was translated into testable hypotheses. An operational definition was established for related concepts and the resulting variables were identified. Two main data collection methods were chosen to collect data about these variables. This allowed for the triangulation to take place, consequently providing more convincing evidence about research results. A detailed explanation about the research instruments and data analysis procedures is given in the following chapters.

Chapter 4

Methods of Data Collection, Analysis and Interpretation

4.1. Introduction

In order to achieve the research strategy, appropriate methods must be chosen for obtaining knowledge. The choice of the methods is critical since this might lead to data being collected for purposes other than serving this research strategy. A coherent link between research strategy and research methods was established to ensure collecting data that allow the testing of the hypotheses developed in Chapter 3, and also scrutinizing the workability of the framework developed. Two main methods were used in this research, namely, questionnaire and interviews.

Both set of questions that were used in the questionnaire and in the interviews were derived from the themes that constitute the developed framework. They were designed in a way that reflects the interaction between these concepts and the interrelationships between them.

This chapter presents the rationale for the choice of these two research methods and data analysis techniques. It shows also the procedures followed in collecting the two types of data required (quantitative and qualitative) and how the triangulation of research methods can add to the credibility of the evidence required to look into the research problem. A detailed description of these two adopted methods together with procedures followed in analysing and interpreting the data gathered are presented.

4.2. Data types required

In order to fulfil research objectives, two types of data were required. The first was quantitative data to allow for the hypotheses testing and scrutinising the link between different study variables. The second was qualitative data to provide more insights into the IAP and the context within which it was carried out.

It is argued (Eisenhardt 1989) that the evidence in a study may be qualitative (*e.g.* words), quantitative (*e.g.* numbers) or both. In this study, both types of data were used to collect the empirical evidence. While the quantitative data was used to study the interrelations between factors that influence the IAP and to test the hypotheses, the qualitative data was employed to emphasise descriptive aspects of these factors and the nature of the IAP.

4.2.1. Quantitative data

Quantitative data are collected in numerical form and mainly using methods such as questionnaires, laboratory experiments, and archives. These quantitative data can be grouped into six main types (Hussey & Hussey 1997, Denscombe 1998): nominal, ordinal, interval, ratio, discrete, and continuous.

4.2.2. Qualitative data

Dey (1993) observed that qualitative data is often presented as being "rich" and "more valid" than quantitative data. However, it is often dismissed as "too subjective" because assessments are not made in terms of established standards. This type of data can be collected via four major qualitative methods: observation, analysis of texts and documents, interviews, recording and transcribing. These methods are often combined. The main features of both types of data are summarised in Table 4.1

Regardless of its type, data can be classified into primary data and secondary data. Primary data is regarded as the vital data type that the researcher needs in order to achieve the purpose of the research (Collis & Hussey 2003). It includes a wide range of data (Ghauri & Grønhaug 2002):

1- Status and state of affairs data (age, education levels, profession, gender).

2- Psychological and lifestyle data.

3- Attitudinal and opinion data.

4- Awareness and knowledge data.

5- Data on intentions.

6- Data on motivations.

While this source of data is important in ensuring the consistency of the data collected with the research questions and research objectives (Ghauri & Grønhaug 2002), it can take a long time and be costly to collect. Moreover, it could be difficult to get access since the researcher is dependent on the goodwill of the respondents for their cooperation.

Table 4.1. Main Features of Data Types

Qualitative Data	Quantitative Data
• Emphasis on understanding • Focus on understanding from respondent's point of view • Interpretation and rational approach • Observations and measurements in natural settings • Subjective 'insider view' and closeness to data • Explorative orientation • Process-oriented • Holistic perspective • Generalization by comparison of properties and contexts of individual organism	• Emphasis on testing and verification • Focus on facts and reasons for social events • Logical and critical approach • Controlled measurements • Objective 'outsider view' distant from data • Hypothetical-deductive, focus on hypothesis testing • Result-oriented • Particularistic and analytical • Generalization by population membership

Source: Ghauri & Grønhaug (2005, p. 110)

The main characteristic of this data is that the materials are gathered by the researcher himself (Jankowicz 2005), who can collect it by several choices such as observations, experiments, questionnaires and interviews.

In contrast to primary data, which are collected for the research problem at hand, secondary data represents information that is collected by others for purposes which can be different from those of the research. These data could be available from many resources such as government publications, financial institutions, companies' annual reports, published books, and academic as well as professional journal articles.

The main advantages of these data are pointed out by Ghauri & Grønhaug (2002) in terms of saving time and money, and also broadening the base from which scientific conclusions can be drawn. Moreover, they claim that these data are reliable and provide an instrument for

comparison to interpret and understand primary data. However these advantages may not always apply as the data might not completely fit the research objectives.

For this study, primary data was collected through two methods. A questionnaire was used to collect the primary quantitative data and the interview method was employed to collect primary qualitative data. A range of SMMT (Society of Motor Manufacturers and Traders)' published reports, FAME (Financial Analysis Made Easy) database and several internet websites and E-Journals formed the source of secondary data.

It was thought that this combination of data sources would create rich data, thus, allowing for effective achievement of the research aim and objectives. This is because some research questions can be answered best by combining information from secondary and primary data (Ghauri & Grønhaug, 2002).

4.3. Research methods

Data collection methods are well documented in the research methods literature (*e.g.* Saunders *et al.* 2007, Robson 2002, Ghauri & Grønhaug 2002). There is no generally-accepted best method (Robson 2002) .The selection of the methods should be driven by the kind of research questions and has to be moderated by what is feasible in terms of time and other resources, skills and expertise (*ibid*).

Since each method has its advantages and disadvantages (Manly 1992), it is usually desirable to combine data collection methods such as archive searching, interviews, questionnaires and observations (Collis & Hussey 2003). Therefore, studies may combine methods producing quantitative data with others yielding qualitative data (Robson 2002).

Given the explanatory and exploratory nature of the research, two methods were deployed to collect the data required in order to achieve the research objectives. These methods are questionnaire and interview. The questionnaire was designed to provide quantitative data that enable statistical testing, and thus, to resolve research hypotheses and answer research questions. The other instrument (interview) was intended to give more insights into the IAP and contribute towards achieving the research objectives.

It is worth indicating the fact that interviews (usually associated with phenomenological philosophy) were used in this positivistic research because a research method is not necessarily designated as phenomenological or positivistic by its label, but by how it is used (Collis & Hussey 2003).

The tools used in these two methods (questionnaire and interview schedule) represent the indicators that stand for study concepts (see Chapter 3). These indicators are embedded in the questions contained in both tools. It is argued (Bryman 2001) that it is necessary to have an indicator or (indicators) that will stand for the concept. The indicator(s) can be devised through a question (or series of questions) that is part of a structured interview schedule or self-completion questionnaire. The question(s) could be concerned with the respondents' report of an attitude, or their social situation, or a report of their behaviour.

4.3.1. The questionnaire

Collecting research data requires communicating with those who have experienced the phenomenon under investigation. Therefore, a mailed questionnaire approach was selected since it is the most useful, popular data collection method particularly when large numbers of people are to be reached fairly easily in different geographical regions (Sekaran 2003).

The nature of the research objectives requires data about finance directors' opinions and behaviour regarding the role of MJ and the ROA in the IAP. It is claimed (Dillman 2000) that a questionnaire is the most appropriate method for collecting this type of data. He argues that there are three types of data variable that can be collected through questionnaires:

- **Opinion variables:** record how respondents feel about something or what they think or believe is true or false.

- **Behavioural variables:** record what respondents do. Subsequently, recording their behaviour. Therefore, these variables contain data on what people did in the past, do now or will do in the future.

- **Attribute variables:** contain data about respondents characteristics (things they possess: *e.g.* age, gender, marital status, education, occupation and income)

In addition to this, and since the industry under investigation (the Automotive Industry) is widely geographically spread, a mailed survey was expected to be an efficient way to achieve a broad coverage of firms operating in different geographical areas and subsequently to obtain diverse data. The main feature of the data yielded by questionnaire is "standardisation" which allows easy comparison (Saunders *et al.* 2007). This is thought to be crucial for applying the statistical analysis to test the hypotheses developed in Chapter 3, and for allowing statistically valid conclusions about the population to be drawn.

The main features of the questionnaire are illustrated below:

1 - Questionnaire contents

- **The introductory letter:** to preface the questionnaire, an introductory letter was provided to present the main elements of the research. This included the topic, the aim of the research and its importance to those involved in the IAP. Several appealing factors were considered to increase the response rate. The university mail service and address were used to ensure an academic and formal context for the survey, the respondents were given the choice whether they would like to receive a copy of the findings upon the completion of the study. Cosmetic aspects such as the appearance, the layout and the length of the questionnaire were also considered (4 pages of A4), and a stamped and a self-addressed envelope was enclosed in each letter. Each questionnaire was signed by the researcher to demonstrate the importance of the research to him. The introductory letter was assigned the same code given to the first page of the questionnaire to identify non-respondent companies to whom a reminder would be sent at a later stage.

- **The questions:** the main elements of the research problems and objectives were translated into specific questions to facilitate the data collection process. The questionnaire was divided into three parts with a total of 32 questions. Part A was a "demographic section" with (6) questions designed to obtain general information for classification purposes. Part B involved (7) questions about financial appraisal techniques, MJ factors, formal adoption

of the ROA, and risk appraisal techniques. Part C was the largest part with (19) questions about the importance of both financial techniques and MJ factors in the IAP, ROA factors, the treatment of risk in the IAP, and about business strategy.

2 - Questionnaire design

To minimize bias and provide data that could be statistically analysed, Gill & Johnson (2002) highlight several interrelated issues in questionnaire design:

- **Questionnaire focus:** the extent to which the questions to be asked cover the various aspects of the research problem adequately and in sufficient detail.

- **Question phraseology:** whether or not the ways in which questions are asked are intelligible to respondents.

- **The form of response and question sequencing:** data must be elicited in a form that permits subsequent analysis (computer aided, statistical manipulation).

Likewise (Robson 2002) highlights the importance of a well-designed questionnaire in providing a valid measure of the research questions, getting the co-operation of respondents, and eliciting accurate information. Ghauri & Grønhaug (2002) suggested that the design of the questionnaire can be structured (pre-determined questions and answers for the respondents to choose from), unstructured (the questions are roughly pre-determined) and semi-structured (predetermined questions but the respondents can use his/her own words and ways to answer).

Bearing in mind the preceding points, a structured questionnaire was designed (Appendix 1). The purpose of the research was evident from the questions asked and most of the questions had a range of suggested fixed responses for the respondents to choose from. All efforts were made to ensure a good response rate from this postal questionnaire. The questions were *"sufficiently simple and straightforward to be understood with little or no explanation"* (Moser & Kalton 1993, p. 260). The questions were intended to cover all areas relating to the research problem in simple language with no unusual or ambiguous phrases, and easy to fill in with plenty of spaces for questions and answers.

The order of the questions was considered carefully to ensure a logical sequence of the questions and smooth transition. To allow the application of statistical tests using the SPSS (Statistical Package for Social Sciences) package, an academic statistician was consulted and the questions were formatted in such a way that would provide data that could be easily coded and entered into the SPSS software. The final draft of the questionnaire was examined for bias, clarity and validity by the researcher's supervisory team and experts at the Bournemouth University Business School whose comments were considered before the questionnaire was pre-tested in the field by conducting a pilot study.

Protocol analysis (Ericson & Simon 1993) was used to improve wording by asking those individuals to give any thoughts that occur to them when the question is read out. The intention is to help the researcher understand respondents' perception, and how they arrive at their responses.

3 - Questions format

The questions were formatted to provide a variety of measurable data on different scales. Four types of question were used:

- **Closed questions:** where the respondent can choose between numbers of predetermined alternatives (4 in the questionnaire).

- **Questions with multiple choice answers:** where the respondent is asked to tick applicable predetermined alternatives (2 in the questionnaire).

- **Questions with a rating scale for answers (using a five-point Likert scale):** where the respondent decides upon the level of agreement with a specific statement (20 in the questionnaire).

- **Open-ended questions:** where respondents are free to answer according to their own opinion. It is recommended to minimise open-ended questions in self-completion questionnaires (Robson 2002) as it takes a long time for respondents to respond and also

for the researcher to analyse. Therefore, only six questions of this type were used, all of them for descriptive analysis purposes.

Most of these four types of questions are easy to complete by respondents (answering by ticking a box) and do not take up much space, and are simple for the researcher to code and analyse. The resulting data conformed to three kinds of measurement scales: nominal, ordinal and interval.

4.3.2. The interviews

Interview is often considered the most productive data collection method. Ghauri & GrØnhaug (2002) have identified the following types of interview:

- **Structured interviews:** where a standard format of interview is used with emphasis on fixed response categories, systematic sampling and loading procedures combined with quantitative measures and statistical methods.

- **Unstructured interviews:** where the respondent is given almost full liberty to discuss reactions, opinions and behaviour on a particular issue.

- **Semi-structured interviews:** where topics and issues to be covered, sample sizes, people to be interviewed, and questions to be asked have been determined beforehand.

Among the main reasons for using qualitative interviewing, is:

> *"When the ontological position of the researcher suggests that people's knowledge, views, understandings, interpretations, experiences, and interactions are meaningful properties of the social reality which research questions are designed to explore."* [Mason 2002, p. 63].

According to Robson (2002), in an exploratory study, in-depth interviews can be very helpful to find out what is happening and to seek new insights. Therefore, interviews provide an accurate and clear picture of a respondent's position or behaviour. This is ascribed (Ghauri &

Grønhaug 2002) to the nature of the questions (open-ended questions) and the freedom given to the respondents to answer according to their own thinking with no constraints or few alternatives to choose from.

These characteristics of the interview make it a reliable method since it permits the interviewer to expand on the questions and to ensure the respondent understands them. Furthermore, it allows the researcher to ask more complex questions and ask follow-up questions. Besides, authenticity and understanding human behaviour were regarded as the main advantages of the interviews (Silverman 2001).

While these advantages make the interviews more appealing, great concern needs to be given to question design and the process itself in order to crystallise these advantages. Yin (2003) highlights many sources of bias: bias due to poorly constructed questions, response bias, and inaccuracies due to poor recall and reflexivity.

Therefore, and in order to optimise the interviewing process, problems associated with conducting interviews need to be looked at prior to the interviewing process. These problems are summarised below (Collis & Hussey 2003):

1. The whole process can be very time-consuming and expensive.
2. Confidentiality issues.
3. Gaining access to an appropriate sample.
4. Each respondent must understand the question in the same way.
5. Interviewees might give what they consider to be a "correct" or "acceptable" response (*i.e.* rationalisation of answers).

In recognition of the ability of the personal interviews to explore themes included in the developed framework in great depth, it was planned to conduct a few personal interviews with executives who would have completed the questionnaire. An interview guide (Appendix 2) was developed to ensure an appropriate coverage of the themes and also to restrict the focus of the interview to these themes. Subsequently, a list of interview questions (Appendix 3) was developed based on an interview guide.

The interview guide and the interview questions were tested prior to conducting the main interviews via mock interviews with plant managers locally. The questions were open-ended creating room for discussing issues that might arise from the course of the interview to serve as a point of departure for further discussion. Each question was asked precisely as it was worded and in the same order that it appeared on the schedule. This was thought to be very important to the reliability of the interview (Selltiz *et al.*1964).

4.4. Data analysis procedures

The choice of data analysis techniques depends, among other things, on the type of data, the research design, and the purpose of the research. The primary data required for this research was of two types: quantitative, collected by questionnaire survey, and qualitative, collected by the interviews. This entailed different procedures in the analysis. The SPSS (Statistical Package for Social Sciences) software was used for analysing the first type of data whereas template analysis (King 2004) was used for the second type.

4.4.1. SPSS software

Responses were coded and entered into the SPSS package. The data entry process was scrutinized twice to ensure accurate entry of the data. The data obtained via the questionnaire yielded three types of variable measurement (dichotomous, nominal and ordinal). Given the non-parametric nature of some of the data obtained, this created a good opportunity for the deployment of a wide variety of test statistics. However, having considered research objectives, a set of test statistics that served the research objectives was deployed.

In order to discover the prevalence of the financial appraisal techniques among the respondents, a descriptive analysis was conducted (frequencies, mean, SD (standard deviation), Friedman test and other tests explained in Chapter 5). For hypotheses testing and finding the correlation between research variables, the following test statistics were applied: the Kruskal-Wallis one-way ANOVA test (non-parametric test) for three or more unrelated samples, the Mann-Whitney U-test (non-parametric test) for two unrelated samples, Cronbach's Alpha, Spearman's rho test statistic and Kendall's tau. A detailed explanation of the application of these test statistics is given in Chapter 5.

4.4.2. Template analysis

Interpreting and organising the diverse and complex body of data gathered during the field study research is a challenging task which has to be addressed in a rigorous way. Following the protocol of Strauss & Corbin (1990), transcripts were coded at the paragraph level in order to determine the sub-categories that capture the main theme of each paragraph and identify the more general category to which they belong.

Interviews were interpreted with the aid of template analysis (King 2004). The term 'template analysis' does not describe a single, clearly delineated method, it refers rather to a varied but related group of techniques for thematically organizing and analysing textual data (*ibid*).

King (2004) argues that template analysis may be used within a range of epistemological positions. It can be employed in the kind of 'realist qualitative work' which accepts much of the conventional positivistic position of mainstream quantitative social science, that is to say, research which is concerned with 'discovering' underlying causes of human action (*ibid*).

To ensure that the interview analysis is systematic and rigorous, a set of procedures was used to guide the data analysis and the development of the final template. These procedures are explained below:

- **Initial stages of analysis**

All interviews were tape-recorded and transcribed immediately after the interview to create permanent records for analysis. The overall analytical approach adopted largely followed the conventions of template analysis, where the researcher produces a list of codes ('the template') representing themes identified in the textual data (King 2004).

The coding process was carried out manually as this helped to preserve the contexts within which quotes were made and due to the relatively small number of interviews (11). Therefore, no attempt was made to benefit from the software package (MAXQDA) since the software is only an aid to the organisation of the material and is not in itself an interpretive device (King

2004). Moreover, it is more efficient when working with large amounts of texts in order to carry out complex search and retrieval operations (*ibid*).

- **Generation of the themes and categories**

Using template analysis (King 2004), the transcripts were coded into broad themes based on the research objectives and interview guide (Appendix 2) to create an initial template (Appendix 4). The use of the interview guide that originally derived from the conceptual framework developed in Chapter 3, was preferable as it reduced the variability of responses and thus increased comparability of themes across the sample.

As can be seen from Appendix 4, the initial template consisted of five highest-order codes, sub-divided into one, two, three or more levels of lower-order codes. The first level-one code is 'investment appraisal process' comprising three level-two codes. These codes covered the central issues in this research "the context of the IAP". The remaining codes represented other themes of direct relevance to the first code and research aim.

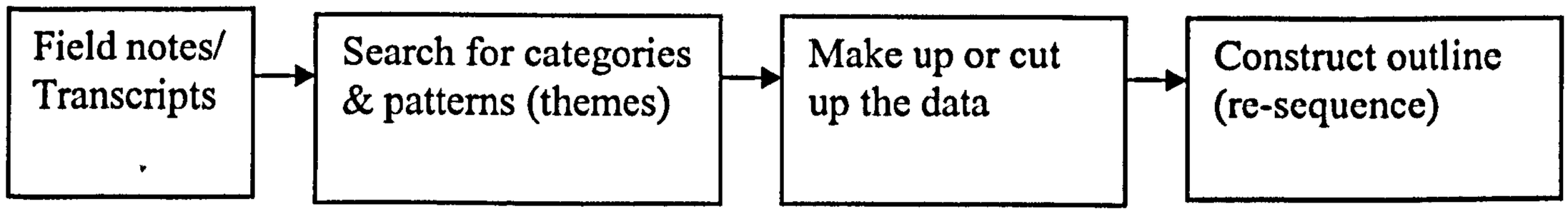
The initial template derived from coding the transcript of first interview, and then other transcripts were coded subsequently. This resulted in categories being added (to cover emerging codes not covered by existing codes) or deleted (overlap with other codes) within each theme. The development of this template from initial form to final form (Appendix 5) reflected the diverse attitudes of the individuals towards the themes under investigation.

This procedure is claimed to be very useful in revealing the inadequacies in the initial template:

> *"Once the initial template is constructed, the researcher must work systematically through the full set of transcripts, identifying sections of text which are relevant to the project's aims, and marking them with one or more appropriate code(s) from the initial template. In the course of this, inadequacies in the initial template will be revealed, requiring changes of various kinds. It is through these that the template develops to its final form."* [King 2004, p. 261].

Fielding (2001) argues that while there are several approaches to the analysis of the ethnographic data, the mechanical procedures that researchers use are straightforward and readily summarised as shown in Figure 4.1:

Figure 4.1. Procedures for Qualitative Analysis



Source: Fielding (2001)

Therefore, the transformation process of the qualitative data (the interviews transcripts) to meaningful form in template analysis follows a flow similar to other qualitative approaches.

Given the external constraints, meaning there is limited time to produce an 'ideal' template, the decision to stop the process of developing the initial template to the final one is a difficult one to make. However, this was facilitated by the coincidence of coding of transcripts and development of the initial template. Having coded the first three transcripts, the need for more interviews was apparent. While coding the transcript, the codes from each transcript were compared with the codes generated from other transcripts and also with codes generated from a company of the same size. This allowed a decision on whether to conduct the next interview or not.

In relation to small and medium-sized companies, the second interview did not generate sound new categories; therefore, no more companies were invited for further interviews. The situation was different in large and very large companies where more companies were invited as more categories emerged with each interview until the emergent categories became insignificant and overlapped with other categories, and then the decision was made to stop interviewing.

This indicated the emergence of the "saturation state" which means, according to Bertaux & Bertaux-Wiame (1981), that the sampling process proceeds until a theory-saturation point is reached, that is until a picture of what is going on and an approximate explanation for it can

be generated. This point is reached when data begin to stop yielding anything new about the social process under scrutiny.

The continuous comparison allowed the refining of the sub-groups in each theme to generate well-defined groups that allow all relevant sections from transcripts to be quoted. This was considered to be one of the signs that the template has reached a final stage. As King (2004) suggested:

> *"However, the template cannot be considered 'final' if there remain any sections of text which are clearly relevant to the research question, but remain uncoded. Also, the data have not been read through and the coding scrutinized at least twice."* [King 2004, p. 263].

Therefore, the decision about when a template is "good enough" is always going to be unique to a particular study and a particular researcher. Each broad theme then was subject to a detailed manual analysis. This led to the formation of more specific categories within each theme and allowed the analysis of the texts at different levels of specificity. This also helped to make fine distinctions both within and between cases (King 2004). The use of separate categories allowed the exploration of the data and a comparison of the similarities and differences. The thematic analysis is presented in Chapter 6.

The use of this technique in the social sciences is gaining support. A study by King & Maskrey (King 1998) about identifying key issues for General Practitioners (GPs) in making decisions about the management of patients with mental health problems used a sample of 13 participants. Another study (Cassel *et al.* 2005) used a sample of 45 academics and professionals to analyse the assessment criteria and training needs for qualitative management research. This used both personal and telephone interviews.

4.5. Triangulation

Triangulation refers to the use of different data collection techniques within one study in order to ensure that the data are saying what the researcher thinks they are saying (Saunders *et al.* 2007). Since quantitative and qualitative data collection techniques and analysis procedures each have their own strengths and weaknesses (Smith 1975), triangulation is considered to be an appropriate strategy in order to overcome the potential bias and sterility of a single-method approach.

Easterby-Smith *et al.* (1991) identify four types of triangulation:

- **Data triangulation:** data is collected at different times, or from different sources.

- **Investigator triangulation:** different researchers independently collecting data on the same phenomenon.

- **Methodological triangulation:** both qualitative and quantitative methods of data collection are used.

- **Triangulation of theories:** a theory is taken from one discipline and used to explain a phenomenon in another discipline.

A similar classification is introduced by Mason (2002) who viewed triangulation as an integration process that takes place at different levels explained below:

- **Technical integration:** data generated via different sources or methods take a similar or complementary form in a technical or organizational sense, so that they can be straightforwardly aggregated, or grouped together, or made comparable in some way. The different forms of data use the same, or complementary, "units of analysis".

- **Ontological integration:** data are ontologically consistent, based on similar, complementary or comparable assumptions about the nature of social entities and phenomena.

- **Integration at the level of knowledge and evidence:** different methods or forms of data emanate from the same epistemology, based on similar, complementary or comparable assumptions about what can legitimately constitute knowledge or evidence.

- **Integration at the level of explanation:** similar to the previous level, but the focus is upon the construction of social explanations and the making of generalisations.

Given the diverse nature of the research objectives explained in Chapter 1, a "methodological triangulation" was chosen as this would allow the integration of the knowledge and evidence. The integration is more fully explained in the following paragraph.

4.5.1. Triangulation of research methods

It was argued that it is perfectly possible, and even advantageous, to use different research methods since this allows a broader and often complimentary view of the research problem or issue (Collis & Hussey 2003). Therefore, qualitative data collected using semi-structured interviews may be a valuable way of triangulating quantitative data collected by other means such as a questionnaire (Saunders *et al.* 2007).

This approach of multiple research methods is increasingly advocated within business and management research (Curran & Blackburn 2001) where a single research study may use quantitative and qualitative techniques and procedures in combination, as well as using primary and secondary data. The production of the combination of data collection techniques and procedures using some form of multiple methods design would result in one of four different possibilities (Saunders *et al.* 2007):

1- **Multi-method quantitative study:** combinations where more than one data collection technique is used with associated analysis techniques, but this is restricted within either a quantitative or qualitative world view (Tashakkori & Teddli 2003). This is applied, for example, using questionnaires and structured observations and analysing these data using statistical (quantitative) procedures.

2- **Multi-method qualitative study:** collection of qualitative data using, for example, in-depth interviews and diary accounts and analysis of these data using non-numerical (qualitative) procedures.

3- **Mixed-method research:** uses quantitative and qualitative data collection techniques and analysis procedures either at the same time (parallel) or one after the other (sequential), but does not combine them. This means that although mixed-method research uses both quantitative and qualitative world views at the research methods stage, quantitative data are analysed quantitatively and qualitative data are analysed qualitatively. In addition, often either quantitative or qualitative techniques and procedures predominate.

4- **Mixed-model research:** in contrast to mixed-method research, this approach combines quantitative and qualitative data collection techniques and analysis procedures as well as combining quantitative and qualitative approaches at other phases of the research such as research question generation. This means that the researcher may take quantitative data and qualitise it, which is, convert it into narrative that can be analysed qualitatively. Alternatively, the researcher may quantify the qualitative data, converting it into to numerical codes so that it can be analysed statistically.

However, the integration of different methods, while often highly productive, is not straightforward (Mason 2002). There are many reasons and justifications for using this approach:

1- To explore different parts of a process or phenomenon.

2- To answer different research questions with different methods and sources.

3- To answer the same research questions but in different ways or from different angles.

4- To analyse something in greater and lesser depth or breadth, using different methods accordingly.

5- To seek to corroborate one source and method with another, or to enhance the quality of the data through some form of "triangulation" of methods.

6- To test different analyses, explanations or theories against each other.

Bearing in mind the research objectives and the research hypotheses developed in the previous chapter, it is believed that a mixed-method research is the most appropriate way to tackle the research problem. A survey strategy is used since it is the best one to answer questions of the type "who, what, where, how many, how much" (Yin 2003). Positivists may sometimes use qualitative methods, depending on the hypothesis being tested, for instance in the exploratory stage of research (Silverman 1993). In this study, (11) in-depth interviews were conducted in the field work to provide insights and illumination on the IAP and the extent to which MJ factors are considered for investments with growth options in this process.

Since the research focuses on contemporary events and the researcher has no control over actual behavioural events, triangulation of both methods is thought to be appropriate as this allows for convergent lines of evidence. The justifications for the triangulation are explained more fully in the light of the research hypotheses as shown in Table 4.2.

Table 4.2. Justification for Data Collection Methods

Research hypotheses	Data sources and methods	Justification
H1: Companies rely more on MJ factors for assessing strategic investments with future growth options than on financial techniques. **H2:** Financial appraisal techniques are applied to investment proposals regardless of the growth options embedded within them. **H3:** More emphasis is placed on financial appraisal techniques than on MJ factors for assessing investments with no or few growth options. **H4:** ROA factors will explain the variation in the application of MJ for investments with growth options. **H5:** Investments with growth options are difficult to justify because of the complexity of quantifying the ROA factors. **H6:** The use of MJ factors increases with the level of risk of the investment project being evaluated. **H7:** The deployment of MJ factors for assessing new investments will vary depending on the size of the firm.	• Data sources: Finance Directors and decision-makers in the companies. • Data collection methods: questionnaire survey and interview.	• Interviews provide finance directors' accounts of how they handle both the decision making process and the IAP, taking account of risk associated with the proposed project, factors that influence the SIDs including MJ factors, issues considered when making the decision (financial returns, growth options, consolidating business strategy), criteria in use. • Interviews provide directors' judgements about the IAP in the firm and reveal beliefs they operate in relation to assessing proposed projects. This helps to discern whether directors share attitudes towards the best practice in the IAP. • Interviews reveal something about how the IAP is conducted and whether they negotiate for their proposals to be approved, deploy MJ factors. • Analysis of the questionnaire survey reveals the prevalence of the financial appraisal techniques and MJ factors, the link between different variables (risk, company size, nature of the proposed projects) and the use of each appraisal criteria. • A comparison of similarities and differences between the data yield from the different sources helps to build up a picture of the use of MJ factors in the IAP.

4.6. Credibility of research instruments

Ensuring reliable and valid data collection methods and analysis procedures is crucial for the credibility of the research findings. However, it is argued (Patton 2002) that no way exists of perfectly replicating the researcher's analytical thought processes. No straightforward tests can be applied for reliability and validity. In short, no absolute rules exist except perhaps this: "do your very best with your full intellect to fairly represent the data and communicate what the data reveal given the purpose of the study" *(ibid)*. All possible efforts were made to ensure consistent and robust procedures in the questionnaire and interview development process as explained below.

4.6.1. Reliability of research instruments

Reliability in this regard refers to the extent to which data collection techniques or analysis procedures will yield consistent findings (Saunders *et al.* 2007). It can be assessed by posing the following three questions (Easterby-Smith *et al.* 1991):

1- Will the measures yield the same results on other occasions?

2- Will similar observations be reached by other observers?

3- Is there transparency in how sense was made from the raw data?

The highly structured methodology adopted in this positivistic research contributed to a sound degree of reliability since it facilitates replication (Gill & Johnson 2002). The pursuit of the scientific rigour increased this reliability. This was demonstrated by three points: being independent from what is being observed, the use of the reliable data source (FAME) and the use of the standardised data collection methods.

The procedures followed in developing research instruments (postal questionnaire and interviews) were designed to provide an acceptable level of reliability. It is argued that research in the quantitative tradition often relies upon standardization of research "instrument" or 'tools' and upon cross-checking the data yielded by such standardized instruments in order to check reliability (Mason 2002). The use of the standardized questionnaire in this study allowed for the comparison between sample members and yielded

consistent data. This is demonstrated in the absence of unusual trends or conflicting results in the statistical analysis.

Regarding the interviews, it has been argued (Silverman 2001) that to ensure reliability, it is very important that each respondent understands the questions in the same way and that answers can be coded without the possibility of ambiguity. This is achieved through a number of means, including:

1- Pre-testing of interview schedules.

2- Training of interviewers.

3- As much use as possible of fixed choice answers. (*ibid*)

The mock interviews conducted with selected local managers provided the opportunity for checking the reliability of the interview guide and interview questions. Moreover, using standardized methods to write field notes and prepare transcripts was claimed to enhance the reliability of the interview method (Silverman 2001).

To increase the reliability of these two methods and, thus, the reliability of the research findings, a formal detailed plan was established as how to collect and analyse the required data. Regarding the questionnaire, this plan included a list of entitled companies and the name of the finance director, corresponding address, sending the questionnaire to the named finance director using first class post service and a self-addressed envelope, coding process, data entry process, identifying the statistical tests required to test the hypotheses with the assistance of a statistician prior to conducting the main survey and based on the analysis of the responses from pilot study, the use of reliable software for analysing the responses (SPSS package).

Regarding the field work, this plan included the structure of the field procedures (*e.g.* detailed list of interviewees to be interviewed such as name, location, position in the company and other information as shown in Appendix 6), substantive issues to be discussed and the interview questions (interview guide and interview questions that have been tested in the mock interviews), analysis plan (coding process, matrix development, template analysis) and guide for writing the final report about the analysis of qualitative data.

It has been claimed (Birnberg *et al.* 1990) that such a formal plan is important to achieve the necessary cohesion in the data collection and thus increase its reliability. The procedures followed in collecting data through these two methods were documented to establish a retrievable database, hence to increase the replicability of the research findings. This is considered to be a criterion to increase both the internal and the external validity of the research (Sekaran 2003).

4.6.2. Validity of research instruments

Some have claimed [*e.g.* Mehrens & Lehmann (1984), Murphy & Davidshofer (1991)] that there are three ways to ensure that an instrument measures what it is supposed to measure, all of which are common in academic research:

1- **The logical or rational approach:** based upon a theory, each concept to be measured with an instrument results in construct elaboration and, in turn, a set of questions or observations. Trial sets of questions are piloted on subjects and those that contribute the most to high reliability are used in the final instrument. This approach can be summarised as follows:

Logical: theory ⇒ concept ⇒ constructs ⇒ questions set

2- **The factor-analysis or homogeneous approach:** starting with a concept, a set of questions is generated that is given to a trial group of subjects, using factor analysis on the results, groups of questions are identified with sufficient commonality to determine constructs that make up the concept. This approach can be summarised as follows:

Factor analysis: concept ⇒ questions ⇒ factor analysis of trail data ⇒ question set ⇒constructs

3- **The empirical approach:** using the characteristics or behaviours of recognized, independently classified subjects for a reasonably well-defined trait, a set of questions is generated. These are administered to the group possessing the trait and to a control

group lacking the trait. Those questions that best discriminate between the two are subsequently used in the final instrument. This approach can be summarised as follows:

> **Empirical:** observations ⇒ questions ⇒ group scores ⇒ constructs ⇒ question set

For the purposes of this research, the first method was used. Based on previous theories, models and studies relating to the IAP, the main concepts under investigation were conceptualised (collapsed into constructs) then these constructs were operationalised (given an operational definition to allow for their measurement)*.

The procedures used in designing and preparing both research methods were intended to provide an acceptable level of validity. The piloting process helped to ensure clear understanding of the questions and allowed for amendments to be made prior to the main study. The use of protocol analysis (Ericson & Simon 1993) in the process of developing the questions ensured that the Finance Directors understand the questions in the same way, and therefore, provide the required answers**. More importantly, the respondents and the interviewees were not under pressure and participated freely in this study. This is reflected clearly in two things: the high number of respondents who expressed interest in this research and asked for a copy of the findings, and the literal transcripts of the interviews and quotes used in this study showed spontaneous reaction by the interviewees. So actual behaviour was observed rather than artificial behaviour (artificial behaviour is where respondents behave and give information that they think they should be giving rather than what is happening in reality).

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* See Chapter 3 for operational definition of the research concepts.
* *See section 4.3 for more details about the procedures taken to ensure validity.

4.7. Summary

This chapter has presented the rationale for the choice of data collection methods used in this study and data analysis techniques. A detailed description was provided of the development process of the research methods adopted together with the procedures followed in the analysis of the data obtained from both methods.

Amongst the diverse data collection methods, questionnaire and interview are thought to be the most appropriate methods to ensure getting as much information as possible towards achieving the research objectives. The questions in both methods were derived from the conceptual framework. The justifications for using these two methods were presented while linking them to research hypotheses.

Since two types of data were collected (quantitative and qualitative), this entailed two analytical procedures. The SPSS package was used to analyse quantitative data and template analysis was used to interpret qualitative data. Data quality issues were suitably addressed. The analysis of the data collected is presented in the following chapters.

Chapter 5

Empirical Evidence (1): The Questionnaire Survey

5.1. Introduction

This chapter presents the first stage of the process of collection of data for hypotheses testing. This stage involved conducting the questionnaire survey that aims at answering a substantial part of the research objectives. The aims of the survey can be summarised as:

1- **Descriptive:** to update the previous exercises by other researchers (past studies related to the use of financial techniques in the IAP)*. In particular, exploring whether there is evidence of considering MJ and growth options in the IAP, and under what conditions.

2- **Analytical:** to test the hypotheses developed in Chapter 3 in order to explore the relationships between MJ and other variables that influence the SIDs.

This chapter starts with the characteristics of the population of the research and of the sampling process. This is followed by a description of the main survey and hypotheses testing. Finally, the results of the analysis are presented.

5.2. The population

This research was conducted among British Automotive Components Manufacturers (BACMs), based on the FAME database (Financial Analysis Made Easy) which lists all registered companies operating in the UK. The Primary UK SIC (2003) for this industry is 34: Manufacturers of Motor Vehicles, Trailers and Semi-Trailers. This code is divided into three sub-groups as follows:

341: Manufacturers of motor vehicles.

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* See Chapter 2 (literature review)

342: Manufacturers of bodies (coachwork) for motor vehicles, manufacturers of trailers and semi-trailers.

343: Manufacturers of parts and accessories for motor vehicles and their engines.

Since the scope of this research is automotive components manufacturers, the first group (341) was excluded from the study. The total number of registered and operating companies under the 342 code is 533 companies and 758 companies under the 343 code [FAME, accessed on 26, 09, 2005]. This brings the total number of companies involved in the study to 1,291 companies.

5.3. Sampling frame

Studying the whole population would be costly and time-consuming. Besides, a representative sample from the population can provide an approximate reflection of the population. Therefore, the main step in the sampling process was to identify the sampling frame which is the source of the eligible population from which the survey sample is drawn (Robson 2002). In the process of identifying the sampling frame, companies whose financial reports are incomplete (normally micro-firms) were excluded to avoid any bias in the findings that might result from using unreliable data and to ensure good quality of the research findings. Therefore, the sampling frame for this research was reduced to 523 companies. Firms that appear under two codes were considered only once (8 firms).

5.4. Pilot study

According to Collis & Hussey (2003), it is essential to pilot or test the questionnaire before conducting the main survey. This allows any potential problems in the pro forma of the questionnaire (*i.e.* biases, errors) to be identified and corrected (Gill & Johnson 2002). To test the questionnaire and predict how respondents will react to the questions, a sample of 30 companies was drawn randomly from the sampling frame of 523 companies (5.7%). 7 responses (23%) were returned and analysed. Based on these responses, a few changes and amendments were made to some questions and the final format was completed to be used in the main survey.

5.5. Research sample

The requirements of a "good sample" were identified by Collis & Hussey (2003) as follows:

- Chosen at random (each member of the population has equal chance of being included in the sample)
- Large enough to satisfy the needs of the investigation undertaken.
- Unbiased.

While a random sample needs to be of adequate size, what is regarded as adequate depends on several issues which are potentially confusing (Gill & Johnson 2002). What is important here is not the proportion of the research population that gets sampled, but the absolute size of the sample selected relative to the complexity of the population, the aims of the research and the kinds of statistical manipulation that will be used in data analysis (*ibid*).

This research is unique in exploring the role of MJ and the ROA in the IAP and the contribution the assessors can make to this process using their experience and own judgement. A relatively large sample to the population was drawn randomly to provide a clear picture of the complexity of the context of the IAP. Moreover, larger sample sizes reduce sampling error but at a decreasing rate (Gill & Johnson 2002). In order to ensure the above conditions, the following procedures were adopted in the process of selecting the research sample.

Bearing in mind the response rate from the pilot study (23%) and the response rate in previous studies in this domain (which ranges between 18-28% as explained in the following paragraph), the expectation was that the net usable response rate would be between 20-30%. To ensure at least a 30% net response rate and allow for invalid responses, a 32% expected total response rate was used to identify the sample size as follows: 493 (the sampling frame was reduced to 493 [523-30 = 493] companies) times 23% (net response rate from pilot study) = 113 (expected useable responses). Therefore, the sample size required is: 113 (expected usable responses / 32% (expected total response rate) = 353 companies. These 353 companies were drawn randomly (using SPSS random selection instruction) from the sampling frame (493 companies) after excluding those included in the pilot study. This random sampling was

used for this explanatory stage of the research to obtain maximum diversity of data that help in identifying as many potentially relevant variables as possible.

5.6. Main survey

Having ensured an appropriate questionnaire design, the questionnaire was mailed to senior financial executives of a sample of 353 companies. The main survey took place in the first week of November 2005, and a reminder was sent to non-respondents in the first week of December 2005. A total of 117 responses was received, a total response rate of 33.2% [total number of responses/ (number in sample less ineligible), Neumann 2000]. Saunders *et al.* 2003 claim that for postal surveys a response rate of 30% is reasonable. Of those received, 44 responses were invalid because of a variety of reasons as shown in Table 5.1. Consequently, the sample size dropped from 353 to 309.

Bryman (2001) defines the response rate as the number of usable questionnaires/ (total sample less unsuitable members of the sample) * 100. Therefore, the net usable response rate or "active response rate" (Neumann 2000) was thus 23.6% [73 completed questionnaires / 309 (353-44) potential respondents]. This response rate compares reasonably with some other similar surveys such as those of Sangster (1993), 21.8%, Chen (1995), 20%, McIntyre & Coulthurst (1986), 18.8%, and rather less favourably with Lefly's (1994), 28% and Alkaraan & Northcott (2006), 30.6%.

This relatively low response rate in this study is explicable as the respondents are all busy senior executives. Moreover, a low response rate is a common problem with self-completion questionnaires (Robson 2002). The low returns by mail operator suggests the reliability of the database (FAME) used in this research to get the information about the population. This was confirmed when inviting the respondents for interview in a later stage in this research.

Table 5.1. Invalid Responses and Non-Respondents' Justifications

Reasons for not responding and invalid responses	Number of cases
Company does not disclose information	2
Registered office only	5
Lack of time	5
No investment activities	3
Company ceased manufacturing and closed very recently	8
Company policy not to participate in a survey	2
Incomplete responses	2
Very small company and the questions are not applicable	5
Do not want to participate	7
Investment proposals are considered by parent company	1
Company is in process of change	1
Returned by mail operator "unknown at this address"	3
Total	**44**

It has been noticed that incomplete responses (2) and not applicable questions (5) came from very small companies. Large companies were responsible for the majority of unusable returns in the first three groups in Table 5.1. Other unusable returns came from a variety of firms. The sample drawn (353 companies) covers about 72% of the sampling frame [(353 / 493) * 100]. This makes margins of error small as the larger the sample, the smaller the margins of error (Stutely 2003).

5.7. Testing for non-response bias

Wallace and Mellor (1988) describe the following three methods for dealing with questionnaire non-response:

- To analyse and compare responses by date of reply. One method is to send a follow-up letter to those who do not respond to the first enquiry. The questionnaires which result from the follow-up letter are then compared with those from the first request.

- A comparison of the characteristics of those who respond with those of the population, assuming there are known.

- A comparison of the characteristics of the respondents with those of non-respondents from the sample, assuming the relevant data such as age, occupation, *etc...* is available.

In this study, the first and third methods were applied, early responses were compared with late responses. The first inquiry was conducted over four weeks. Responses received within the first two weeks were compared with responses received within the last two weeks and also with those received after the reminder. In addition, responses received from the first request were compared with those received after the reminder.

The main criterion used as a proxy of firm size is turnover. This criterion is the most reliable one among other criteria such as gross assets and number of employees. This is justified by the popular usage of this criterion to represent firm size in many previous studies (see Table 2.2, Chapter 2). While this might not reflect the value of the assets employed to generate the sales, it is considered to be the best of the available alternatives, due to the following problems related to the use of book value of the assets:

1- Book value of assets is based on historic cost and may not reflect the actual market value of these assets.

2- Firms whose business does not require much investment in fixed assets may be categorized as small firms whereas in fact their scope of operations may be quite large.

The Kruskal-Wallis one-way ANOVA test (non-parametric test) for three or more unrelated samples was used. This test can be used to compare scores in more than two groups and the cases in the different samples are ranked together in one series (Bryman & Cramer 2005). The three independent groups (companies replied within first two weeks, companies replied within last two weeks, companies replied after the reminder) are compared on a single ordinal variable (company turnover). The results (Tables 5.2 and 5.3) show comparable mean ranks of the three groups with significance level greater than 0.05. This means there are no significant differences between responses received from companies of these groups in the mean ranking of the rated turnover.

Table 5.2. Results of the Kruskal-Wallis one-way ANOVA for Non-Response Bias

Ranks

	Response time	N	Mean rank
Company's turnover in 2005	Received within first two weeks	20	36.92
	Received within last two weeks	30	41.32
	Received after reminder	23	31.43
	Total	73	

Table 5.3. Significance Level of the Mean Ranks Differences

Test Statistics (a, b)

	Company's turnover in 2005
Chi-Square	2.953
df	2
Asymp. Sig.	.228

a: Kruskal-Wallis Test , b: Grouping Variable: response time

To test for the non-response bias for responses received from the first request and those received after the reminder, the **Mann-Whitney test** (non-parametric test) for two unrelated samples was used. This test relies on scores being ranked from the lowest to the highest. Therefore, the group with the lowest mean rank is the group with the greatest number of lower scores. Similarly, the group that has the highest mean rank should have a greater number of high scores within it (Field 2000).

In other words, it compares the number of times a score from one of the samples is ranked higher than a score from the other sample (Bryman & Cramer 2005). It is similar to the **Kruskal-Wallis test** in that the cases in the different samples are ranked together in one series. However, unlike the Kruskal-Wallis test, the Mann-Whitney U test can be used to compare scores in two groups only. The results (Tables 5.4 & 5.5) show comparable mean ranks of the two groups with significance level greater than 0.05. This means there is no significant difference between responses received from companies of these groups before and after the reminder in the mean ranking of the rated turnover.

Table 5.4. Results of Mann-Whitney U test for Non-Response Bias

Ranks

	Response time	N	Mean rank
Company's turnover in 2005	Before reminder	50	39.56
	After reminder	23	31.43
	Total	73	

Table 5.5. Significance Level of the Mean Ranks Differences

Test Statistics (a)

	Company's Turnover in 2005
Mann-Whitney U	447.000
Z	-1.554
Asymp. Sig. (2-tailed)	.120

a: Grouping Variable: response time

To further examine the possibility of non-response bias, the 73 responding companies were compared to the 236 non-responding companies in regard to their turnover. The results of the non- parametric Man-Whitney test indicate that there is no statistically significant difference between the mean ranks of these two groups (Mean rank for responding companies is 161.99 and for non-responding companies is 152.83, P-value = 0.427). These results suggest that more respondents would not have changed the results of the study.

5.8. Characteristics of the sample

5.8.1. Respondents' identity (position in the company)

The questionnaire was addressed to the named finance director at each company as given in the database on the premise that finance directors are most likely to be involved in the IAP (Arnold & Hatzopoulos 2000, Graham & Harvey 2001). However, and as expected, some responses came from other senior people (*i.e.* managing director, Chief Executive Officer (CEO), and senior accountant) as shown in Table 5.6. This is because the investment decision-making process and the IAP in general is a collective one and all those people are

involved in the process. Therefore, they have a common perspective and knowledge that enables them to answer the questionnaire (92.4% of them have at least an academic and / or professional qualification). Moreover, in small firms, some executives occupy several roles (*e.g.* Managing Director is also the Finance Director).

Table 5.6. Respondents' Identity

Position in the firm	Frequency	Percent (%)
Finance Director	40	54.8
Managing Director	27	37.0
Chief Executive Officer	4	5.5
Accountant	2	2.7
Total	73	100.0

5.8.2. Working experience

The working experience of the respondents ranges from 1 to 38 years (Figure 5.1). The average working experience of the respondents is just over 12 years with 66.2% of them having a working experience more than 6 years (Table 5.7). The high median value (9 years) reflects the great experience possessed by sample members (Table 5.8). The relatively low value of the Mode could be ascribed to the fact that some respondents gave the number of years working for the current company not including years worked for previous companies.

Figure 5.1. Respondents' Experience in Years

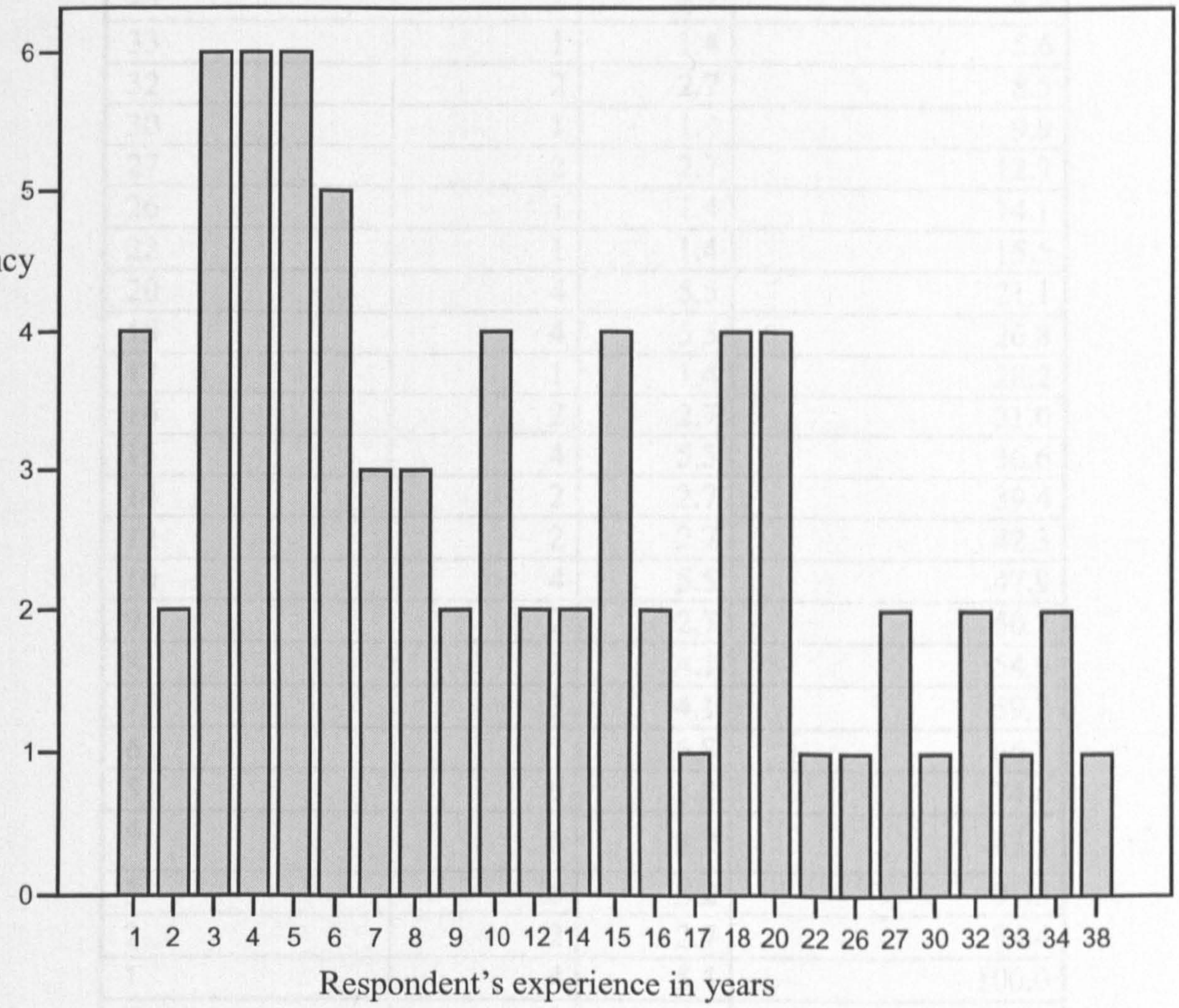

Table 5.7. Respondents' Working Experience in Years

Number of years	Frequency	Percent	Cumulative percent
38	1	1.4	1.4
34	2	2.7	4.2
33	1	1.4	5.6
32	2	2.7	8.5
30	1	1.4	9.9
27	2	2.7	12.7
26	1	1.4	14.1
22	1	1.4	15.5
20	4	5.5	21.1
18	4	5.5	26.8
17	1	1.4	28.2
16	2	2.7	31.0
15	4	5.5	36.6
14	2	2.7	39.4
12	2	2.7	42.3
10	4	5.5	47.9
9	2	2.7	50.7
8	3	4.1	54.9
7	3	4.1	59.2
6	5	6.8	**66.2**
5	6	8.2	74.6
4	6	8.2	83.1
3	6	8.2	91.5
2	2	2.7	94.4
1	4	5.5	100.0
Total	71	97.3	
Missing	2	2.7	
Total	73	100.0	

Table 5.8. Descriptive Statistics on Respondents' Working Experience in Years

N	Valid	71
	Missing	2
Mean		**12.13**
Median		**9.00**
Mode		**3(a)**
Std. Deviation		9.739
Skewness		.997
Std. Error of Skewness		.285

5.8.3. Respondents' academic and professional competences

Most of the respondents who declared their qualifications, (92.4%) have at least an academic and / or professional qualification, 43.9% having at least two qualifications. Table 5.9 shows the qualifications held by the respondents.

Those who did not declare their qualifications are from a variety of companies of different sizes and hold diverse positions in their firms (Table 5.10). Therefore, there is nothing to suggest bias or any abnormal patterns. Accordingly, no efforts were made to pursue those who did not declare their qualifications.

Table 5.9. Educational Level of the Respondents

Qualifications	Frequency	Valid Percent (%)
Bachelors degree	35	53.0
Masters degree	2	3.0
MBA	10	15.2
PhD	2	3.0
ACCA	7	10.6
FCA	17	25.8
FCMA	6	9.1
Other professional qualifications	15	22.7
At least one qualification	**61**	**92.4**
At least two qualifications	**29**	**43.9**
At least three qualifications	4	6.1
No qualifications	5	7.6
Total replied	66	90.4
Missing	7	9.6
Total	73	100

Table 5.10. Characteristics of Respondents with Undeclared Qualifications

Position in the company	Experience (in years)	Company type	Turnover(£)
FD	Undeclared	Head office	20-100 millions
FD	15	Head office	5-13 millions
CEO	7	Head office	20-100 millions
FD	20	Business unit	100-400 millions
FD	10	Business unit	20-100 millions
MD	1	Stand-alone	less than 2 million
MD	4	Business unit	2-5 millions

5.8.4. Firm status and size

Companies involved in this research are of three main types by status (Table 5.11) and cover a wide variety of sizes ranging from under £2 millions to over £800 millions (Table 5.12) while number of employees ranges from 10 to over 6,000 (FAME, accessed on 26, 09, 2005).

The large number of investment projects undertaken by each firm is one of the main characteristics of this sample. The average number of projects undertaken by these companies annually is over 15 projects, with more than 73% of these companies undertaking at least four projects per year (Table 5.13). The number of projects was considered more appropriate than the value of investments to express the investment activity since this shows the frequency of the IAP and how often the SIDs are made, also it may reflect the company's attitudes towards risk (whether to have a portfolio of investments to diversify the risk). Moreover, it indicates the company policy in terms of business growth.

Table 5.11. Responding Firms' Status

Firm status	Frequency	Percent (%)
Head Office	20	27.4
Business Unit	25	34.2
Stand-alone	27	37.0
Other	1	1.4
Total	**73**	**100.0**

Table 5.12. Responding Firms' Size by Turnover in 2005

Responding firms' size by turnover in 2005	Frequency	Percent (%)
< £2 M	10	13.7
£2 to < £5 M	6	8.2
£5 to < £13 M	11	15.1
£13 to < £20 M	12	16.4
£20 to < £100 M	23	31.5
£100 to < £400 M	8	11.0
£400 to < £800 M	1	1.4
> £800 M	2	2.7
Total	**73**	**100.0**

Table 5.13. Investment Activity of the Sample Firms During 2005

Number of investments undertaken per year	Frequency	Valid Percent (%)	Cumulative Percent (%)
100	4	5.6	5.6
65	1	1.4	7.0
50	3	4.2	11.3
40	1	1.4	12.7
30	2	2.8	15.5
20	5	7.0	22.5
18	1	1.4	23.9
10	8	11.3	35.2
8	1	1.4	36.6
6	6	8.5	45.1
5	7	9.9	54.9
4	13	18.3	**73.2**
3	8	11.3	84.5
2	7	9.9	94.4
1	4	5.6	100.0
Total	**71**	**100.0**	
Missing	**2**		
Total	**73**		
Mean	**15.30**		

Based on the preceding characteristics of the samples, it can be concluded that responses represent a good cross-section of the BACMs, as they covered a wide range of companies, and the questionnaires were typically completed by well-experienced, well-educated and qualified people working at senior levels in the companies and with reliable knowledge about the IAP. The very large companies have some of the biggest budgets for capital expenditure in the UK with more than 100 projects per year.

5.9. Financial appraisal techniques in the IAP

5.9.1. Prevalence of investment appraisal techniques

The respondents were asked to rank the four main investment appraisal techniques (PB, IRR, NPV and ROCE) on a scale from 1 (low usage) to 4 (high usage) in the IAP, a blank box corresponding to any technique meant that this technique is not in use by the responding company. The results are presented in Table 5.14.

Table 5.14. Incidence of Financial Appraisal Techniques

Techniques	Level of usage	Incidence	Valid percentage (%)	Cumulative percentage (%)
PB	High usage(4)	34	47.2	47.2
	Moderate usage(3)	16	22.2	**69.4**
IRR	High usage(4)	9	12.5	12.5
	Moderate usage(3)	14	19.4	**31.9**
NPV	High usage(4)	12	16.7	16.7
	Moderate usage(3)	7	9.7	**26.4**
ROCE	High usage(4)	22	30.6	30.6
	Moderate usage(3)	19	26.4	**56.9**

As can be seen, the predominance of the Payback period technique over other techniques is evident with 69.4% of the surveyed companies using this technique on a frequent basis. It is used by 22% (69.4 / 56.9 = 1.22) more companies than Return on Capital Employed (ROCE), the second most popular method. Despite the theoretical superiority of DCF techniques, they came third and fourth in the ranking with 31.9% and 26.4% respectively. These results are similar to those reported by Lefly's (1994) study of large UK manufacturing firms where the PB technique was used by 94% of the companies while only 69% used either IRR or NPV. This might suggest fewer tendencies towards sophisticated DCF techniques by firms.

To test whether the ranking of the financial appraisal techniques is significant, a Friedman two-way analysis of variance test was carried out. The results indicate the same ordering, as in the preceding table, and the differences in ranking are very significant as shown in Table 5.15:

Table 5.15. Friedman Test Results for Financial Appraisal Techniques Usage

The Financial Techniques	Mean Rank
PB usage	3.00
IRR usage	2.22
NPV usage	2.07
ROCE usage	2.72
Test statistics	
N	72
Chi-Square	27.610
df	3
Asymp. Sig.	.000

As can be seen, a statistically significant difference (at the 95% confidence interval) is found in the frequency of usage of the financial techniques among the companies involved in this study. The least usage of DCF techniques, in practice, could not be ascribed to the difficulty or complexity of the relevant calculations since 92.4% of respondents have at least an academic and / or professional qualification. However, this could be due to the market pressure for good performance expressed in terms of short capital cycle and need to present impressive results (profits) to shareholders.

A comparison of the results of this study with previous studies (Table 2.2, Chapter 2) confirms the popularity of the Payback method and the tendency by the companies to use more than one financial technique. However, and unlike earlier studies, this study reports a lower use of DCF techniques and a higher use of ROCE. This could be due to small firm bias in this industry if compared with very large firms involved in previous studies.

5.9.2. Financial techniques and firm size

To explore the general propensity of the use of the financial techniques among companies of different sizes, a Kruskal-Wallis test was conducted (Table 5.16). When comparing the mean ranks, it appears that the use of the financial techniques varies depending on company size. While the use of PB and IRR increases with increased company size, small companies increasingly use NPV. Most companies make use of the ROCE technique.

However, this variation seems to be insignificant (at the 95% confidence interval). Therefore, it could be argued that no strong evidence exists to link the "size factor" to the use of any specific financial technique. This contradicts the findings of other studies (Pike 1975-1992, Arnold & Hatzopoulos 2000, and Drury & Tayles 1997) where a link is established between the use of DCF techniques and large firms. Particularly, the use of NPV by those firms (in this study) is low if compared with IRR and PB.

This study shows similar findings to those of Sangster (1993) in relation to the lower usage of ROCE by large firms compared with smaller firms. Similar results to Arnold & Hatzopoulos (2000) are found in relation to the small companies where they use DCF techniques most frequently, especially NPV. A comparison between the findings of this study and previous

studies regarding the use of investment appraisal techniques is presented in Table 5.17. However, it is worth indicating that the results of this study are not directly comparable with the others since the samples surveyed in each study come from different populations and different definitions of firm size. For example, Pike (1996) surveyed the largest UK companies according to market capitalization, Abdel-Kader & Dugdale (1998) used the FAME database, and Arnold & Hatzopoulos (2000) used capital employed of companies from the Times 1000.

Table 5.16. Results of the Kruskal-Wallis one-way ANOVA for Investment Appraisal Techniques Usage within Different-Sized Companies

Company turnover	N	Mean Rank (PB)	Mean Rank (IRR)	Mean Rank (NPV)	Mean Rank (ROCE)
< £2 M	9	29.22	33.06	34.67	37.56
£2 to < £20 M	29	38.31	36.40	39.28	35.50
£20 to < £100 M	23	36.00	35.46	34.80	40.13
> £100 M	11	38.73	41.77	34.23	30.68
Total	72				
Chi-Square		1.646	1.057	.925	1.728
df		3	3	3	3
Asymp. Sig.		.649	.787	.819	.631

Table 5.17. Comparison between the Findings of this Study and Previous Studies Regarding the use of Financial Techniques

Author	Date	Firms involved	Findings
Pike	Longitudinal survey between 1975-1992	100 large firms	-Substantial increase in the use of discounted cash flow techniques and risk appraisal techniques. - Tendency by the firms to use a combination of four different methods (PB,ROI,IRR,NPV)
McIntyre and Coulthurst	1986	141 small and medium firms	- Increased use of DCF but not at the expense of PB which continued to gain support.
Sangster	1993	Small and large Scottish companies	- PB is the most popular method, then IRR. - The use of more than one method. - Less usage of ARR. - The use of more sophisticated discounted cash flow techniques is high.
Drury and Tayles	1997	866 firms (small and large firms)	- DCF techniques are used far more extensively by the larger organisations. - 90% of the larger and 35% of the smaller organisations "often" or "always" used either net present value (NPV) or internal rate of return (IRR) discounting methods.
Carr and Tomkins	1998	71 vehicle component manufacturers based in Britain, USA, Germany and Japan.	- Longer-term strategic orientation of German and Japanese companies and Anglo-American short-termism. - The short-term orientation in Britain and USA companies reflects a preponderance of strong financial control style. - Amongst the UK firms, the most significant financial measure in the investment appraisal process is PB then ROC then DCF techniques.
Arnold and Hatzopoulos	2000	300 firms (100 small, 100 medium, 100 large)	- Reduction in the use of PB but remains at a high level. - All large firms use either IRR or NPV. - Most of small and medium sized firm use IRR or NPV - Most firms are using three or more methods.
This study	2007	353 companies	- PB and ROCE are the most prevalent financial techniques. - High usage of the PB and IRR among large firms. - The use of more than one technique. - NPV and ROCE are the most prevalent techniques among small companies. - Medium companies tend to make comparable use of all the techniques. - Increased popularity of the ROCE but not at the expense of the PB which maintains high usage.

5.9.3. Financial appraisal techniques and projects with growth options

Table 5.14 showed that PB and ROCE are the most prevalent financial techniques with 69.4% and 56.9% of surveyed companies making use of these techniques in the IAP in general. Likewise, the same techniques are the most important ones among the financial techniques when assessing proposed investments with growth options. "Not important" or "slightly important" add up to under 20% for each of PB and ROCE, compared with 50% and 60% for IRR and NPV respectively as shown in Table 5.18.

These results are similar to those reported by Carr & Tomkins in 1996 when they found that traditional payback is considered as the financial measure of prime importance in the evaluation of strategic investment for 69% of UK automotive companies. The second most significant financial measure was return on capital for the project, ranked as the primary measure by 19% of UK automotive companies. Only 12% of UK automotive companies regarded DCF as the key financial measure when assessing these strategic investments.

Table 5.18. Importance of Financial Techniques in Assessing Investments with Growth Options

The level of importance	PB		ROCE		IRR		NPV	
	Frequency	Valid Percent	Frequency	Valid Percent	Frequency	Valid Percent	Frequency	Valid Percent
Not important	5	**7.0**	7	**10.0**	18	**25.7**	23	**32.9**
Slightly important	9	**12.7**	6	**8.6**	17	**24.3**	19	**27.1**
Moderate important	16	22.5	23	32.9	17	24.3	12	17.1
Important	19	26.8	25	35.7	11	15.7	10	14.3
Extremely important	22	31.0	9	12.9	7	10.0	6	8.6
Total	71	100.0	70	100.0	70	100.0	70	100.0
Missing	2		3		3		3	
Total	73		73		73		73	

5.10. The prevalence of risk techniques in the IAP

Using risk techniques is considered to be an essential way to take account of risk and assess its effects on the projected cash flows. The respondents were asked to tick the risk techniques they use in the IAP. The most popular techniques, in descending order, are conservative cash flow forecasts, sensitivity analysis, shorter payback period, and raised required rate of return (Table 5.19). The low percentage given to sophisticated techniques (*i.e.* simulation, CAPM, and certainty equivalents) implied a tendency toward employing less sophisticated techniques.

Table 5.19. Reported Usage of Risk Techniques

Risk techniques	Frequency	Valid Percent
Simulation	12	16.9
CAPM	3	4.2
Probability Analysis	18	25.4
Sensitivity Analysis	34	47.9
Certainty Equivalents	2	2.8
Conservative Cash Flow Forecasts	47	66.2
Shorter Payback Period	29	40.8
Raised Required Rate of Return	23	32.4

While these results are similar to those reached in previous studies (see Chapter 2, 2.6) in terms of frequency and sophistication, they showed an emergent propensity in this respect. This is demonstrated in the use of more than one risk technique (Table 5.20). This emergent tendency could be due to diverse criteria to be met together before acceptance. Therefore, a combination of three risk techniques (*i.e.* conservative cash flow forecasts, shorter payback period, and raised required rate of return) in order to be checked against the appraisal criteria (the minimum required payback, minimum projected cash flows, and required ROCE).

Table 5.20. The Intensity of the Use of Risk Techniques

	Frequency	Valid Percent
At least one risk technique	64	90.1
At least two risk techniques	48	67.6
At least three risk techniques	33	46.5
At least four risk techniques	16	22.5
At least five risk techniques	6	8.5

5.11. The strategic approach in the IAP

This strategic approach represents the combination of MJ factors and the ROA in the IAP. The argument is that the growth options embedded in the investment proposals will trigger the application of MJ in the IAP. This is based on the strong link established in the literature between MJ factors and the ROA (see section 2.7.1). Therefore, the deployment of MJ factors for such projects will make firms more prepared to override the financial techniques (which are criticized for the failure to accommodate growth options in the IAP and consequently exclude projects with growth options from the IAP) and increase the chances of approval for such projects. This will allow firms to buy the right to invest (ROA definition in section 2.7.1) in the opportunity and initiate full adoption of the ROA (modeling, valuing, and exercising the options).

In the process of implementing the strategic projects (projects with growth options), firms tend to use RO factors. For example, once a firm spots a growth opportunity (*i.e.* new plant abroad, expanding the production capacity, *etc*...), it might decide to postpone the investment decision to a later date (option 1) until the incoming information resolves part of the uncertainty. Then, depending on the information that becomes available, it might decide to carry on the investment (option 2) or contract part of it (option 3) or sell off part of it (option 4) and focus on a few options that emerge and are thought to be attractive to the firm. Therefore, the RO factors are actions taken to initiate and capture the growth option.

Projects with growth options are strategic in nature as they are implemented over a long period, their benefits are realized in the long-term, involve high business risk, and require a substantial amount of money. It is worth noting that by exercising one of the RO factors, the firm cannot capture the whole opportunity. It is a series of continuous actions where the firm might change course in the future in order to exploit the growth options.

5.11.1. The incidence of the ROA

Before exploring the link between MJ factors and the ROA, the actual adoption of the ROA in the IAP is checked. The respondents were asked whether they had adopted the ROA in their IAP and when. The aim was to test the formal use of this approach. Data analysis suggests that the ROA has apparently not been adopted formally in the IAP by any of these firms (Table 5.21).

Table 5.21. Formal Adoption of the ROA

	Frequency	Percent (%)
Respondents replied with "No"	36	49.3
Respondents did not reply (blank box)	37	50.7
Total	73	100.0

This table shows that 49.3% of responding companies did not use ROA formally in the IAP and 50.7% of them did not answer the question (left blank). This might mean that this concept is new to them. Even among those who answered "no", it could be the case that they do not know what it is. Therefore, part of their answer could mean also it is new to them but they say "no" as they do not know what it means. This result is consistent with the result of survey published in the Economist 1999 where only 4 out of 100 British firms had ever even heard about real options approach. These results show that the ROA is still largely unknown by British firms. Since the sample members showed very little formal knowledge about ROA, this meant that this approach is still at a very early stage of recognition in this industry.

There is no evidence to suggest that the characteristics of the sample members affect the answers to this question. Both "no" or "no answer" results came from a variety of people in different positions with diverse qualifications and characteristics and in comparable numbers (Appendix 7).

5.11.2. MJ factors and projects with growth options

As there is no formal adoption of the ROA in the IAP, as explained in previous paragraph (5.11.1) it is important to test the extent to which the growth options embedded in a project will trigger the deployment of MJ factors and facilitate the ROA adoption. So, based on the strong link between MJ factors and the ROA (2.7.1), firms who show a high level of MJ deployment in the IAP for projects with growth options are expected to be more ROA-orientated (ability to buy the right to invest in growth option) than those who showed low level of MJ deployment in the IAP for projects with growth options. To explore the role of the MJ factors (Past Experience and Intuition & Own Judgement) in assessing investments with growth options, respondents were asked to express their opinion about the importance of these factors on a scale from 1 "not important" to 5 "extremely important". The results are shown in Table (5.22)

Table 5.22. Importance of MJ Factors in Assessing Investments with Growth Options

The level of importance	MJ Factors			
	Past Experience		Intuition & Own Judgement	
	Frequency	Valid Percent	Frequency	Valid Percent
Not important	3	4.2	2	2.8
Slightly important	7	9.7	12	16.7
Moderate important	13	18.1	14	19.4
Important	**27**	**37.5**	**27**	**37.5**
Extremely important	**22**	**30.6**	**17**	**23.6**
Total	72	100.0	72	100.0
Missing	1		1	
Total	73		73	

The high importance of these two factors is clear, with "important" and "extremely important" adding up to 68.1% and 61.1% for past experience and intuition & own judgement respectively. Furthermore, these factors are of great importance for such investments when compared to the importance of PB and ROCE for the same types of investments (Table 5.18).

While this represents the general attitudes of the sample members towards MJ factors, these attitudes became clearer when comparing study groups. A clear distinction can be made between Managerially Judgement-Orientated firms (MJOs) and Non-Managerially

Judgement- Orientated firms (NMJOs) in their views towards these factors. These factors are perceived to be far more important by MJOs than NMJOs (Appendix 8).

5.12. Hypotheses testing

5.12.1. Research variables

In order to assess the validity of the research hypotheses, it was necessary to develop measures of the constituent concepts. This process is often referred to as operationalisation which was demonstrated in detail in Chapter 3. Since the ROA has not been adopted formally in the IAP by these firms (section 5.11.1), and given the strong link established in the literature between MJ factors and the ROA (section 2.7.1), an attempt is made to explore the extent to which these firms are prepared to consider the ROA in the IAP and the role of MJ factors in this respect. In other words, the extent to which they are prepared to buy the right to invest in a growth option (ROA definition as explained at the end of section 2.7.1). This is scrutinized through asking the respondents to express the extent to which they use MJ factors (past experience, intuition and own judgement) when assessing investments with growth options on a scale ranging from 1 (never) to 4 (always). This formed the dependent variable in this study (**Managerial Judgement**). Based on the responses received, there are four levels of prospective adoption as shown in Table (5.23).

Table 5.23. Level of MJ deployment amongst Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	2.7	2.8	2.8
	Rarely	24	32.9	33.3	36.1
	Frequently	37	50.7	51.4	87.5
	Always	9	12.3	12.5	100.0
	Total	72	98.6	100.0	
Missing		1	1.4		
Total		73	100.0		

Since there are small numbers in the first and last groups, each was combined with its adjacent group that implies a similar attitude. Therefore, groups 1 and 2 (never and rarely) were combined to form one group (Non-Managerially Judgement Orientated, NMJOs) and groups 3 and 4 (frequently and always) were combined to form the opposite group

(Managerially Judgement Orientated, MJOs). Such a combination of adjacent groups that shows similar attitudes has been used in similar studies. For example, Graham & Harvey (2001) reported that about a third of the CFOs in their 2001 survey said they "always" or "almost always" use real options when evaluating new investments. Ryan & Ryan (2002) reported that around 10-15% of surveyed companies using real options techniques "always" or "often". Consequently, this variable was transformed from an ordinal to a dichotomous (nominal variable) as shown in Table 5.24. Given that these two groups are not equivalent, the appropriate test statistics (one sample chi-square) was carried out to check whether these two groups are equivalent or not in the population*. The results showed that these two groups are not equivalent in the population and there is a significant difference between the two groups in the population. [Chi-Square value = 5.55, df =1, Asymp. Sig. = 0.018].

Table 5.24. Level of MJ deployment

		Frequency	Percent
Valid	NMJOs	26	35.6
	MJOs	46	63.0
	Total	72	98.6
Missing		1	1.4
Total		73	100.0

It appears to be that there is a tendency to use MJ factors for projects with growth options amongst the respondents. Some respondents are using MJ factors in the IAP. Therefore, as explained before, respondents who showed a high level of MJ involvement regarding appraising projects with growth options are labelled Managerially Judgement-Orientated (MJOs), those who showed a low level of MJ involvement are labelled Non-Managerially Judgement-Orientated (NMJOs). This distinction is essential to explore the relationship between MJ and the ROA because a high level of MJ means firms are prepared to undertake projects with growth options regardless of their immediate cash flows (financial returns) and are prepared to override the financial techniques and rely on MJ factors. Subsequently, MJOs firms are more likely to buy the right to invest in the investment opportunity (growth option) and adopt the ROA to capture this opportunity more than NMJOs.

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* When conducting the test, the assumption was that all categories are equal in the population. This assumption was rejected as the significance level is less than 0.05.

A variety of independent variables were developed to translate and measure the concepts that are thought to influence MJ. These concepts are:

- **Real options factors** (staging, timing, flexible capacity, and technical importance) the respondents were asked to express their attitudes towards the importance of these factors in the IAP and difficulties associated with considering them in the IAP.

- **Financial analysis:** this involves the main four investment appraisal techniques (PB, ROCE, NPV and IRR). The respondents were asked to express their attitudes towards the validity of these techniques for assessing strategic projects (with growth options), risky projects, and short-term projects.

- **Risk associated with the proposed project** (high, medium and low), the respondents were asked to express their attitudes towards the influence that the level of risk might have on the use of the financial techniques and MJ factors in the IAP.

- **Company size** (turnover Figure in 2005) the respondents were asked to give the company turnover in 2005.

These concepts were operationalized by selecting indicators (constructs) for each concept (Chapter 3, Table 3.5). Each indicator entails a statement in relation to which respondents had to answer (Bryman & Cramer 2005). This is done by asking the respondents to express the extent to which s/he agrees with the statement on a scale specified in the questionnaire. A 5-point Likert scale ranging from 1 (strongly disagree, or not important) to 5 (strongly agree, or extremely important) was used for all these independent variables (based on the aim of the question whether a level of agreement with the statement or of importance of the factor), except the turnover variable where an ordinal scale was used (Appendix 1: the questionnaire).

5.12.2. Testing Hypotheses 1, 2 and 3

These three hypotheses (listed below) are postulated to confirm whether the growth options embedded within the proposed project influence the deployment of MJ as opposed to financial techniques in the IAP and thus the SIDs.

H1: Companies rely more on MJ factors for assessing strategic investments with future growth options than on financial techniques.

H2: Financial appraisal techniques are applied to investment proposals regardless of the growth options embedded within them.

H3: More emphasis is placed on financial appraisal techniques than on MJ factors for assessing investments with no or few growth options.

- **Testing the reliability of the scale**

Ahead of testing the hypotheses, the reliability of the measures needs to be examined. The reliability of a measure refers to its consistency. External reliability refers to the degree of consistency of a measure over time (Bryman & Cramer 2005). On the other hand, internal reliability raises the question of whether the items that make up the scale are internally consistent (*ibid*). This can be done through SPSS: split-half reliability, a correlation coefficient is generated, and the nearer the value to 1- and preferably 0.8 or more- the more internally reliable is the scale (*ibid*).

The widely-used Cronbach's Alpha essentially calculates the average of all possible split-half reliability coefficients. Therefore, the reliability test was carried out for the scale that measures the importance of MJ factors: past experience and intuition and own judgement in assessing investments with growth options. The results are shown in Table (5.25).

Table 5.25. Reliability Test of the Measure of the Importance of MJ Factors in Assessing Investments with Growth Options

Reliability Statistics

Cronbach's Alpha	N of Items
.860	**2**

The high values of the Cronbach's Alpha reflect the reliability of the scale used.

- **Testing the hypotheses**

To test these three hypotheses, respondents were asked to express the importance of financial appraisal techniques and MJ factors when assessing investments with growth options on a scale ranging from (1) not important to (5) extremely important. By testing these hypotheses, it is expected that MJOs would be more ROA-orientated and strategically-orientated than NMJOs and less financially-orientated than NMJOs and *vice versa*. The central tendency measures and spread measure are calculated for each technique / factor within each group (Appendix 9). As can be seen from the central tendency tables, it is clear that MJOs have scored higher on both MJ factors and PB than their counterparts (NMJOs) whereas, the opposite happened in relation to ROCE, IRR and NPV (financial techniques) where NMJOs scored higher. In fact, looking at the Median and the Mode values reveals that MJOs rely less on DCF techniques which are essential for NMJOs. The big difference of the group means occurs in relation to IRR (3.31- 2.18 = 1.13) and NPV (3.15- 1.93 = 1.22). This reflects the relative importance of DCF techniques to NMJOs compared with MJOs. The cut-off value is 3 (midpoint of the scale), *i.e.* "moderately important". The standard deviations for these variables are slightly higher for one group or another, but not greatly so.

Since there are only two groups [dependent variable as explained in section 5.12.1], the Mann-Whitney test was carried out for the importance of financial techniques and MJ factors for projects with growth options within the two groups. The results are shown in Tables 5.26 and 5.27.

The high mean rank of MJ factors (Past Experience, Intuition & Own Judgement) for projects with growth options among MJOs indicates that they are crucial in assessing these types of projects. More importantly, the big difference between mean ranks of these two variables (Past Experience, Intuition & Own Judgement) among these two groups is very significant at the 0.95% confidence interval with a significance level well under 0.05 (Table 5.27). This means that growth options embedded in the proposed projects influence MJ involvement in the IAP and SIDs. This supports H1.

Table 5.26. Results of the Mann-Whitney Test for Appraisal Techniques and MJ Factors within two Groups

Ranks

	MJ	N	Mean Rank
The importance of PB in assessing investments with Growth Options	NMJOs	26	**29.63**
	MJOs	45	**39.68**
	Total	71	
The importance of ROCE in assessing investments with Growth Options	NMJOs	26	**35.58**
	MJOs	44	**35.45**
	Total	70	
The importance of IRR in assessing investments with Growth Options	NMJOs	26	**46.13**
	MJOs	44	**29.22**
	Total	70	
The importance of NPV in assessing investments with Growth Options	NMJOs	26	**46.90**
	MJOs	44	**28.76**
	Total	70	
The importance of Past Experience in assessing investments with Growth Options	NMJOs	26	**28.87**
	MJOs	46	**40.82**
	Total	72	
The importance of Intuition & Own Judgement in assessing investments with Growth Options	NMJOs	26	**24.23**
	MJOs	46	**43.43**
	Total	72	

However, this is not at the expense of financial techniques. PB technique is very important for such projects among MJOs than NMJOs. The difference between mean ranks of these two groups on this variable (PB) is very significant (0.041) with confidence interval 95%. Both groups rely comparably on ROCE. In brief, this means two financial techniques (PB and ROCE) are reported to be important for this kind of project. This gives support to H2.

Companies that do not apply MJ factors (NMJOs) rely mainly on two financial techniques (IRR and NPV), and to some extent, on ROCE. The high mean ranks of these techniques in this group (46.13, 46.90, 35.58) respectively compared with the corresponding values for MJOs (29.22, 28.76, 35.45) indicates the tendency of these companies (NMJOs) towards relying on financial techniques (except in the case of PB where the NMJOs group have a lower mean rank compared with MJOs). The difference between mean ranks of these two groups on these two variables (IRR & NPV) is very significant (0.001 & 0.000) with a

confidence interval of 95%. This is confirmed by low mean ranks for this group (NMJOs) given to MJ factors.

Moreover, the mean ranks for MJOs on the financial techniques are lower than those on MJ factors. This suggests that they use the financial techniques for projects with low growth options (low risk) since they can predict the cash flows with a higher degree of certainty. This supports H3.

The significance value for the Mann-Whitney test gives the two-tailed probability that the magnitude of the test statistic is a chance result (Field 2000). As there are no predictions (directional hypotheses), a two-tailed probability was used. The significance level of all the differences in the mean ranks is less than 0.05 except for the case of ROCE, where both groups rely similarly on this technique.

Table 5.27. Significance Levels of the Mann-Whitney Test Results for Appraisal Techniques and MJ Factors within two Groups

Test Statistics (a)

	Asymp. Sig. (2-tailed)
The importance of PB in assessing investments with Growth Options	**.041**
The importance of ROCE in assessing investments with Growth Options	.980
The importance of IRR in assessing investments with Growth Options	**.001**
The importance of NPV in assessing investments with Growth Options	**.000**
The importance of Past Experience in assessing investments with Growth Options	**.015**
The importance of Intuition & Own Judgement in assessing investments with Growth Options	**.000**

a Grouping Variable: MJ

5.12.3. Testing Hypothesis 4

H4: ROA factors will explain the variation in the application of MJ for investments with growth options.

The aim of this hypothesis is to test whether the deployment of MJ for projects with growth options is associated with the recognition of the ROA factors in the IAP. Respondents were asked to express their attitudes towards the importance of these ROA factors on a scale ranging from (1) "strongly disagree" to (5) "strongly agree". By testing this hypothesis it is expected that MJOs would score higher than NMJOs. To test this hypothesis, the Mann-Whitney Test was applied for each of these factors as shown in the following Tables 5.28 and 5.29.

Table 5.28. Results of the Mann-Whitney Test for the Importance of the ROA Factors within two Groups

Ranks

	MJ	N	Mean Rank
Staging	NMJOs	26	35.67
	MJOs	46	36.97
	Total	72	
Timing	NMJOs	26	33.83
	MJOs	46	38.01
	Total	72	
Flexible capacity	NMJOs	26	36.62
	MJOs	46	36.43
	Total	72	
Technical importance	NMJOs	26	33.08
	MJOs	46	38.43
	Total	72	

Table 5.29. Significance Levels of the Mann-Whitney Test Results for the Importance of the ROA Factors within two Groups

Test Statistics (a)

	Asymp. Sig. (2-tailed)
Staging	.785
Timing	.341
Flexible capacity	.971
Technical importance	.266

a Grouping Variable: MJ

The results show there is a comparable mean rank for each factor expressed by members of these two groups (MJOs and NMJOs). The small differences between the mean ranks are not significant (Table 5.29). This means that both groups realise the importance of these factors. However, realising these factors is not sufficient to trigger the application of MJ for projects with growth options and buying the right to invest in the growth option. In other words, the deployment of MJ factors in the IAP is not solely reliant on recognising these factors. There is no evidence to support H4.

It appears that there are other factors that influence the use of MJ factors in the IAP. Those factors could be the availability of resources and flexibility of the decision-making process itself. This involves difficulty of convincing members of the board, the number of people involved in the SIDs process, (for example in a small company, the owner makes a decision and few other people are consulted). On the contrary, in big companies, there are many directors with conflicting ideas and opinions.

5.12.4. Testing Hypothesis 5

H5: Investments with growth options are difficult to justify because of the complexity of quantifying the ROA factors.

This hypothesis aimed at exploring the extent to which the difficulties associated with valuing the ROA factors impact on the investment decision regarding projects with growth options. By testing this hypothesis, the expectations are that difficulties in quantifying the ROA factors might lessen the chance of MJ involvement in the SIDs and consequently, exclude such strategic projects from the IAP. Respondents were asked to express their attitudes towards the

effects of difficulties of quantifying the ROA factors and backing the decision to invest in risky projects on a scale ranging from (1) "strongly disagree" to (5) "strongly agree".

Statistical results show that most companies (53.4%) acknowledge the difficulty in quantifying the ROA factors. Similarly, 46.6% of surveyed companies acknowledge also the complexity of supporting the decision in relation to projects with growth options (*i.e.* convincing others about the profitability of such projects and justifying them).

Table 5.30. Attitudes Towards Quantifying ROA Factors

The statement	Level of agreement with the statement	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
ROA factors are difficult to quantify.	Strongly agree	5	6.8	6.8	6.8
	Agree	34	46.6	46.6	53.4
	Disagree	17	23.3	23.3	
Difficulty of supporting the decision relates to projects with growth options.	Strongly agree	7	9.6	9.6	9.6
	Agree	27	37.0	37.0	46.6
	Disagree	15	20.5	20.5	
	Strongly disagree	3	4.1	4.1	

The Mann-Whitney test was applied to explore whether the difficulty of quantifying ROA factors and the difficulty of supporting the decision in relation to projects with growth options influences the accept / reject decision.

Table 5.31. Mann-Whitney Test in Relation to Quantifying ROA Factors

Ranks

	Real options adoption	N	Mean Rank
ROA factors are difficult to quantify	NMJOs	26	38.12
	MJOs	46	35.59
	Total	72	
Difficulty of supporting the decision relates to projects with growth options.	NMJOs	26	33.29
	MJOs	46	38.32
	Total	72	

Table 5.32. Significance Levels of the Mann-Whitney Test in Relation to Quantifying ROA Factors

Test Statistics (a)

	Asymp. Sig. (2-tailed)
Strategic benefits are difficult to quantify	.599
Difficulty of supporting the decision relates to projects with growth options.	.307

a Grouping Variable: MJ

The results show there are no significant differences between these two groups of MJ on both factors. Therefore, the difficulties associated with quantifying the ROA factors and enhancing the decision for strategic projects are not major obstacles for the NMJOs to undertake strategic projects. There is no evidence to support H5.

5.12.5. Testing Hypothesis 6

H6: The use of MJ factors increases with the level of risk of the investment project being evaluated.

As we saw from the literature, risk is claimed to be an essential condition for the adoption of the ROA. By testing this hypothesis, it is expected to find a significant correlation between risk and MJ factors given the strong link established between MJ factors and the ROA as explained in 2.7.1.

To test this hypothesis, respondents were asked to express their attitudes towards the suitability of MJ factors in assessing risky projects on a scale ranging from (1) "strongly disagree" to (5) "strongly agree".

The reliability of the scale used was examined to check whether these two variables are measured correctly on this scale (consistency test). The results (Table 5.33) show that the scale used is reliable (Cronbach's Alpha is .828).

Table 5.33. Reliability Test of the Measure of MJ Factors in Assessing Risky Projects

Reliability Statistics

Cronbach's Alpha	N of Items
.828	2

The descriptive statistics of the responses received (Table 5.34) show that directors in the majority of the companies view MJ factors (past experience, intuition and own judgement) as crucial factors for assessing risky projects with (82.2%, 78.1%) respectively. The mean values and standard deviation values for both factors indicate a high level of agreement with the statement.

Table 5.34. Attitudes towards the Validity of MJ Factors in Assessing High Risk Projects*

		Past experience as a criterion for risky projects	Intuition & Own judgement as criteria for risky projects
N	**Valid**	73	73
	Missing	0	0
Mean		3.97	3.99
Std. Deviation		.745	.790
Strongly agree (5)		15	18
Agree (4)		45	39
Cumulative Percent of both		82.2%	78.1%

*Based on a 5-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree".

To test the correlation between the use of MJ factors and the risk associated with the proposed investment, Spearman's rho test statistic and Kendall's tau-b could be applied as the variables are measured on an ordinal scale.

Both tests are non-parametric statistics, the former works by first ranking the data and then applying Pearson's equation, the latter is used when there is a small data set with a large number of tied ranks. Since Kendall's tau-b is more cautious and takes account of tied ranks it is adopted in this study. Furthermore, it is claimed that a more accurate generalisation can be drawn from Kendall's statistic than from Spearman's (Field 2000). While adopting Kendall's tau-b, Spearman's rho was also applied for checking purposes and showed similar results to those obtained by applying Kendall's tau-b.

As this is a directional hypothesis, a 1-tailed probability was applied to test the direction of the relationship. The results are shown in Tables 5.35 and 5.36.

Table 5.35. Correlation between the MJ Factor (Past Experience) and the Risk Associated with the Proposed Project

Correlations

			MJ	Past experience as a criterion for risky projects
Kendall's tau-b	**Past experience as criterion for risky projects**	Correlation Coefficient	.410(**)	1.000
		Sig. (1-tailed)	**.000**	.
		N	72	73
	MJ	Correlation Coefficient	1.000	.410(**)
		Sig. (1-tailed)	.	**.000**
		N	72	72
Spearman's rho	**Past experience as a criterion for risky projects**	Correlation Coefficient	.432(**)	1.000
		Sig. (1-tailed)	**.000**	.
		N	72	73
	MJ	Correlation Coefficient	1.000	.432(**)
		Sig. (1-tailed)	.	**.000**
		N	72	72

** Correlation is significant at the 0.01 level (1-tailed).

Table 5.36. Correlation between the MJ Factor (Intuition & Own Judgement) and the Risk Associated with the Proposed Project

Correlations

			MJ	Intuition & Own judgement as a criterion for risky projects
Kendall's tau-b	**MJ**	Correlation Coefficient	1.000	.507(**)
		Sig. (1-tailed)	.	**.000**
		N	72	72
	Intuition & Own judgement as criterion for risky projects	Correlation Coefficient	.507(**)	1.000
		Sig. (1-tailed)	**.000**	.
		N	72	73
Spearman's rho	**MJ**	Correlation Coefficient	1.000	.538(**)
		Sig. (1-tailed)	.	**.000**
		N	72	72
	Intuition & Own judgement as criterion for risky projects	Correlation Coefficient	.538(**)	1.000
		Sig. (1-tailed)	**.000**	.
		N	72	73

** Correlation is significant at the 0.01 level (1-tailed).

It can be concluded from the above tables that there is a strong correlation between MJ factors and the level of the risk associated with the proposed investment on both statistics (Spearman's rho test statistic and Kendall's tau test statistic). The positive correlation indicates that the increase (decrease) in one variable would lead to an increase (decrease) in another variable. Therefore, the riskier the project, the bigger is the chance for MJ to be considered in the IAP. Despite the significance of the correlation, the amount of the increase (decrease) is relatively small (correlation coefficient values are between .41 and .538).

5.12.6. Testing Hypothesis 7

H7: The deployment of MJ factors for assessing new investments will vary depending on the size of the firm.

By testing this hypothesis, a link could be established between firm size and MJ factors. Consequently, linking firm size to the potential adoption of the ROA since high MJ involvement implies high chance of adopting ROA (as explained in section 2.7.1). To explore whether there are mean differences between MJOs and NMJOs on the size variable, the Mann-Whitney test was applied. The results are presented in Tables 5.37 and 5.38

Table 5.37. Results of the Mann-Whitney Test Statistic Regarding MJ and Company Size

Ranks

	MJ	N	Mean Rank
Turnover in 2005	NMJOs	26	44.85
	MJOs	46	31.78
	Total	72	

Table 5.38. Significance Levels of the Mann-Whitney Test Regarding MJ and Company Size

Test Statistics (a)

	Company's Turnover in 2005
Asymp. Sig. (2-tailed)	.009

a Grouping Variable: MJ

From these tables, it can be seen that there is a difference in mean ranks value of groups of MJ on the company size variable. This difference is very significant with a significance level of 0.009, with confidence interval 95%. Large companies scored more highly on the NMJOs than small ones who scored high on the MJOs group (the NMJOs group is the group with the greater number of large companies and the MJOs is the group with greater number of small companies).

This means that small companies tend to apply MJ factors more than large ones. In other words, the smaller the company, the more likely it is to override financial techniques and make the SIDs on the basis of MJ. This means there is a difference between companies of different sizes in the form of MJ.

Since the Mann-Whitney test indicates that there are significant differences in the mean rank of groups, it is important to test whether these two variables (MJ and company size) are correlated. As these variables are ordinal, Kendall's tau-b and Spearman's rho tests were used. The results are shown in Table 5.39.

Table 5.39. Correlation between Company Size and MJ

Correlations

			MJ	Company's Turnover in 2005
Kendall's tau-b	**MJ**	Correlation Coefficient	1.000	-.274(**)
		Sig. (1-tailed)	.	**.005**
		N	72	72
	Company's Turnover in 2005	Correlation Coefficient	-.274(**)	1.000
		Sig. (1-tailed)	**.005**	.
		N	72	73
Spearman's rho	**MJ**	Correlation Coefficient	1.000	-.309(**)
		Sig. (1-tailed)	.	**.004**
		N	72	72
	Company's Turnover in 2005	Correlation Coefficient	-.309(**)	1.000
		Sig. (1-tailed)	**.004**	.
		N	72	73

** Correlation is significant at the 0.01 level (1-tailed).

It can be concluded from the low P-value in both tests (0.005 and 0.004 for Kendall's tau-b and Spearman's rho respectively) that there is a significant association between these two variables below the 0.01 level. More interestingly, the association is significant in both cases, (two-tailed) and (one-tailed). However, the relatively small value of the correlation coefficient indicates that a change in one variable will not contribute largely to a change in the other.

This analysis supports Hypothesis 7. Therefore, it can be concluded that the larger the company, the less likely it is for MJ factors to be adopted.

5.13. Further analysis of the hypotheses testing

Having tested the hypotheses, an attempt was made to explain the results obtained. It is thought important to explore why respondents responded differently, what are the motives behind propensity for adopting / not adopting MJ in the IAP, and how this impacts upon the ROA in the IAP. This is done by examining the respondents' attitudes and opinions in each group (MJOs and NMJOs) regarding the following issues: treatment of risk, financial techniques (mainly DCF, as it is viewed as superior to other financial techniques), business strategy (achieving and enhancing competitive advantage), and finance directors' vision. This allowed not only for a coherent link of the results obtained but also for the understanding of the respondents' behaviour in the IAP.

Based on the analysis of the respondents' perceptions towards these issues (Tables 5.40 and 5.41), it appeared that they hold different opinions that contributed to the preceding results.

While both groups (MJOs and NMJOs) consider business strategy achievement is the centre of the IAP, they use different approaches in validating the contribution of the proposed projects to this goal. Both expressed similar attitudes towards the importance of the alignment of the project's outcomes with business strategy and achieving competitive advantage (mean ranks for both groups on business strategy and competitive advantage as criteria being comparable without significant differences). However, NMJOs showed stronger attitudes of commitment towards financial analysis than MJOs in the IAP. In contrast to MJOs, NMJOs are less likely to override the financial techniques in the IAP. The difference in mean ranks of these two groups regarding this variable is significant with significance level of .058. This suggests that there are stronger attitudes among MJOs to ignore financial analysis than among NMJOs when they think that the growth options outweigh the financial shortfalls.

Table 5.40. Results of the Mann-Whitney Test for Underlying Motives for MJ within two Groups

Ranks

	MJ	N	Mean Rank
Business Environment Scanning	NMJOs	26	33.98
	MJOs	46	37.92
	Total	72	
DCF for assessing low risk projects	NMJOs	26	42.23
	MJOs	45	32.40
	Total	71	
High discount rate for high risky projects	NMJOs	26	39.96
	MJOs	45	33.71
	Total	71	
DCF commitment	NMJOs	26	40.96
	MJOs	45	33.13
	Total	71	
NPV as appraisal criterion	NMJOs	26	43.79
	MJOs	45	31.50
	Total	71	
Short term orientation	NMJOs	26	34.77
	MJOs	46	37.48
	Total	72	
DCF is biased against long-term projects	NMJOs	26	30.94
	MJOs	45	38.92
	Total	71	
DCF is biased against strategic investments	NMJOs	26	34.25
	MJOs	45	37.01
	Total	71	
Overriding financial analysis	NMJOs	26	31.12
	MJOs	46	39.54
	Total	72	
Competitive advantage as a criterion	NMJOs	26	34.63
	MJOs	46	37.55
	Total	72	
Business strategy as criterion	NMJOs	26	37.98
	MJOs	46	35.66
	Total	72	

Table 5.41. Significance levels of the Mann-Whitney Test Results in Relation to the Underlying Motives for MJ within two Groups

Test Statistics (a)

	Asymp. Sig. (2-tailed)
Business Environment Scanning	.401
DCF for assessing low risk projects	.041
High discount rate for high risky projects	.205
DCF Commitment	.113
NPV as appraisal criterion	**.011**
Short term orientation	.583
DCF is biased against long- term projects	.098
DCF is biased against strategic investments	.563
Overriding financial analysis	**.058**
Competitive advantage as a criterion	.527
Business strategy as criterion	.572

a Grouping Variable: MJ

The strong attitudes by the NMJOs towards the financial concept of the IAP are reflected in the criteria they employ in the SIDs making process. This group (NMJOs) showed a stronger commitment towards financial criteria in the SIDs making process than MJOs. Therefore, projects with a negative NPV have a greater chance of rejection by NMJOs than MJOs. The big difference in the mean ranks for both groups on this variable (NPV as appraisal criterion) is very significant (.011) with a confidence interval of 95%.

Despite the fact that both groups of respondents showed similar attitudes towards the importance of reviewing the business environment for investment opportunities and risk, they take account of risk differently in the IAP. NMJOs seem to rely heavily on the DCF techniques to accommodate the project's risk. They appear to apply these techniques for all projects regardless of the risk associated with them (as we saw in Table 5.26 and the discussion about H2 and H3). They apply DCF techniques not only for projects with low risk but also to projects with high risk (growth options) as shown in Table 5.26. On the contrary, MJOs showed fewer tendencies towards using DCF techniques for projects with low risk (they rely mainly on two financial techniques (PB and ROCE) as complementary techniques even for projects with growth options as explained in Table 5.26) and MJ factors for high risk projects. The difference in the mean ranks of these two groups on the variable relates to the

suitability of the DCF for assessing low risk projects is significant (.041) with a confidence interval of 95%.

Although MJOs appear to use DCF less frequently to integrate risk into the IAP, they expressed similar attitudes to those of NMJOs regarding using high discount rates for high risk projects. A comparison between the mean ranks of both groups on this variable reveals that NMJOs are more likely to apply a high discount rate for risky projects, and thus lessen the chances of the risky project being approved, than MJOs who showed fewer tendencies in this respect and seem to consider factors other than financial ones.

The recognition of the failure of DCF to accommodate the growth options associated with proposed projects by the MJOs seems to contribute to the preceding result. A comparison of the mean ranks of both groups of respondents on the suitability of DCF for long- term projects "DCF is biased against long-term projects" and for strategic investments "DCF is biased against strategic investments" showed that MJOs have strong attitudes towards not using DCF for such projects. This might contribute to the motive for MJ, whereas NMJOs expressed fewer tendencies in this concern, and think it is appropriate for all types of projects. Although the difference in the mean ranks in this regard is not significant in both cases (.098, .563), the low significance level (0.098) gives an indication about the general propensity and implies that taking more respondents might have helped in giving a clearer patterns.

Important to MJ is the extent of commitment to the financial analysis and managers' vision. It appears that MJOs are less committed to the financial outcomes from the projects than NMJOs. Comparing the mean ranks for both groups on this variable shows that NMJOs are more committed to the financial analysis (40.96 to 33.13 for MJOs) and tend to apply DCF for every new project. However, both show comparable attitudes regarding managers' short-term earning vision with MJOs expressing higher mean rank than NMJOs. While the difference in the mean rank for these two groups on these two variables is not significant, it indicates the profit and performance orientation of these firms.

The strong tendency by NMJOs towards a financial perception of the IAP could be ascribed to their attitudes towards risk. It seems that they are less likely to undertake risky projects and prefer to carry out projects whose financial outcomes are more secure. The perception of "risk aversion" seems to be prevalent amongst members of this group. This is reflected by the

extensive use of the risk techniques by this group compared with MJOs (Tables 5.42). The high mean rank of the intensity of the use of the risk techniques by NMJOs over MJOs (also significant differences in two occasions, Table 5.43) shows this uni-directional perception. Therefore, they (NMJOs) are more cautious about risk and prefer to undertake projects whose financial returns are more predictable.

In contrast to NMJOs, MJOs seem to perceive risk in a positive way. They tend to consider future opportunities that might be generated by risk alongside financial returns. So when MJ factors indicate that growth options outweigh the financial shortfalls, the chance of undertaking the project becomes high. This might justify the tendency of these group members towards using fewer risk techniques. It seems to be a form of "trading-off" the financial returns with risk in order to achieve the strategic "intangible" benefits. Therefore, they are more likely to undertake risky projects relying on MJ factors and fewer risk techniques.

Table 5.42. Results of the Mann-Whitney Test for the Intensity of the Risk Techniques within two Groups

Ranks

	MJ	N	Mean Rank
At least one risk technique	NMJOs	26	38.13
	MJOs	45	34.77
	Total	71	
At least two risk techniques	NMJOs	26	40.67
	MJOs	45	33.30
	Total	71	
At least three risk techniques	NMJOs	26	42.71
	MJOs	45	32.12
	Total	71	
At least four risk techniques	NMJOs	26	41.65
	MJOs	45	32.73
	Total	71	
At least five risk techniques	NMJOs	26	37.10
	MJOs	45	35.37
	Total	71	

Table5.43. Significance Levels of the Mann-Whitney Test Results in Relation to the Intensity of the Risk Techniques within two Groups

Test Statistics (a)

	Asymp. Sig. (2-tailed)
At least one risk technique	.200
At least two risk techniques	.074
At least three risk techniques	**.016**
At least four risk techniques	**.015**
At least five risk techniques	.480

a Grouping Variable: MJ

5.14. Summary

In this chapter, statistical analysis was conducted to explore the current usage of the capital budgeting techniques and MJ factors. The findings show some similar results to earlier studies in relation to the capital budgeting techniques. The popularity of the PB and the use of more than one technique are both confirmed in this research. However, and in contrast to previous studies, DCF techniques appear less popular and the higher usage of ROCE is evident.

A previous study (Pike 1982) found a link between the levels of the sophistication of the methods used related to company size, and also Mills & Herbert (1988) found that company size was a significant factor in the range and type of techniques used. No such relationship is found in this study. The main thrust of the findings of the statistical test comes in relation to the role of MJ factors in assessing a project with growth options and prompting the potential adoption of the ROA. The statistics show no formal adoption of the ROA. However, prospective adoption is suggested to be evident. The analysis shows that MJ factors are more important in assessing investments with growth options than financial techniques.

With regards to hypotheses testing (Table 5.44), two hypotheses were rejected (H4 and H5) and the remaining ones were supported (H1, H2, H3, H6, and H7).

Table 5.44. Hypotheses Testing Summary

Hypothesis	Rejected / Supported
H1: Companies rely more on MJ factors for assessing strategic investments with future growth options than on financial techniques.	**Supported**
H2: Financial appraisal techniques are applied to investment proposals regardless of the growth options embedded within them.	**Supported**
H3: More emphasis is placed on financial appraisal techniques than on MJ factors for assessing investments with no or few growth options.	**Supported**
H4: ROA factors will explain the variation in the application of the MJ for investments with growth options.	Rejected
H5: Investments with growth options are difficult to justify because of the complexity of quantifying the ROA factors.	Rejected
H6: The use of MJ factors increases with the level of risk of the investment project being evaluated.	**Supported**
H7: The deployment of MJ factors for assessing new investments will vary depending on the size of the firm.	**Supported**

There is evidence to suggest that companies tend to use financial techniques for all types of proposed projects, especially for projects with low growth options, while projects with growth options are assessed by MJ factors. ROA factors and the difficulties related to supporting the investment decision for risky projects seem to have little effect on MJ deployment in the IAP. There is a strong evidence to suggest the usage of MJ factors for risky projects and also their popularity among small companies compared with large ones. This appears to mean that small firms have a more intuitive attitude to project appraisal than large ones. While consolidating business strategy is considered as the goal of the IAP, NMJOs are more committed to the financial returns than MJOs in order to achieve this goal. This might be due to their different attitudes towards treatment of risk associated with the new investments.

Chapter 6

Empirical Evidence (2): Field work

6.1. Introduction

The statistical analysis in the previous chapter showed the popularity of the PayBack (PB) technique and revealed the typical use of more than one capital budgeting technique in the IAP. Companies tended to use appraisal techniques for all types of proposed projects. The importance of MJ factors over financial appraisal techniques in assessing investments with growth options and risky projects was also evident.

While statistical analysis represented the analytical part of the research, this chapter represents the exploratory part. This chapter presents information gathered from a range of interviewees who have a direct involvement in the IAP in their companies. Robson (2002) claims that *"such qualitative narrative account is important to enhance the interpretability of the statistical analysis."*.

As the research progressed from explanatory to exploratory, the focus remained on the same framework developed in Chapter 3, but with a different research strategy. In this stage of research, a selective sample instead of a random sample was used. The rationale for this purposive selection is the fact that fieldwork is concerned with the factors that prompt the deployment of MJ in the IAP. Therefore, it would be much more useful to focus upon companies that showed a variable level of MJ to shed more light on the role of MJ factors regarding assessing projects with growth options.

The purpose was to examine how a wide range of companies with diverse characteristics (Appendix 6) perceive study themes and the link between them (the developed framework in Chapter 3). This allowed the analysis of each theme across the interviewees in order to show the similarities and differences in the way interviewees perceived these themes and, hence, explore the motives behind each view expressed by the interviewees. While these insights are used to enhance the interpretability of the statistical results, it also contributed towards

depicting the IAP as a dynamic process (framework developed in Chapter 3) rather than a static one (fixed procedures to be followed).

6.2. Fieldwork: justifications and objectives

A field study methodology was chosen for this stage of the research in order to provide an in-depth understanding of the IAP and the extent to which MJ factors are considered, by managers, as elements of this process. In fact, it has been argued that the field study is a fruitful method to investigate issues associated with management control and the information-related behaviour of managers (Hopper *et al.* 1985, Birnberg *et al.* 1990). Moreover, it was assumed that more accurate and relevant data could be gathered using field research methods such as interviews than through surveys for two reasons:

First, amongst the purposes of this research is to explore a complex phenomenon within its natural setting and build a deeper understanding of it based on the findings of the fieldwork. This is exactly where field research has a comparative advantage over other research methods (Birnberg *et al.* 1990). It was believed that investigating the role of MJ and the ROA in the IAP is an area where field research can be fruitfully applied as the research seeks to explore and understand what lies behind a phenomenon about which little is yet known. According to the Economist (1999), only 4 out of 100 British firms had ever even heard about real options. Therefore, by entering into the natural setting, a great opportunity was created to collect rich data not merely about the IAP itself but also about actual SIDs and the contextual conditions in which they occur. This, in turn, allowed for gaining deeper understanding of management control practice.

The second reason is the dynamic status of the IAP suggested in the framework developed. The focus here is on the interaction between the elements of the IAP and how this interaction influences the SIDs.

Therefore, the objectives of this qualitative analysis can be outlined as:

1- Investigating current perceptions of the IAP, including perceived barriers in using MJ in the IAP.

2- Identifying perceptions of the optimal or ideal assessment process and criteria to be used.
3- Identifying current assessment criteria for the IAP.
4- Ascertaining perceptions of factors viewed as influential for MJ deployment in the IAP.

6.3. Selection of the companies for the field work

It has been claimed that because the aims of the interviews are to generate an in-depth analysis, issues of representativeness are less important in qualitative research than they are in quantitative research (Bryman 2001), even though all efforts were made to select a sample that reflects the diverse attitudes of the population. The sample was selected on the basis of the following considerations:

1- The purpose of the research: this research was conducted with the purpose of investigating the role of MJ and the ROA in the IAP among British Automotive Components Manufacturers. Therefore, companies with diverse characteristics were chosen in terms of size, status, geographical spread, international spread, and finance directors' experience as shown in Appendix 6. This created the opportunities to investigate the varied contexts within which the IAP is conducted and the factors that influence the deployment of MJ and the ROA in the IAP.

2- The results of the questionnaire analysis: Companies whose responses indicated different levels of MJ deployment were selected to give more insights about the assumptions underlying their views. This allowed a deeper understanding not only for the IAP but also of the decision-making process.

3- Firms' investment policy: since the objective of the research is to study how the growth options embedded within the programmed projects might influence the investment decision, firms with big investments (in terms of money spent and project size) were chosen. This selection criterion provided maximum opportunities for linking strategic opportunities to investment appraisal through investigating the impact of project type upon the balance between formal financial analysis on one hand and the strategic approach (MJ and the ROA) on the other in the IAP.

It is claimed (*e.g.* Finch & Mason 1990) that such a process of theoretical sampling is not only one that gives priority to theoretical significance in sampling decisions, but is also one that forces researchers to sharpen their reflections on their findings during the field process.

Based on these criteria, a ranking of potential firms was made. The most appropriate companies were approached resulting in a total of 11 in-depth, semi-structured interviews with individuals from different automotive firms of different characteristics being conducted. Since, amongst the objectives of this research is the focus on SIDs (decisions about projects that are capable of setting strategic direction), more large and very large companies than SMEs were included in the sample for two main reasons:

Firstly, these types of projects (strategic projects) are more likely to initiate the full range of interaction between MJ and the ROA in the IAP which is the focus of this study. Secondly, the nature of this industry. This manufacturing industry involves undertaking large investments in manufacturing plant and equipment. These investments are typically strategic in nature and constitute an important proportion of capital investments in manufacturing companies (*i.e.* new plant, new machinery for new models, new production lines). Moreover, the business risk associated with this type of project is greater than that attached to small investments.

Since the sizes of the selected firms varied sharply, there was not a clear cut-off point to differentiate between them in terms of size. Furthermore, using the 1985 Companies Act size bands (Appendix 10) will result in 10 companies being large and one company small. Therefore, a judgemental classification for these firms was established to reflect the relative differences in size among them. Since the main focus here is to compare interviewees' perceptions towards study themes, it is thought to be acceptable as they are from the same industry. Mills & Herbert (1987) have used different criteria from standard size definitions in an attempt to enable greater comparison to be made between their survey results and others, with three different criteria to define company size (Appendix 11). Therefore, in the present study, the firms were classified in terms of size (turnover) as follows:

Table 6.1 Judgemental Classification of the Sample Members

Turnover (£M)	Judgemental size (arbitrary size)	Symbol used in the text	Number in the sample
< 10 £M	Small	S	2
10 to < 30 £M	Medium	M	2
30 to < 100 £M	Large	L	4
> £ 100 £M	Very large	VL	3
Total			11 firms

Since the statistical analysis showed no bias in the sample to the population, 4 interviews were conducted with finance directors of firms who did not participate in the questionnaire survey. The remaining interviewees (7) were chosen from the statistical sample. This both enhanced the credibility of the research, and also broadened the scope of the fieldwork.

6.4. Field work

Although the IAP was the focus of the fieldwork, the interviews were quite wide-ranging and thoroughly explored the topics identified in the framework. The aim was to identify the interactions and the mutual influence between these themes in order to understand the context within which the strategic investment decision was made.

Since the sample members varied in their characteristics (Appendix 6), the structure of the interviews did vary slightly according to the company size and the reaction and answers received from the interviewees. Individuals were initially contacted by telephone to obtain preliminary consent to participate in the study. Having agreed on the date and time of the interview, a summary of the purposes of the research and the main topics to be discussed were sent to the interviewees well in advance. It was made clear to the interviewees that the interview would be taped and permission was obtained for this. Assurances were given to the individuals that the material gathered would be considered confidential and used only for the purposes of this research.

However, individuals did not express any concern in this respect and had no problems in being identified. This came with no real surprise as no confidential information was required. More interestingly, most of the individuals were happy to contribute to the research.

Therefore, individuals were identified by first names in the text and the full name and other related information are stated in Appendix 6*.

The interviews were arranged and conducted in the first half of 2006, it took considerable time to arrange these interviews due to managers' workload and lack of time. These interviews were the sole (*i.e.* no documents) source of information and conducted with people involved directly in the company's capital budgeting process. This included individuals who create, approve or reject project proposals.

The first four interviews were conducted at the interviewee's workplace (the chronological sequence of the interviews takes the same order in the interviewees' list in Appendix 6). However, as there was no indication of the influence of the geographical location and other factors that might necessitate the physical presence of the interviewer, it was decided to conduct the remaining interviews using telephone interviews.

In addition, the practicalities of the situation necessitated telephone interviews as it would have been very expensive and would have required much more time than was available (Cassell *et al.* 2005). The managers were interviewed once each. The duration of the interviews varied between 35 minutes and 1 hour with an average length of 45 minutes, and totalling approximately 7-8 hours.

6.4.1. Presenting fieldwork findings

The main concern in this study was to investigate how these themes were perceived, and to what extent they were viewed as integrated elements in the IAP. Therefore, while analysing each theme as a discrete unit, the impacts of other themes were highlighted to show the integrated nature of the whole IAP. Groups that constituted each theme were combined and reorganized to be presented as an integrated unit of analysis. The final template was transformed into the presentational template as shown in Appendix 12.

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* To ensure confidentiality, companies' names are referred to in capital letters in the appendix.

The findings of the qualitative analysis were presented using this presentational template. The quotes were presented in italics surrounded by double quotation marks to indicate that they are the interviewee's words. The name of the interviewee was placed at the end of the quote and between brackets. The interviews were transcribed literally (without any editing by the interviewer) to preserve the "authenticity" and the live context of the interview. Although the context of some quotes might appear to be non-academic and somewhat "ragged", interviewees' opinions and ideas were clear and easy to understand. This was very important to highlight the context within which the interviews were conducted. The interviewees talked freely and expressed their ideas and opinions without constraints. This is thought to consolidate research validity as facts and actual behaviour was observed. Company size was mentioned after the interviewee's name when necessary. An explanation was provided between brackets to indicate the context within which the quote was said. The dotted line at the either side of the quote signified a redundant (unrelated) issue to the subject. However, within the quote it indicated that this quote is a combination of quotes related to the same subject but mentioned at different places by the interviewee when answering different questions. This combination was established by the researcher to highlight the link between themes. Sometimes, the question was mentioned in order to help to understand the context in which the answer was given.

A thematic analysis of these interviews is presented in the following sections.

6.5. The investment appraisal process

6.5.1. Generation of investment ideas

This is the departure point in the IAP. The main sources of investment ideas appear to be customers and the company itself. The former implies that companies invest in projects based on customers' requests, the latter comes as reaction to actual or expected changes in business environment.

- **External source (customers)**

Here the customer proposes the investment and the company scrutinizes the benefits associated with it and whether it has the capabilities required to carry out such a project:

"If we pick up a new customer that's got the volumes so then we may need more the facilities. So obviously it may be customer-driven. Obviously if the volume isn't there then we'll try to utilize some of the equipment that is more general and non-customer specific.... They (customers) may bring business to us that require the investment in plant and equipment." [Paul].

However, a company's decision is affected by the nature of its relationships with the customer. Firms that are tied to a specific customer (first-tier supplier) are governed by this customer's investment policy and find themselves under pressure to carry out customers' projects at the expense of their own growth projects:

"In all honesty, the all-air investment is driven by the Honda new model programmes really. We support Honda Manufacturing. So any new models that they introduce that we require investment for, then, that's really driven by that. We obviously make some small investments into process improvements if we see an opportunity to do that. But our major investment is always driven by Honda." [Nigel].

- **Internal source (within the company)**

Here, investment ideas are generated and transformed into proposals within the company as a response to the changes in the business environment. These changes create challenges for the company and exert pressure for more improvements and developments in the manufacturing process. Therefore, projects are proposed to consolidate the company's competitive position and contribute to its growth:

"I think we encourage people in the business to come up with proposals whether it is for one extreme for new vehicles or it is another extreme just for capital improvement plans. What we would do is to ask them with going off, and we'd give them sort of a small budget for them to go and do a very early assessment of the project, whatever it is. That could be more their time and effort rather than actual expense. And we'd expect them probably within a relatively short period of time to come back with ideally some sort of outline, just in very general terms of their proposal. If it is for a significant capital expenditure programme, say it was for a new model or a variant of one of our models, we would then expect, at that stage, we would sort of go through what they'd done, decide whether it is worth pursuing to the next stage. And the next stage would be probably to check out some of the base assumptions." [James].

These ideas come from different people working in different departments at different levels. Consistency with the firm's strategy is considered to be the main criterion for pursuing the proposals:

"It is their job to keep abreast with changes in legislation and effectively to keep on looking five to ten years ahead to try to work out what developments in the industry we need to be reflecting in our investment programmes." [James].

This is also pointed out by another interviewee

"we do it (investment) on the basis of what is needed to develop our work, not on any other basis at all." [Gail].

Essential to exploiting investment ideas is the company's size. While small companies might lack the capabilities and the capacity, large companies find it less difficult to exploit investment ideas that come from both sources and hold a portfolio of investments:

"Many of the projects, many of the investment ideas that we would get involved in, that involve the development of new products...I mean there's two types of development that we get involved in, either the development of a new product idea that we think is going to be attractive to the market and that's sort of a little bit of blue sky stuff. And we don't do a lot of that to be honest. We do some of that. Or the other development ideas we get involved in is where we would work with a customer to develop a particular new product idea." [Ken, VL].

6.5.2. Describing the IAP

Interviewees were asked to describe the IAP in their companies. Based on the interviewees' account of this process, many definitions were identified and subsequently categorized as follows:

- **Direction of the IAP**
    - As a bottom-up process
    - As a top-down process
- **Construction of the IAP**
    - As a structured process
    - As a structured process with flexibility (semi-structured)
    - As an unstructured process (flexible process)

- **As a bottom-up process**

This implies the development of the investment ideas into project proposals which are refined as they go through upper levels within the company. In other words, the IAP is defined in

terms of exploring the business environment for potential projects that are scrutinized and assessed through different stages in the firm then submitted to the higher levels:

"I think it works very much like a sort of a pyramid. I mean we have two main business streams here which are our engineering consultancy business and our cars business. The cars business before a proposal gets to the main Board in the cars business itself they will have the equivalent. So the Managing Director of that business and the Financial Controller of that business will have interrogated the proposal. So it will have gone through various hurdles before it gets submitted to the main Board. So it is always being questioned and improved until it gets to the main Board and then obviously we react to it." [James].

- **As a top-down process**

This type of appraisal takes an integrated form where a business unit's plans feed into the company's strategic plan. Investment activities are determined by the head office and business units propose projects which serve the overall plan. The main feature of this type of investment is the collaboration between business units and the head office facilitated by direct communications:

"In formulating the strategy we, from the Group centre, which is obviously here in London, have a dialogue with the businesses and through that dialogue we have an agreed strategy for going forward and out of that agreed strategy comes investment ideas. And those ideas will either be to make small, well not necessarily small it could be of whatever size, bolt-on acquisitions or it could be to make investments in new production lines or it could be to make investments in new green field sites. And typically what happens is that in the businesses they will come up with a proposal." [Ken].

While this process takes a top-down form in the eyes of the head office, it is a bottom-up process from a business unit point of view:

"But again it is a kind of a bottom-up. There's a strategic plan and then we all feed our requirements forward." [Phil].

- **As a structured process**

One key definition of the IAP developed by the interviewees emphasizes the structure of this process, and how different economic factors pull together to help the decision-maker in deciding upon the appropriateness of this project. In this process, the assessor has little or no influence on the suitability of the proposed project:

"So the way we actually appraise a project is we have our, like operating plan, set up in Excel with several spreadsheets, which allow for several variables such as exchange rates, price changes to material, increase in labour, etc. And, if we have a project in mind, we'll put the figures in and see if it gives us, you know, 5% or more profit and if so then we try to carry on with it." [Ian].

Here, proposals are refined by the financial department using a variety of financial hurdles incorporated in a standard appraisal model. Priority is given to the economic contribution of the proposal with less attention paid to the non-financial contribution:

"They (proposals) always go through Finance. We have a standard investment appraisal model where all business cases they have to go through so that they're in a standard format. Once they have been checked by Finance and the assumptions sort of listed out or what-have-you, then, if they're still generating the sort of returns that we're looking for, they will go forward to the Board for review." [James].

- **As a structured process with flexibility (semi-structured)**

While emphasizing the financial aspects of the IAP, other interviewees argued that growth opportunities attached to the proposed project are of equal importance to financial ones in the IAP. Therefore, they set up their own IAP which takes account of the project's contribution to the business strategy as a whole:

"We have our own (investment appraisal process), it is a project management system. It is greater than purely a capital expenditure appraisal or investment appraisal system. It is for full project management...which is part of our CIPPS process, C (first letter of company's

name referred to as J in this study) Integrated Project Planning System. That (proposed project) was put forward on a capital expenditure approval sheet with justifications on why it is required, what it is required for, the detail quotes." [David].

So, interviewees claimed that the IAP takes a wider scope through the involvement of the assessors in stressing the importance of the non-quantifiable benefits of the project, as well as its implications for the firm's strategy. Therefore, the IAP entails recognition of the growth opportunities that cannot be expressed in financial terms.

- **As unstructured process (flexible process)**

Here the assessors' intervention in the IAP is substantial where few financial hurdles are in place. Moreover, proposals could be prepared in a variety of ways with no standard format:

"We'll basically discuss it. It will be instigated by one particular Director that is responsible for the area where the possible investments can come. And basically there is very little, how can I put it, investment appraisal techniques used. It is very much a discussion at Board... There are no specific procedures for it. Obviously, it will be down to the specific individual Directors to put their case together. So, you know, that can vary from a detailed report with costs in, up to little more than a few words said at the meeting." [Paul].

This diversity in the range of definitions reflects different observations by the managers. While there is a sort of consensus about the objective of the IAP that can be expressed as 'judging the validity of the proposed projects', different approaches are used to reach this judgement.

Despite the diversity of the "definitions" of the IAP amongst the interviewees, the focus on the financial aspects of it seems to be a common characteristic for most of them. It is noticed that these different definitions reflect the diverse characteristics of the companies involved in this study in terms of size and status. While the IAP tends to be more structured and takes a bottom-up direction in the head office of large firms, it appears to be loose and more flexible in small private companies and business units.

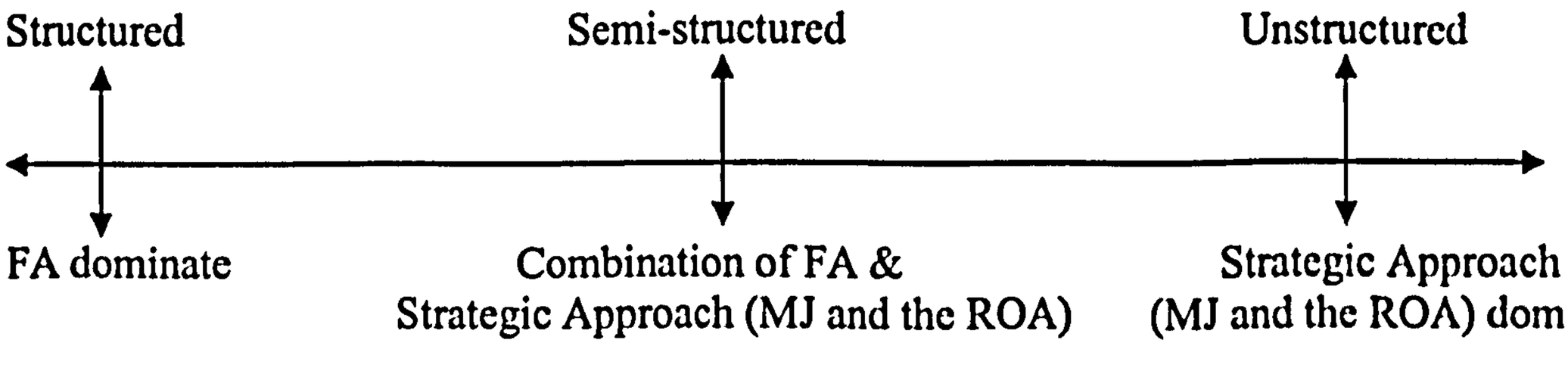
Additionally, this classification of the IAP is not discrete. A combination of constructional and directional forms seems to exist in some firms. These diverse "definitions" of the IAP are very important, not only because they present the context within which the capital expenditure is assessed, but also because they may influence the way in which the SIDs are made.

6.5.3. Appraisal criteria in use

The division between the financial analysis (the deployment of the financial techniques: PB, ROCE, DCF) and the strategic approach (the combination of MJ factors: past experience, intuition and own judgement and ROA) has contributed to the preceding taxonomy of the IAP. While some interviewees perceived the IAP as a set of financial criteria to be met (as a bottom-up process, as a top-down process, as a structured process), others viewed it as a flexible process that allows human interference with limited use of the financial hurdles (As a structured process with flexibility, as an unstructured process).

Therefore, the IAP can be delineated on a spectrum ranging from structured (with financial techniques dominating the process) to unstructured (with MJ and the ROA dominating the process) with a semi-structured (combination of both) in the middle.

Figure 6.1. The Investment Appraisal Process Structure



- **Financial criteria in the IAP**

Most interviewees claimed to make use of financial techniques. The tendency is to use one or two as primary techniques and the other techniques as minor ones. Some used Payback and

Return On Capital Employed for projects requested by customers: *"Because they're quite simple in their application."* [Phil], and they are imposed by head office: *"But to get authorisation to spend, you've got these two headline measures from Head Office to drive the company."* [Phil]. In addition, they use NPV for the company's own projects: *"when we're looking at projects internally for our own purposes we need to know cash flows because we've got to predict the financing requirements of this company. So we will always look at that on a net present value basis just to see how cash, velocity of money, flows through the company. So we'll do that internally."* [Phil].

This particular interviewee argued that the main techniques vary from company to company:

"they do change in each company. In other companies I've been to, payback has always tended to feature, everywhere I've been. Thereafter, yeah, net present value, internal rate of return." [Phil].

In contrast to this view, other interviewees emphasized the use of DCF techniques as the main criteria:

"financial appraisal which is predominantly based on discounted cash flow techniques showing net present value and internal rate of return .... We do look at payback. We don't look at return on capital employed. Our main criteria are DCF techniques, yes." [David].

However, the use of financial techniques varied not only between companies but also within the company depending on the project size and objectives:

"It (the use of financial techniques) depends on the size of the project. So if it comes up as a cost saving and it is a low value, by which I probably mean less than £100,000 sterling, we'd probably just use a simple pay back. If it is a more involved project or if it is high spend, then we'd probably look at ... well, first of all we'd look at different scenarios... what's the best case scenario, worst case scenario. We'd look at ... if we start the project and our assumptions turn out not to be valid, you know, what's the abandonment scenario. And we'd look at discounted cash flow." [Jill].

In addition, comments were made about the importance of applying fixed rules for certain type of projects: *"If it is a normal investment we have to have a payback. We have to have an IRR of about 16%. If it is a non-strategic, we might have even faster."* [Nick].

A contradictory view comes from another interviewee, who could be positioned at the opposite end of the spectrum; he does not use any financial techniques:

"We'll obviously look at some costs behind it. But as for any method of return or payback I have to admit that it is minimal... We'll look at the cash flows. But as for actually any investment appraisal using the different methods, then no, we don't do it... no fixed rules at all." [Paul].

One interviewee who had previously worked for many companies cast doubt upon the consistency of the financial techniques and defended using few of them in the IAP:

"There's probably a handful of criteria that people would use. I think you've got to be careful not to over-complicate. Because what you could do is choose all five and come out with five different answers and reasons why or why not to go forward." [Phil]. Moreover, using few techniques facilitates the control of the company: *"To control a business, for me, you have to keep it simple and focused."* [Phil].

Cultural differences and decision-makers' backgrounds seem to influence the number of financial techniques in use. One of the most experienced interviewees who worked for a large British company (Unipart) for 20 years and then established a joint venture with a Japanese firm (Honda) in 1996, highlighted the extensive use of the financial techniques by British firm while the Japanese tend to use one technique:

"Interviewee: If we did it (project) independently for ourselves, we usually use payback, internal rate of return, net present value. But the Japanese, more so, just concentrate I think on payback.

Interviewer: They concentrate on this only.

Interviewee: Yeah, payback, usually it is payback. When we had more involvement with Unipart it was internal rate of return and net present value and payback, a combination of the three... So I think it is fair to say that they're driven usually by payback... I think it is because payback is easier to understand than net present value and internal rate of return. I think they can get their mind around 'Well we should get our money back in three years on this' or whatever." [Nigel].

These cultural differences appeared to affect also the way in which the proposals were prepared. Therefore, one interviewee whose firm has two overseas subsidiaries highlights the importance of communications in resolving this problem:

" We've got one in Germany and one in Czech Republic , the way they present their capital request is quite different and it is sort of having discussion with them, again, and tease the information out to make sure your really understand it." [Jill].

- **Limitations of financial appraisal techniques**

Interviewees have identified two main problems associated with the use of the financial techniques. The first is the competence of the assessors to deploy these techniques effectively in the IAP, particularly, lack of skills required to conduct a sufficient and convincing analysis of the project to justify its approval. This raises doubts about the credibility of the proposal and influences the decision about it as expressed by one interviewee:

"Well, I think, I mean the key thing to us is that you get a properly presented proposal, it is fact based, he(business unit manager)'s done a good job of putting up some reasonably sensible and conservative assumptions and that the management team that are putting it forward actually are credible. And the thing is so often you see financial projections which do not make any sense because they either assume you are achieving returns way in excess of what you've achieved in the past, or they assume that you get returns higher than the competitors. And, you know, you have to ask the sensible questions. 'Why should we get a 10% return on sales and all of our competitors can only get 5?' And if we're creating capacity in a market we have to ask ourselves what strategy have we got in place to actually fill that capacity because if we're going to be growing faster than the market we've got to be

taking market share and so we have to understand what we believe the competitor's reaction might be." [Ken].

The second problem was the possibility of these techniques being abused by assessors. When assessors want to go ahead with a project they tend to justify it on bases other than financial, then they do the financial analysis and manipulate the figures to match their requests:

"Interviewer: You always go through the different scenarios, and at the same time consider other issues rather than just financial return?

Interviewee: Yes. It is definitely the quality of the thinking and the quality of what this will bring to the business and what the implications are. And then the numbers basically just formalise that.

Interviewer: So sometimes you might make a decision and then do the calculation?
Interviewee: That's generally how it works. Well, we'd certainly make a decision that we wanted to advance the project. Then I'd come away and I'd look at the different scenarios and the different implications. I'd look at the cash flows. I'd look at what that does to the profit and loss of the Group." [Jill].

In this sense, a comparison is made between the financial and non-financial consequences of the project. Therefore, a project might be justified based on its non-financial contribution to the business. But at the same time, there is still a need for a financial analysis to make sure that these benefits could be achieved with minimum financial losses. So here, the decision is made prior to the financial analysis based on: *"quality of thinking and the implications of the project on the business"*. In other words, on the basis of managerial judgement.

While this form of manipulation might be defensible, other interviewees expressed concerns about the possibility of abusing these techniques to influence the decision and get their proposal accepted, as articulated by one interviewee:

"A lot of the time it (financial analysis)'s a lot of bullshit to be honest. Because sometimes people manipulate the future earnings and the cash flows in order to reach the 15% (hurdle rate). They say, you know, 'I've got to make this much money in 2008, whatever.' And when

they come to 2008 they might not do it because the model they have overstated the sales or the selling prices or various things like that." [Nick].

For this reason, some companies do not publish financial hurdles for business units when appraising the projects:

"But we don't actually publish a target because if we did what would happen is every single proposal that came through from the businesses would be above the target. So it would be a bit of a pointless exercise really." [Ken].

It is interesting to reflect upon the assumptions that might be underlying the second view. Clearly, there is an argument that projects could be accepted regardless of their financial returns. Their contributions to the business strategy might outweigh the financial losses that they might incur. However, in the long term, these projects might accrue considerable financial returns. Here, the project is assessed in conjunction with other projects and within the overall integrated strategy. Therefore, strategic benefits from the project might well justify it; assuming assessors are well-qualified and have the required skills.

This is why MJ factors are considered for this type of project whose return might fall below normally required financial standards but with growth options. Thus, financial techniques (numbers) could be used to support as much as possible the qualitative justifications (words) to provide a rigorous proposal.

- **MJ factors and the ROA in the IAP**

Like financial techniques, most interviewees claimed to make use of MJ factors (past experience, intuition and own judgement) in the IAP. This appeared in many guises. One of these forms is the modification of the IAP over time based on experience gained in the past: *"And it (the investment appraisal process) is a very, very good fluid workbook. It is grown up over the years with sheets being added in, taken out."* [Ian].

The impact of MJ factors in prompting the ROA application seems to feature in most of these companies. This takes the form of discussion in the meetings for making the decision about the proposal. It is argued that this incorporation of MJ factors and the ROA in the IAP is

essential in approving or rejecting the project. One interviewee who appeared to use the ROA 'informally' in the IAP described how the integration of MJ affects the investment decision:

"Well, I think we probably do (use ROA). I mean we don't call it that (ROA), but I think in the discussions we're having, we're weighing up in our own minds about what the priorities are, what the cash looks like. I mean if we know, for example, that every project overspends by 20%, you'd kind of be taking that into account and factoring that in. Or if we didn't have a good track record at delivering projects on time, again you'd be... You'd have that in your mind when you're making the decision." [Jill].

While criticising the ROA, another interviewee acknowledged the informal use of this approach and highlighted its significance for strategic projects. He signalled the conditions that necessitate the application of this approach. An example of which is outlined below:

"We don't actually use real options because in practice we've found that it is very, very judgemental and doesn't really, I don't really think, helps that much with the decision process. In some respects, I mean real options in a way get considered. I mean for instance if we're developing new products as the thing progresses, at various stages, we're assessing, you know, what we now believe the present value's likely to be of a particular project depending on the phase it is in. But we don't formally have a process for using real options." [Ken].

In this context, the interviewee talked about one of the ROA factors which is 'staging'. This allows flexibility in the decision-making process where the 'abandonment option' might be considered at each stage of implementation.

Of particular interest here is that the deployment of MJ factors and the ROA is occasionally linked with the company's financial situation and the flexibility in the decision-making process given by the head office:

"You can override them (financial techniques) if you improve. You won't override them if you deteriorate, no. They (head office)'re quite tough on that." [Phil].

So, managers are more flexible in using MJ factors and the ROA as long as the company's financial statements indicate good performance:

"They (head office) pretty much leave us to get on with it ourselves. Probably because we're generating profit, you know. I suppose if we were making a loss it would be different." [Ian].

- **Mixed criteria**

The use of mixed criteria (financial analysis and MJ factors and ROA) was advocated by a number of interviewees. A lack of understanding of the role of financial analysis in management control was highlighted in relation to the credibility of the IAP:

"Being the Finance Director I'm not 100% happy. But I think given the circumstances, you know, we could improve on what we're doing... I think if there was more financial appraisal then there would be more financial accountability." [Paul].

There was a sense that financial techniques and MJ factors could support and complement each other in terms of financial analysis providing the 'financial impact' and MJ factors showing the 'future opportunities' for the company. One interviewee highlighted the importance of this combination, especially for assessing projects with low financial returns or even a negative NPV:

"Well, with something like that (important project with low or negative NPV), we'd probably look at what happens if the project doesn't go ahead and what happens if the project does go ahead... So, even if the project on a stand-alone basis doesn't look favourable, it does when you compare it to the alternative of not spending the money." [Jill].

This view of incorporating both approaches in the IAP implies the possibility of capturing a wider range of benefits rather than what might result from using one of them. Therefore, while the conflicting views towards financial analysis and the strategic approach (MJ factors and the ROA) presented earlier might reflect the conflict rather than combination, there is some suggestion that they complement one another in a variety of ways that can enhance and add to the credibility of the SIDs by providing the expected financial returns, and future opportunities that might arise from conducting a project.

- **Factors affecting the use of either approaches**

Interviewees identified a number of issues which might influence the use of either of these criteria in the IAP.

1- The shortage of funds

Limited resources available for investments were seen as a crucial factor in shaping the investment policy, consequently, dictating the types of measurements to be used in the IAP. The impact of this factor on MJ and the ROA seems to be greater than on applying financial techniques. Therefore, some large companies with sufficient resources were able to utilise MJ and create the potential of the ROA adoption and also carried out a variety of projects with diverse outcomes:

"Well there's always a limit because capital's finite. I mean generally speaking we take the view that if it is a good project and has a credible management team, then we will find a way of financing it and there's nothing really that we've wanted to do that we've not been able to do because of lack of availability of finance." [Ken, VL].

While large companies were more likely to use MJ and thus increase the chance of adopting the ROA due to funds available, smaller ones appear to struggle to sustain funding projects over a long period and resolve the financial consequences in case of failure. Therefore, shortage of funds seems to restrict their choices as explained by one interviewee: *"If something starts to go adrift, we don't have a large pool of resource that you can suddenly reallocate to sorting it out."* [Jill, L].

The impact of this factor becomes noticeable in small companies that struggle to fund their projects. Therefore, occasionally, they try to engage customers in funding the projects on a mutual benefit basis:

"They will invoice us over a period of time, at no extra cost, no interest... Because in return, what we will do is we will help them with a turbo-charger (company product) on their car or something like that... So in that way we know we can sustain paying it off over the period of time and it won't actually make any dent in our business's finance." [Gail, S].

In this context, resources available might determine types of projects to be undertaken and, therefore, the criteria in use. While large companies with lower funding concerns tend to consider MJ and the ROA, small companies might tend to undertake short-term projects and to use financial techniques.

2- Risk involved

The distinction between financial analysis and strategic analysis was seen by some interviewees as crucial in assessing projects of different levels of risk. The reason given was that financial techniques are construed as being incapable of dealing with risky projects, and mostly suit simple projects, whereas a strategic approach (combination of MJ and the ROA) is needed when the risk becomes higher. Therefore, an integrated approach with a full range of both techniques is required for risky projects. This was illustrated below where one interviewee highlighted the limitations of financial techniques in relation to risky proposals:

"I think the other one that is hardest to specify is the level of risk with the project. So I think we recognize there are some simple projects that, if you like, are sort of bread and butter projects and it is very straightforward for us to do...It is a relatively low risk programme in terms of delivering to time and to budget. Whereas if you then go into something maybe going into a completely different market where it needs to be homogeneous and different emission controls what-have-you. That becomes a lot higher risk and we try to ...review that with the project as well. So that tends to be, if you like, the fourth factor that we look at when we are assessing projects." [James].

Here, the implication is that risk associated with proposals is a crucial factor in the choice of the techniques used in the IAP. While financial techniques are viewed as appropriate for low risk projects, it is felt that they are not sufficient to assess high risk projects and, therefore, different approaches are applied.

3- Decision-maker's culture

It was argued that the assessor' culture not only affects the number of financial techniques in use and the way proposals are prepared as found earlier, but also in striking the balance between the financial analysis and the strategic approach in the IAP. It is claimed that

Japanese firms tend to adopt a long-term vision aiming at getting their money back while achieving business strategic objectives in contrast to their British counterparts who seem to be concerned with short-term earnings:

"I think the Japanese tend to look further down. It is not immediate return. It is let's secure the business, let's produce a quality product. If we get the confidence of the customer, then they'll come back and ask us again in the future. They're not looking for quick returns." [Nigel].

So this might reflect contradictory business strategies driven by different ways of thinking. Thus, the comparative cultural attitudes influence the strategic and financial decision-making process as well as short-termism. Such cultural differences in managerial behaviour and underlying influences have been reported in many studies [*e.g.* Hofstede's (1991 & 2002) work on cultural values, House *et al.* (2002), Doyle 1992, Trompenaars & Hampden-Turner's (1997) value studies] where USA and British firms are the most profit and performance-oriented, and the Japanese ones are the least.

4- Lack of skills

The main points here are that there is a competence issue throughout the IAP, and maybe not enough attention is paid to training and skills development. One of the interviewees located problems with the understanding and the application of different criteria:

"I think, my opinion, is that it is probably that the finances are a small voice within the way the company's run. And therefore, you know, probably the requirements of the other Directors to have some financial training for non-financial people may help this. But we haven't even got round to that to be honest." [Paul].

This suggests a link between the use of a specific technique and the familiarity of the assessor with it regardless of the suitability of this technique for this type of project. There are two separate issues here: that of assessors being aware of the range of different appraisal techniques, and that of how to make the 'right' choice considering the context appropriate for applying each of them. Both of these issues are linked to the assessors' competence and their attitudes towards the credibility of both criteria in the IAP. Therefore, managers who have had

less exposure to a strategic approach (MJ and the ROA as part of the IAP) might find it less credible because of their lack of expertise and because of doubts about its perceived credibility. On the other hand, assessors who are familiar with financial techniques find them more convincing as they produce tangible evidence (figures) that support the investment decision more than the ROA ones.

6.6. Risk associated with proposed projects

The main focus here is on the treatment of risk attached to the proposed projects by the interviewees. As well as focusing on the risk techniques in use, this theme casts some light on the implications of risk for the IAP and SID-making process. Here, the interviewees' attitudes towards risk are presented together with the different approaches they utilise in assessing risky projects. Risk here was often viewed in terms of possibility of substantial loss and viability of project outcomes.

The general perception reflecting the interviewees' views was that this industry (automotive industry) is very risky:

"This industry is one-off. There is no other industry like it... our market changes so much that we might invest in £10,000 worth of product today, but tomorrow that product will not be wanted by anybody any more." [Gail].

6.6.1. Attitudes towards risk

The prevalent attitude to risk amongst the interviewees is "risk aversion". This phrase implies that risk in some way inhibits the success of the proposed project and therefore its effects should be kept to a minimum:

"So *we have turned down projects in the past because although on face value they have a good business case and we just believe that it is at the riskier end of the scale and therefore something that we don't want to do."* [James].

A stronger feeling came from another interviewee who linked the fate of the project with the risk attached to it without considering the benefits generated by conducting such projects:

"And if the thing is considered to be a very high risk project then the chances are it won't actually happen." [Ken].

This attitude might be ascribed to the assessors' competence in risk management and how they trade-off risk with potential returns. Therefore, to minimise the risk, they use some form of risk technique and also seek a high rate of return for risky projects. As a result, risky projects are more likely to be rejected.

6.6.2. Assessment of risky projects

The assessment process varies between firms. While some firms use risk techniques included in an assessment process developed by the firm, others tend to rely only on their judgement and experience (MJ factors). The first type of risk assessment tends to characterise very large firms and the second one, SMEs and some large firms:

"I mean what we do is produce a risk matrix that actually identifies the likelihood of the risk happening and its potential financial impact. And if there are a number of high likelihood, high financial impact risks, the business, the person sponsoring the investment has to come up with their mitigating factors and how they're going to manage that risk." [Ken, VL].

A similar view was expressed by another interviewee. However, here, risk assessment is done in conjunction with the IAP of the projects. In contrast to the preceding view, this integration allows considerations to be taken other than financial:

"If it is a new project, if it is a major project then it would be done, managed through a project management system which basically has seven gateways which have to be passed through before the project can go ahead. So at each gateway the project is reviewed by senior management and if things are not going to plan then either the project will not go ahead or counter measures need to be put in place to ensure that the plan is achieved." [David, VL].

No distinction was made between proposed projects in the IAP in terms of risk attached to them. All projects need to be assessed in the same way:

"We tend to use the same approach on all of them (projects). Our focus is actually on cash generation, discounting cash flows, to come up with a view as to what we believe a present value is and internal rate of return." [Ken].

While large firms tend to use a formal risk assessment process, managers in small ones tend to rely on experience and their own judgement (MJ):

"It is (risk assessment process) more, you know, the Directors' opinion more than anything objective." [Alan, M]. Here no formal risk techniques are in place: *"I have not applied any of my business studies at all. Probability doesn't come into it."* [Gail, S].

The use of past experience and judgement is also found in some large companies:

"Here, I don't sort of use a different beta factor or anything like that to take account of risk. Partly because, I think, well..., it is easier I think to explain to the other Directors in this organisation if you just look at something like the differences in the different financial scenarios." [Jill, L].

One interviewee attributed the use of MJ factors to assessors' competence and company size:

"Probably skill levels I would think. The skill levels to use them (risk techniques) or actually understand them if I'm being critical... we're an SME on the ... I suppose that sort of...cannot justify probably techniques like that." [Paul].

One interviewee has explained how vulnerable this approach is:

"Well probably the one (project) we took on last year, there was a level of risk, because as I've said the margins weren't brilliant. So if a couple of variables had gone unfavourable maybe it would have been a loss. But we made the decision and we stuck with it and it was fine." [Ian].

However, this approach worked well for him because:

"We had the experience ... and it is business we knew, so that helped." [Ian].

Therefore, risk techniques are applied only when moving away from core business:

"We have done sensitivity analysis in the past. Really, certainly, if it is a strategic move and we're moving away from our core business. If it is core business, it doesn't tend to have a sensitivity attached." [Phil].

The point here is that there is recognition of the significant risk in the business environment. However, the use of risk techniques is limited only to investing in projects away from core business. This distinction is very important in terms of highlighting the settings within which MJ can be used. While core business represents the arena the managers are familiar with and allows them to use MJ, moving away from it necessitates an intensive risk analysis and the use of risk techniques as they hold no previous experience in this new field. Therefore, the use of MJ cannot be drawn upon in settings that do not create the opportunities for this approach to be used.

6.6.3. Risk transfer

This concept evolves as a strategy that interviewees adopt to mitigate risk. Here, the argument is that the customer should share the burdens of taking risky projects:

"You've got to get your customer to actually fund it (project) up-front. So, what you can say 'OK, we might have the equipment in place, let's say, to do the trials and development. You should buy the tooling. Tooling should be funded by you. Research and development should be funded by you.' And if we get that agreement at the end of the day we're going to lose no money." [Phil].

The main concern here, in addition to funding, is the credibility of the customer forecasts. If the forecasts turned out to be unfavourable, the consequences could be a substantial loss as one interviewee experienced:

"We built this factory in 1997 we had an awful start because the Honda model programme was poor. They could not sell the car, the Accord. We incurred big losses, over the last three years we have been gradually reducing those losses and hopefully by end of March 2008 we would have cleared all these losses and we can then move into a positive profit. It has been a hard work and struggle really." [Nigel].

In contrast to this, another interviewee whose customer's forecasts were more credible had achieved profit which he considered as unusual in this industry: *"Toyota's volumes have been better than they forecasted... and we are making a profit which is quite unusual in the automotive industry."* [Ian].

6.7. The strategic decision-making process

This category is concerned with perceptions with regard to the SIDs. As such, it is closely linked to the IAP to illustrate the context within which the SIDs are made. This integration means that factors that influence the IAP also, to some extent, influence the decision-making process. Therefore, there might be some slight overlap between the content of both themes. However, the focus here is on the context in which the SIDs are made and the unique characteristics of this process. This section is divided into the following categories:

6.7.1. Selling the investment decision

Here, there was an emphasis on the vital role of communications in the decision-making process. This appeared to be a powerful way of convincing the decision-maker informally. An example of this possibility and its importance in swaying the investment decision is outlined below:

"...what would happen in terms of the process (decision-making process) is that I'd probably take it (the proposal) to the Chief Exec and say 'Look, I understand why we're doing this, but

do you realise it doesn't generate any money ... so if he's not happy with the business proposal then it would get ditched at that point. But again it would be ditched more from the discussions rather than purely the financial numbers." [Jill].

This particular interviewee defended this approach, especially, for projects with non-quantifiable benefits because other directors in the company are unaware of these intangible benefits and also the difficulties in expressing these benefits in financial terms:

"... Now because the other Directors don't particularly see that (problems necessitate investments) on a day-to-day basis, they don't really understand what my issues are, and then for what the benefits are... It is very difficult coming up with a financial justification... But that would be done (making a decision) by discussion and trying to sell the idea rather than by putting discounted cash flows on a sheet of paper and then showing them (other directors) the benefits like that." [Jill].

However, the process of selling the investment decision is not restricted to the workplace. It is argued that social occasions offer a good atmosphere for promoting the investment idea amongst other directors as one interviewee explains:

"But after the meeting you might go for a meal, have a drink together and because most... you've all got one common interest, you work for the same company. So you might want to discuss wives, husbands, football, cricket, whatever, but it always will drift back into work, and that is a really good environment to influence people. It really is. So I think that can be more powerful." [Phil].

Another interviewee linked the success of this strategy to individuals' competence in communications:

"It depends on the selling negotiation techniques of the individual, I suppose." [Paul].

The perception of the usefulness of the communications was highlighted not only in relation to managers' communications skills, but also in relation to company size and its geographical spread. It is claimed that the effectiveness of this tool decreases as the company becomes bigger and spread over a wider geographical area. Therefore, in contrast to relatively small

companies, where board meetings become a formal way of endorsing the projects that have already been discussed and agreed informally, it involves more arguments and dispute in large firms, as it is the first time they hear about it. This makes consensus more difficult to reach and the proposal being sent back to business units for more illustrations and explanation:

"The Directors are very hands-on and we work with each other a lot of the time. Maybe in a different organisation where the Board Members are not so close to what's going on in the company, then it would need to be much more formal, because the first time they might have sight of the project would be at the Board Meeting. Normally here, the way things work are by the time you go to the Board Meeting we've already agreed what we want to do." [Jill].

The reason given for this is that, in very large companies, the IAP takes a structured form with minimal personal communications. Furthermore, the decision is made in a different context from that in which the project might be implemented, and by people who are not directly involved in the assessment process in the first place. This, in turn, affects the decision-making process and provides a slim chance for selling the investment idea. Moreover, the use of technology, as an alternative for personal contacts, makes the decision-making process more formal. This means that the IAP is carried out at the business units and the decision about the proposed projects is made somewhere else (head office) as explained below:

"It (investment appraisal process) is an intranet based... we have to put it (the proposal) on the webs intranet. Then it goes to my Director in Germany for his approval. Then goes to the Financial Directors in Germany for their approval. Then it goes on to Paris. And depending on the size of the investment, it might go all the way up to the Chairman of F (company name)." [Nick].

Interviewees have identified two motives for such a strategy. First, shortage of funds that leads to internal competition between business units working for the same group for their individual proposals to get passed:

"I mean at the level above us, the Japanese, they work for JG (parent company name). Whereas, on my level I work for G UK (company name). So the competition is fierce then." [Ian].

Therefore, as there might be many competing projects with different attractive outcomes, managers not only propose the investment but also try to get it through (sell it) all the way through the different levels in the organisation starting from general manager to executive committee. The process of selling the investment decision appeared to rely heavily on formal and informal communications with decision-makers (Lumijarvi 1991).

The second one was company size. It is claimed that, in large companies, the link between head office and business units becomes weak. Therefore, lack of understanding of businesses units' growth needs by head office encourages this kind of informal communications to sell the investment decision, as explained by one interviewee:

"Well, first of all it is the people in the headquarters, they don't really ... it is such a big company. So they probably get hundreds of proposals and they have only so much money. Secondly they don't really probably understand too much of what I'm doing in my little factory. It is not that it is small but what we're doing here... if I have to do something, and it is important, I have to, then, go through my reporting structure. And then I have to convince my direct boss and the financial people in my division that this is important. And they can then push the next level." [Nick].

6.7.2. Financial constraints

One of the key features of the decision-making process is the existence of fixed financial rules. This takes the form of a minimum acceptable level of the applicable financial criterion as expressed by one interviewee:

"We require an internal rate of return greater than 35% ... and generally payback period as well of less than one and a half years." [David].

These criteria are usually set by the Head Office to ensure the alignment of the proposed projects with business strategy:

"Often the Head Office will give us a return on investment criteria as a percentage and number of years payback. And we have to try and satisfy those criteria." [Phil].

In this context, interviewees emphasised the central role of the financial analysis in the decision-making process. While this tends to characterise large companies, small companies tended to override the financial criteria and base the investment decision on MJ, as one interviewee described the elements of the decision-making process in his company:

"Interviewer: So does this mean you rely, I mean the company in general, on your own judgement to decide?

Interviewee: Yeah, very much, as the saying goes, on the gut feeling of certain individuals." [Paul].

Another interviewee demonstrated how the cultural differences and assessors' vision influence the choice of the criteria in the decision-making process:

"*Interviewer: Are these rules fixed, that you have to apply every time you assess any project or is there any flexibility?*

Interviewee: If I was talking about when we were part of U (British company) they were quite fixed. The Japanese, they tend to do things, maybe, because they think it is the right thing to do. So sometimes, in my experience of them, if they think it is right, they'll do it. And even if the payback doesn't look that good, if they think it is the right thing to do they'll go ahead and do it. What criteria they use, whether that's gut feel, past experience, I'm not sure." [Nigel].

This interviewee goes on to explain the reasons behind this different approach in the decision-making process:

"I think they (Japanese) take a longer term view. They're not looking for an immediate payback like we were more driven that way. They do tend to look further down the road as well." [Nigel].

When considering the previous findings, it would seem that there are contradictory views being presented. On the one hand, there is the concern that financial analysis needs to be the focus of the decision-making process to ensure sufficient returns. But on the other, there is the notion that it is possible to rely on MJ factors in the decision-making process for long-term

growth. This reflects two completely different perspectives of the criteria to be used in the decision-making process.

6.7.3. Decision-making empowerment

This concept emerged in large companies where business units were given some degree of flexibility in the decision-making process. This seemed to ease the pressure on the head office in terms of proposals to be dealt with, at the same time, giving the business units the chance to undertake projects that might otherwise get rejected by the head office.

Therefore, business units can authorise the investments themselves up to a certain value set by the head office. However, this flexibility is restricted to the consistency of the project with business strategy set in advance and by the amount required:

"Each of the businesses each year produces a rolling three-year capital plan and if the investment proposal that they are putting forward is within that plan, then providing that it is less than $500,000 they don't need any approval from us to actually do that investment. If they come up with a proposal that is more than $500,000 and is in the plan, then it has to be reviewed and agreed at the centre. And if it is in the plan but over $10,000,000, it needs to have approval by the Board. All of those limits basically halve if the proposal, if the investment idea, isn't in the capital plan." [Ken, VL].

An identical view was expressed by another interviewee:

"If it is included in the budget then it can be, depending on the value, if it is less than 250 thousand then it can be signed off locally within each plant. If it is not included in the budget then it needs to go to Group for signature, Head Office, for sign off, including our President, Managing Director. And if it is over £250 thousand, irrespective of whether it is in the budget or not, it needs Group Approval as well." [David, VL].

6.7.4. Reaching a consensus

Despite the different approaches in the decision-making process, most interviewees stressed the collective nature of the SIDs with interested parties being consulted:

"... very collective, yeah, business managers, I get involved, the Chief Executive of I (company's name) gets involved. All sorts of people get involved." [Ken].

It was argued that communications and shared vision are important to convince the others about the proposal and thus reach the consensus:

"We all tend to work fairly closely together. So if it was (the proposal) something that we knew we needed to do, that would be well known about and well understood." [Jill].

The problem of disagreement might arise from unbalanced negotiation powers in the case of the joint board, especially, parties with conflicting attitudes towards the IAP and decision-making process. One particular interviewee, while being consulted and involved in the decision-making process, signalled the possibility of 'enforced consensus' by the most powerful party:

"Interviewer: Do you feel, now, working with Japanese, do you feel yourself, your personal view, is it better than working with Unipart, a British company? Which is better for you?

Interviewee: For investment, probably the Japanese. They cannot be frustrated.., because you do tend to find that you are not sure who is making the decision. Also you do not feel one person is making the decision. Collectively they make the decision. You have a meeting with the Japanese people and you leave it after three hours and think what the hell that was about and we still, we have not got a decision. Eventually, the decision has been made, but who actually made the decision, I do not know. It is collectively the Japanese.

Interviewer: Which means informally?

No, no, because we are non-smoking company and always have been, but having said

that, we have smoking room and the Japanese are big smokers, so whenever they leave the meeting, they get up and they go to smoking room and carry on the meeting in the smoking room, but in Japanese of course.

Interviewer: So it is a collective decision?

Well, I tend to find the Japanese, they are rather difficult, because you have English and Japanese. So English and English, Japanese to Japanese. So something gets lost in communication. But the final decision, I believe, is probably Japanese. The English guys will be having an influence on it, but the final decision is usually Japanese because the senior people at Honda Swindon are Japanese and our company Managing Director is Japanese." [Nigel].

This raises, again, issues not only about the importance of clear communications in the decision-making process but also the significance of having a clear shared vision amongst the decision-makers.

Occasionally, the notion of 'enforced consensus' appears to be linked well to the company status. It is argued that the owners in the privately-owned company have the power to influence the decision as one interviewee explained:

"Interviewee: Obviously being a privately owned company, when the Directors meet, two of them are the owners of the company. So obviously they'll have, although we try to do various things autonomously, there will be some influence obviously from their positions.

Interviewer: And how about the other Directors? Don't they get involved in the decision-making process?

Interviewee: No, they're involved, but there maybe some bias from the owners if that's the way they feel the investment needs to go." [Paul].

6.8. The strategic approach

A key aim of this research is to investigate the perception of MJ and the ROA in the IAP and their interaction with other themes. As explained before, these two concepts form the strategic approach in the IAP that allows projects with growth options to be considered and undertaken in the IAP (something the financial analysis failed to consider in the IAP). The interview questions, therefore, focused particularly on how interviewees recognised both MJ factors and ROA factors in the IAP, and to what extent.

Four categories relating to the role of MJ and the ROA in the IAP are presented in this section.

6.8.1. Perception of MJ factors

Most interviewees claimed the use of MJ factors in *one way or another*. However, this is done informally while assessing the proposals. This was demonstrated in bringing to bear the assessors' intuition and own judgement together with past experience when assessing the proposal. One interviewee has explained how he made sense of his experiences during the IAP through critical interrogation of the proposal and the team behind it. He claimed that this interrogation is essential to make a decision about the validity of the proposal through judging different aspects in deep detail:

"I think you get the best value out of appraisals by asking the questions. You get a better feeling for whether the amount of effort that's gone into the proposal is the correct amount, whether we've got the right information, whether the people who are presenting to you have a good handle on the issue. So I think that sort of questioning or check and balance are extremely important and that is obviously based on experience with investment proposals generally." [James].

Another interviewee perceived MJ factors in relation to the financial techniques. He emphasized how, in comparison to financial analysis, MJ factors contribute to the long-term growth of the company and its complementary role in the IAP:

"I mean we are not slaves to financial metrics. I mean our businesses, throughout the whole of the I Group, the focus is on having a coherent and developed strategy for growing the business and for achieving or creating value and achieving adequate financial returns. And obviously those strategies lead to the investment decisions that we want to make. But when we get investment proposals through, the fact that they have a positive net present value and you know reasonable modified internal rates of return is not necessarily sufficient justification for the investment being made. I mean a lot of the judgement is obviously going to be exercised of how successful we believe the investment's likely to be. So we don't make ourselves slaves to the financial metrics." [Ken].

Here, the implication is that there is something distinctive about strategic projects in contrast to non-strategic ones in the IAP, and therefore, assessing these projects must entail a different approach.

It was argued that diverse experience is crucial as it gives a wider range of choices that would contribute to the right decision. However, there is still need for qualifications and knowledge to deploy this experience in practice as one interviewee suggested:

"I think everyone in every function uses past experience. And it is really, really, useful. Like in our company we've got quite a.... actually a well educated management team, with very varied experience and that's really good. Because if we were all apprentices with C (company name) and still with C now, our ideas would be very much C indoctrination and we'd be C people. What we can all do is say 'Well actually when I was with T (previous company), they used this. That seemed to work quite well'. You say 'Yeah, actually that could...'. So you can influence and change. And it just gives the company a wider scope. I think experience is invaluable." [Phil].

The point here is that the inclusion of MJ factors in the IAP has led to a wider scope of the benefits realized from undertaking the proposed project. This combination of MJ factors with the right knowledge allowed the assessors to investigate diverse aspects of the proposed project that could not have been realized using one of them on its own. This resulted in undertaking projects that would not have been accepted by using one of them alone.

6.8.2. Perception of ROA factors

In the literature, these ROA factors are claimed to provide 'flexibility' in the IAP and also in the decision-making process. These factors are excluded from the IAP when deploying financial analysis. The focus here is on how the interviewees perceived these elements of flexibility and the extent to which they contribute to the capturing of the growth opportunities.

- **Technical importance**

Here, there was emphasis on the indirect contribution that the project might have on the business strategy as a whole, regardless of its financial merits. Therefore, there was a sense that projects with non-financial returns, or even with a negative NPV, could be carried out in order to consolidate the achievement of the business strategy and support other activities which otherwise could not be conducted. An example of this was outlined by one interviewee:

"Well, again it (applying ROA) would depend on the particular project. For instance a couple of years ago we invested in a project in China that had a negative net present value, but it was with the objective over time of doing further projects which actually would benefit from the initial foundation if you like. So, having established that initial foundation, being able to build projects on the back of it, then the overall combined project, including the original which showed a negative net present value we actually had a positive net present value...I mean if it is a single discrete investment then that's the best that you can do with it, then you won't actually do it." [Ken, VL].

Here, a distinction is made between projects. While projects with growth options might well be considered regardless of their financial returns, projects with limited growth options need to meet the financial criteria to be undertaken.

- **Growth**

This is linked to the previous one (technical importance) in terms of future growth. One interviewee highlighted the importance of overriding the financial analysis and considering MJ factors for assessing such projects:

"But sometimes it is a one-off project and we do it because we know over the two years it will get our name known, and two years later, then we will start seeing the customers come in, From experience, that's not from any other calculation, just experience." [Gail].

- **Staging and abandonment**

Here, undertaking a project in stages was seen as a key advantage of strategic approach over financial analysis. This allowed not only mitigating the risk and reacting to the changes in the business environment but also offers a great chance for sustaining future opportunities related to this project without incurring big losses, as the abandonment option could be considered at any stage:

"Interviewer: So sometimes you will implement a project in phases or stages?

Interviewee: Oh yeah, very much so. I mean for instance we've got a number of investments in, relatively recently, in China and a number of those have got further phases that we may or may not do depending on how successful the earlier phases are." [Ken].

Others stressed the need for close control over the implementation to allow for corrective action to be taken:

"Obviously we'll break ... whatever period of time it is over, we'll break up that time into stages and obviously we'll know how the stages are going against the plan really." [Paul].

A contradictory view came from one interviewee who disputed the possibility of taking projects in stages in this industry due to the type of products produced. It was felt that the business environment put more pressure on companies to deliver short-term earnings. An

example was given in comparison to another industry where the type of product allows for this staging:

"Again, experience and being in different circumstances. When you're in the construction industry, like Tarmac (previous company), your projects, design, development, planning stage, implementation, building, could last years. It could absolutely last years. And I've been involved with projects to do nuclear submarine bases, where they've needed to house nuclear weapons and that's been a long staged project. If you think here, we're in a very fast-moving environment with automotive really. We're on-time delivery, we keep low level stock, it is going, it is moving all the time... We aren't in that (long-term implementation). I mean we can... as I say we do look over a five-year period. But from deciding to move forward to implementing a new product, can take three to six months. So it is quite short." [Phil].

Here, he talked about projects for producing products not about projects for business growth. Therefore, this view could be more valid in the short-term rather than the long-term.

- **Postponement of the investment decision (timing)**

Among the interviewees who claimed the use of MJ factors (see 6.8.1), some highlighted the importance of deferment of the investment decision to a later date. So, while MJ factors indicate the suitability of a project, the possibility of embarking on the project remains limited to business environment conditions:

"But at the time, if it (project) doesn't hit the targets, it would get rejected. If someone wants to bring it back later on because they feel that it still has merit and events have changed then that's fine." [James].

However, uncertain financial returns are not the only reason to postpone the project, it was argued that a changing business environment might create opportunities for non-profitable projects to become profitable as explained by one interviewee:

"So we don't just throw them out because they've got negative net present value, we just look to see if there are further developments of it which actually might take that to be a positive." [Ken].

The postponement decision could be ascribed to the desire to capture the right opportunities regardless of the time it might take:

"Projects can be re-used again after two or three years. Even if they've been rejected previously, circumstances change." [David], or until the company's ability to exploit these future opportunities increased: *"Until either we can raise funding or until we're more certain of the level of income."* [Alan].

6.8.3. Motives for deploying MJ factors and ROA factors in the IAP

In addition to the flexibility, interviewees signalled another driving force for considering MJ and ROA in the IAP. This emerged as "enhancing the achievement of the business strategy" through gaining and maintaining strong competitive advantage in the long-term. This seemed to enable the company to exploit future opportunities that otherwise could not be captured without such strategic investment. An example representing interviewees' views is outlined below:

"There's some investment, for example, we've have a foundry in the Czech Republic, and most of the large investment there is all about trying to improve the added value. It is sort of more strategic investment...The justification is capacity for the future. Investment in machinery in the Czech Republic is all about, you know, it is to do with the strategy of the business and the benefits will be five-to-ten years." [Jill].

The second motive is related, somehow, to the first one in terms of difficulty of quantifying the prospective outcomes of the project:

"I think we use that sort of methodology (ROA) because it is difficult to quantify what the end result's going to be." [Paul].

The uncertainty of the project's outcome was ascribed to the risk attached to the project. This uncertainty was seen as a fertile environment for MJ and the ROA deployment. One interviewee stressed the importance of MJ factors for assessing risky projects as explained below:

"So it (risk assessment process)'s a matter of discussion. Not based on anything but what's happened in the past and what we think might be happening in the future... the judgement is the experience, it is not written down." [Gail].

6.8.4. Factors influencing the use of MJ factors

In addition to the factors influencing the use of either approaches mentioned earlier, the interviewees have identified two main factors central to the deployment of MJ factors in the IAP. Those are listed below:

- Assessors' competence

Some business unit managers suggest the proposals were caricatured by decision makers at top level as unable to carry out an IAP properly to a sufficient high standard because of lack of skills. This manifests itself in lack of consistency in the process of collecting, analysing and presenting the proposals. Therefore projects may get rejected even they might look attractive:

"...I mean, I think the key thing about all of the investments is actually the quality of the analysis ahead of time to make sure that it is fact-based rather than just based on whims. So that people have done adequate research into the market, they've done adequate research into getting a proper assessment of the competitive climate and, you know, we've got a good understanding of how other sort of positioning will have in the marketplace. And most investment proposals that I see tend, if anything, to be weak in those areas. Have they done enough market research, market analysis, competitor analysis and they'll get, if they come though here, they'll sometimes get sent back because they haven't actually done a good enough job of that." [Ken].

In this context, the focus is on the skills required for understanding the business environment in order to identify the potential growth opportunities that allow the use of MJ factors. This stresses the importance of both experience and skills in validating the proposals. Thus, proposals that are prepared by an experienced and skilled team are more likely to be credible and convincing, subsequently, having a bigger chance of being accepted than those prepared by a less qualified team.

Given the perception above, it was claimed that staff shortage and unfamiliarity with large projects might contribute to lower ability in considering MJ in the IAP, as expressed by one interviewee:

"But a very limited number of project engineers, limited experience in handling major projects... So things like project management, you know, even a large number of contractors, like we've got going on at the moment, has quite an impact on people to manage on top of their day-to-day job." [Jill].

- Future growth

While the overall emphasis on financial returns remains, undertaking strategic projects, whose financial returns would not be realised in short-term, can be, for some interviewees, another approach for consolidating and sustaining the stream of income. However, it is argued that MJ factors are essential for assessing such strategic projects and facilitating the potential adoption of the ROA. An example of using own judgement for projects with growth options is outlined below:

"In that particular case (undertaking long-term project with no immediate financial returns) it was a situation where we knew that we were setting a foundation for a business and it was put together with a total package of further phases which would actually turn the negative net present value into a positive one. When we entered into it, we actually knew that if that was the only thing that we did and we didn't do the other phases, we would have a negative net present value. But our judgement at the time, and has proven to be right, was that actually at some stage in the future we would do further phases, which we do. And so it is effectively justified itself." [Ken].

This particular interviewee emphasised the importance of striking a balance between the use of appraisal approaches (financial approach and strategic approach) and how the nature of the project might determine the deployment of each of them in the decision-making process:

"... I mean it (decision-making process for growth projects)'s a combination of financial metrics and judgement ultimately. And there may be situations where the judgement would override the financial metrics. It would be unusual but those situations might arise from time to time." [Ken].

In line with this issue, another interviewee provided an example where the strategic approach (MJ and ROA) overrides financial analysis. While stressing the importance of MJ factors and the ROA for assessing projects with growth options, it also highlights the impact of the assessor's background on the potential adoption of the ROA:

"Interviewer:...For example you have calculated the net interest value and it is negative for this project, but you feel, really we have to go ahead because we feel it will be worthwhile.

Interviewee: I think the Japanese probably do think that way. If the investment in the 400 ton press that we made to improve our profitability, if you'd looked at that purely on financial numbers I wouldn't have invested in it, but the Japanese felt that it was the right thing to do. So I can only say that I believe that their judgement was on their experience, their understanding of press work in Japan." [Nigel].

6.9. Business strategy

The focus here is on how the interviewees perceived the business strategy and the extent to which it has been considered in the IAP.

The interviewees highlighted the crucial role of the IAP in creating and enhancing the competitive advantage through eliminating projects that do not advance the business. In addition, compatibility of the projects with the business strategy was seen as important in the decision-making process.

6.9.1. Perception of business strategy

Business strategy was perceived in terms of improving the company's competitive position. Therefore, it was argued that the outcomes of the IAP need to feed into achieving this objective:

"In the scheme of things, what we're trying to do is grow the overall value of a business. So what we tend to do is we actually run, internally, we actually have economic value models for all of our businesses and basically the model is used to come up with a view of the intrinsic value of the business. And we look at the intrinsic value at the beginning of the year and the intrinsic value at the end of the year and hopefully the investments that have been made in the business during the year have enhanced that intrinsic value. Now, if every single investment was a sustaining investment and had a negative present value, then it is likely that the intrinsic value of the business at the end of the year is going to be lower than it was at the beginning and that's clearly not where you want to be." [Ken].

Given the perception above, it was claimed that the enhancement of the market value requires a portfolio of investments with different outcomes at different timescales. While carrying out projects with clear financial returns, there is a need for growth projects to sustain the stream of income in the long-term, as one interviewee explained:

"... If you look at the categories of the investment. There's on the one side, there's to create capacity you might need new machines. So that links straight back into strategic decision. On the other side, maintenance of operations, to continue normal ongoing of your business you need to invest in certain things, because things are going to wear out. So there are two very distinct things." [Phil].

6.9.2. Business strategy as the central focus of the IAP

There was a sense amongst the interviewees that criteria deployed in the IAP as well as in the decision-making process vary depending on the expected contribution of the project in consolidating business strategy. Consequently, the use of appraisal criteria is determined, to some extent, by type of project and its contribution to the achievement of the business

strategy. This contribution appears either in financial terms or in revealing future opportunities that could be translated into financial terms in the future:

"We have gone ahead with projects which have not achieved that (required ROI) on the basis that it is a new business project with the objective of achieving that figure at a later date. So it is not hard and fast. If it is a strategic project for new customer business, for example, then it may get approved at a lower rate, internal rate of return... It is because strategically it is a small part of a bigger jigsaw in terms of trying to secure business or additional business with that customer." [David].

However, it was claimed that financial returns are not the only criterion to judge a project's contribution to business strategy. This contribution could be realised in terms of the indirect impact of the proposed project on supporting other activities. So, occasionally, projects are assessed in terms of their intangible contribution to the overall business strategy not merely on their individual outcomes:

"So whilst there isn't per se a financial case for that investment, by not doing it you actually stop your business or a chunk of your business. So in effect there is a financial impact. So you can backtrack it to that and say 'OK'. There are some things if you like there is no apparent return but actually we need, just through the normal course of business we have to be doing these things, so it gets passed." [James].

It was argued that this distinction between a project's contributions led to variation in the criteria employed in the IAP and the rationalization for conducting each type and subsequently, the basis upon which the investment decision was made:

"Well, I think it (project with non-financial returns) just requires different, the paper with it requires different information. So it just needs an explanation of, instead of, if you like, a project that you're doing for profit, which is outlining the opportunity and the benefits from doing it. For something that isn't giving a financial return or an apparent financial return, the paper is outlining the requirements of why actually it has to take place or otherwise it has these impacts on the business. So it is, if you like, it is still an information paper, but this way it is, if you like, more internal to the business rather than external where you are hoping for

new business, this one is almost maintaining your business as it is. So it is exactly the same format but a different type of content." [James].

So the alignment of the project with business strategy is central to the decision to undertake it or not. This configuration implied the consistency of the project outcomes with the company's vision.

6.10. Summary

A variety of definitions of the IAP emerged from analysing the interviews. This diverse range of definitions means that assessors view the IAP differently. While there is a consensus about what the IAP is actually aiming at, different appraisal approaches appeared in practice to achieve that aim. This reflects diverse interpretations of the impact of various factors affecting this process.

One of these factors is the risk attached to the proposed project. The analysis of the interviewees' responses suggests that there is a general pattern of 'risk aversion'. The approaches used to envisage the likely impact of the risky project on the company varied between firms. While large companies tend to use few risk appraisal techniques with minimum application of MJ factors, small companies tend to rely purely on MJ factors. The use of risk techniques was linked to type of investments. They are more likely to be used when investing in projects away from core business while relying on MJ factors when investing in core business. Another form of risk treatment appeared to be risk transfer. Customers were involved in funding the risky projects.

Investigating the context of the SIDs is amongst the key objectives of research. This is closely linked with the IAP, and appears to be a complex area. Informal and formal communications seem to influence the decision in many ways. In firms where informal communications dominated, the decision-making process often takes the form of endorsing the decision that has been made informally.

Whilst the use of financial analysis and the strategic approach together might be seen as complementary in the IAP, it is not an equitable relationship when it comes to the SIDs. Many

issues appear to influence the use of either of these approaches (communication, skills, project type, financial appraisal structure, funding and other factors). In addition, the existence of financial constraints restricts to some extent the use of MJ factors in the decision-making process. However, it is important to recognise that achieving flexibility associated with ROA has more to do with effective project management and appropriate organisational structure than with the financial constraints that might be in place.

A consensus seems to feature in this process and is viewed as essential to get everyone behind the decision. While limited flexibility is given to business units with regard to low spend projects, the decision about high spend projects remains in the head office hands. This was partly ascribed to ensuring alignment of the proposed projects with the overall business strategy and scrutinising the credibility of the proposals.

When considering MJ factors in the IAP, there are contradictory views being presented. On the one hand, there are those who argued the complementary status of MJ factors, but on the other hand, there is the notion that MJ factors are more appropriate for strategic projects regardless of their financial returns, that is, MJ factors can be used on their own for projects with growth options and trigger the application of the ROA.

There appears to be a sound understanding and consideration of the ROA factors in the IAP. This had its impact on the decision-making process in terms of projects being approved or rejected. The main motive for considering these ROA factors seems to be enhancing the "long-term competitive advantage" through undertaking projects with growth options regardless of the risk attached. The link between the IAP outcomes and business strategy is very profound. Failure to make the right decision about the proposed projects might lead to destruction of the company's competitive position. Therefore, compatibility of the proposal's outcomes with the firm's business strategy was seen as a decisive factor in approving any project. These outcomes might come in the form of financial returns or future growth options.

As the empirical evidence has now been completed, the findings obtained from the analysis of the quantitative data (Chapter 5) and the qualitative data (this chapter) are integrated to form research results that are presented in next chapter. A reflection of these results on financial theory is made through linking these results to the theoretical framework developed in Chapter 3 which appears to be viable as explained in the following chapter.

Chapter 7

Analysis of Research Results

7. 1. Introduction

This chapter presents the inferences made based on the research findings obtained in the preceding two chapters (Chapters 5 & 6). Since the hypotheses appeared to be plausible, as they have been tested [5 are supported & 2 are denied], and provided explanations for the phenomena under investigation (the role of MJ and the ROA in the IAP), the findings of this research represent facts that were reached through logical reasoning. Given that the aim of this research is to reach specific conclusions, this deductive inference, which moves from the general to the specific and from explanation to fact, is thought to be appropriate. This deductive inference was enhanced by a fieldwork study that provided a sound illumination about the context within which MJ and the ROA in the IAP take place.

While these inferences might be considered as further interpretations of the evidence collected from both data sources, they draw concluding findings that contribute to the theoretical development of the IAP. This contribution is crystallised by the introduction of a new investment appraisal framework that takes account of the growth options associated with proposed projects, together with the financial returns.

This chapter starts with presenting the results of the impact of the corporate context of the IAP on the investment appraisal structure. This includes an explanation of how the elements of this context might affect the deployment of MJ and the ROA in the IAP. The most influential factors appear to be the organisational structure, project risk, culture and analysts' competences. This is followed by presenting the current investment appraisal practices and the extent to which the strategic approach (MJ and the ROA) is considered as an investment appraisal approach compared to traditional financial analysis. This has led to the presentation of the general characteristics of the IAP.

Since the outcome of the IAP is expressed in an investment decision, the involvement of MJ factors in the SIDs is also presented. The key findings of this research then are presented

before presenting the implications of these results for theory. These implications are expressed in the theoretical development which represents the "research contribution" to the investment appraisal discipline. Finally, the credibility of the research findings is assessed and the possibility of applying these findings is demonstrated.

7. 2. The corporate context of the IAP

To understand the IAP, it is necessary to perceive it in conjunction with the context of the overall planning and budgeting process and the factors that influence the evaluation of the capital expenditure. Since each firm has its unique characteristics, the impact of this context varies among firms. The general contextual factors that appeared to influence the IAP and shape the firm's investment policy are listed below:

7.2.1. Organisational structure

It was observed in preceding chapter that, in large companies with many divisions, the IAP takes a formal structure. This structure implied a long journey for proposals to be approved and less informal discussion about the proposal between analysts (people who carried out the appraisal process) and those who make the decision about the proposals. This meant a limited role for the communications to support a decision in favour of the project proposed.

This kind of structure made it difficult for business unit managers to convince the Head Office about the suitability of the proposals, especially those do not match the fixed financial rules set by the head office (*e.g.* specific hurdle rate, payback period, minimum required ROCE). Furthermore, this has an adverse impact on the approval of the projects required for the growth of the business unit. Therefore, companies featured with this kind of structure are more likely to be financially-orientated and restrict the use of strategic approach (MJ and the ROA) to the Head Office.

On the contrary, flexible and semi-structured firms seemed to have informal communication channels that accompany the formal one. This informal communication channel proved to help the analysts not only in presenting their proposal in a flexible way but also in convincing the decision-maker about the aptness of the proposal, especially, proposals related to projects whose financial returns are not predictable in the short-term. Since fewer financial constraints

are involved in this kind of structure, MJ factors seem to play a significant role in the SIDs and the possibility of ROA adoption is high. This is supported by the strong, clear communications created by the fact that analysts and decision-makers work closely with each other.

It appeared that the existence of the informal communications have led to the notion of "selling the investment decision" either formally through official channels of communications (formal discussion between interested parties prior to board meeting) or informally (meetings outside the work environment). Subsequently, board meetings, in some cases, became a way of endorsing the proposals that have already been agreed informally. However, intensive discussions and arguments might take place in board meetings if the interested parties have poor communications. This might result in projects with a good business case being rejected.

The role of communications in the IAP seemed to be affected largely by the type of organisational structure. The tight structure seemed to allow communications through official channels (formal meetings), hence with less chance for the investment decision to be sold. In contrast, flexible and semi-structured forms allow for the informal communications and consequently a big chance for the investment decision to be sold.*

Thus, the structure of the IAP is a crucial determinant in the involvement of MJ and the ROA in the IAP. However, the significance of this structure is mostly affected by the type of communications that dominate the firm. A distinction can be made between two kinds of communications: one-way communication (either bottom-up process or top-down process) and two way-communications (discussion and interaction between parties involved in the IAP). This distinction seemed to be important since the type of communication affects the involvement of MJ and the ROA in the IAP. It was noticed that the latter type of communication facilitates the strategic approach in the IAP more than the former one. This might explain the propensity of a potential adoption of the ROA among small and less geographically-spread companies than very large ones. The role of communications in the IAP can be depicted as follows:

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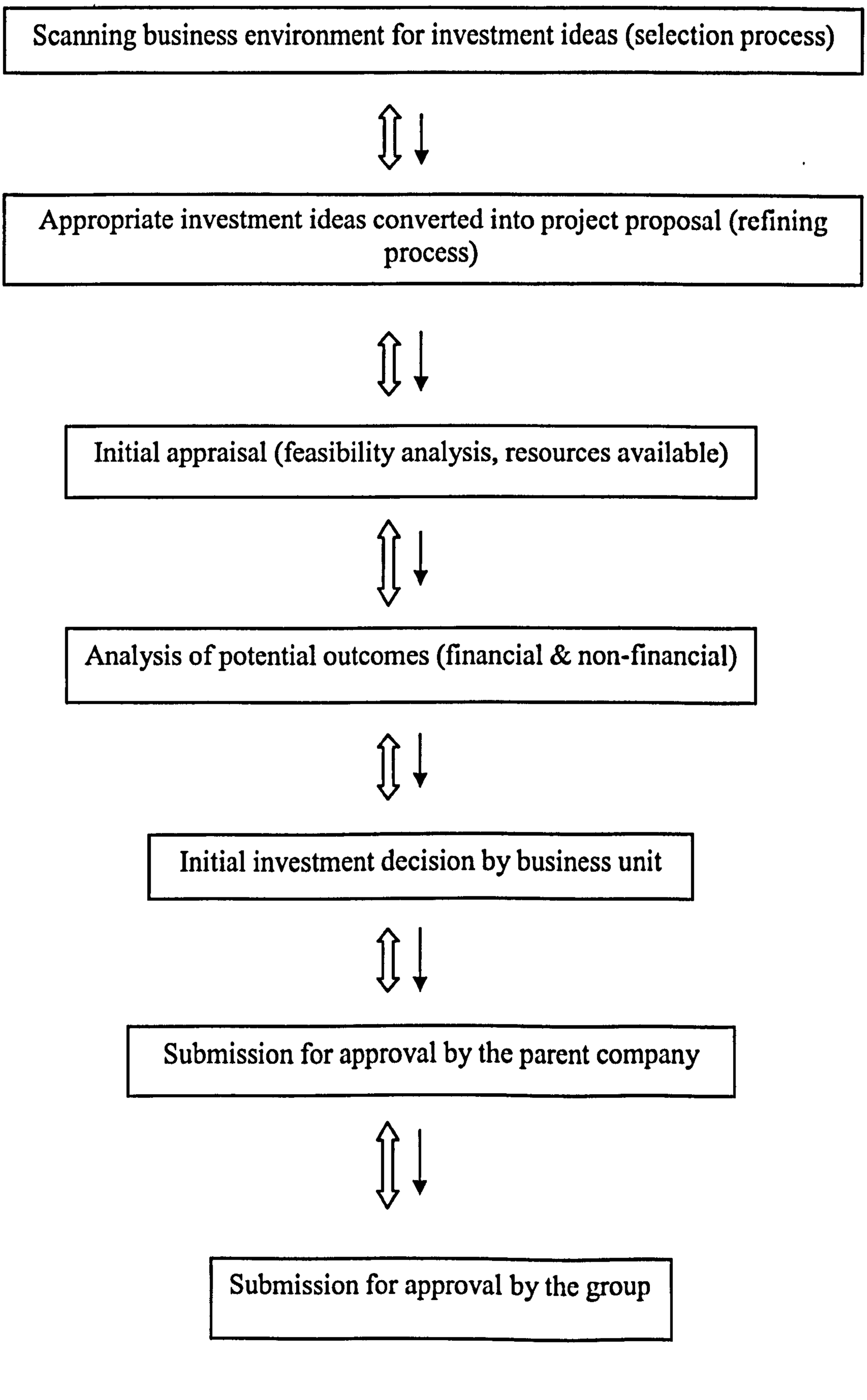
* The idea of selling investment decision was highlighted in Lumijarvi' study in 1991.

Figure 7.1. Formal and Informal Communications in the IAP



7.2.2. Project risk

The existence of risk seems, in many cases, to necessitate the deployment of MJ factors. This is due to the positive correlation found between these two variables (Chapter 5). However, the extent of the application of MJ depends on many factors such as analysts' competences and availability of funds. Therefore, firms vary in their capabilities to implement and exploit the opportunities that might arise from undertaking risky projects.

While some firms are tempted by the future growth options generated by risky projects, they face difficulties in undertaking such projects. Part of the reason could be ascribed to the difficulty in convincing the interested parties in the IAP of the future benefits of such projects due to the complexity of converting these benefits into cash flows in the short-term. Yet, the main obstacle seems to be lack of resources available (experienced people and funds). For that reason, highly risky projects, in some cases, are likely to be rejected due to lack of skills in understanding and dealing with such projects and funds, even when these projects have a good business case.

"Risk aversion" seems to be prevalent in this competitive environment. Subsequently, more focus was placed on the financial outcomes of the projects than on growth options. The directors' unfamiliarity with risk management and the relentless pressure from the market for high performance seems to contribute to this propensity in risk perception. While this has led to decline in undertaking long-term projects whose returns would not appear in near future, it also limited the use of MJ and the ROA. Therefore, the adoption of the strategic approach entails both the provision of effective oversight by the finance directors of risk management and the integration of the risk management into the IAP.

Nevertheless, when the conditions are appropriate for undertaking such risky projects, the strategic approach seems to be crucial not only in the IAP but also in making the SIDs. Furthermore, MJ factors are relied upon heavily as risk techniques more than the traditional risk techniques that might be in place. Many directors interviewed have expressed this attitude.

An example is illustrated below:

"Interviewer: Does this mean when assessing a risky project or this kind of project you tend to rely more on your experience and own judgement rather than financial techniques or figures to convince them (other directors)?

Interviewee: That's right. I mean I think what we have, we have track records of previous projects. So we're able to assess how likely we are to achieve the, you know, to ensure that the numbers that we are actually looking at are realistic rather than just optimistic because people want their projects to be approved. So I think that's the bit that, if you like, the finance department feeds into it." [James,VL]

7.2.3. Cultural influence

Most firms included in this study have international involvement in some way (*e.g.* subsidy, joint venture, business unit with head office located abroad, head office in Britain with business units in Britain and abroad, sister companies around the world). The role of the culture in the IAP is reflected not only in the way analysts perceive the benefits associated with any project but also in the criteria to be deployed in the IAP to capture these benefits. The role of culture becomes more apparent in the case of the joint venture where the management team represents two different cultures as explained by one interviewee who worked for a British company (U) for a long time (20 years) and then established a joint venture with a Japanese company in 1996:

"Interviewer: is there any problem in communication between the Japanese and the British?. The way they do things?

Interviewee: yeah, I expect there is. I think it's probably on the investment side, I'm talking from experience when it was Unipart, it was very much, if you didn't get a payback then we don't do it unless it was a really strategic, big strategic reason, Unipart might change their mind if they were trying to get into a new product. With the Japanese I think it tends to be on gut feel, experience. They know what they're doing.

Interviewer: they're thinking for a long time maybe.

We understand this business and we know what we should be doing. And then they'll roll it out through a business plan and if the profit is maintained, because they don't look for a huge growth in profit, they just look for a steady profit line really." [Nigel, L]

These different attitudes shape the investment behaviour and the investment strategy in the firm. Therefore, firms might have their unique appraisal process that approves projects that might be rejected by other firms.

7.2.4. Analysts' competence

Although the managers in this study appear to have the theoretical knowledge and working experience required to carry out the investment appraisal, this was not sufficient to capture the full elements of the IAP. Lack of knowledge and experience in assessing risky projects and dealing with projects with growth options, in addition to preparing the project proposals in a more convincing format have been identified as the main areas where further training is required.

This might have contributed to the prevalent "risk aversion" attitude. It appears that lack of experience in dealing with risky projects has led to the failure to capture the full range of benefits associated with such projects. As a result, only a slim chance of approval is given to such projects in the IAP. Lack of knowledge about the ROA has contributed to this propensity. Very few signs of applying ROA factors were shown in the IAP. While this might reflect unfamiliarity with the ROA due to less exposure to this approach and projects that necessitate the deployment of this approach, it also stresses the financial orientation of the firms. Lack of competence might justify the suggestion made by writers [*e.g.* Busby & Pitts (1997), Bowman & Moskowitz (2001)] that few practitioners understand or use the ROA.

7.3. Current practices in the IAP

This study discovered that the structure of the IAP varies among firms. It ranges from a highly structured process (formal procedures to be followed) to flexible (with less financial

constraints). The characteristics of the firm seem to shape the IAP. Firm size proved to be influential in this concern. The larger the company the more structured is the IAP. While the IAP might vary among companies, the composition remains the same. However, the degree of involvement of each appraisal approach (financial analysis and / or strategic approach) seems to be determined to some extent by many factors (*e.g.* nature of the project proposed, funds available, business strategy, analysts' competence, and the structure of the IAP itself).

7.3.1. Financial analysis

As is the case in most previous studies [*e.g.* Sangster (1993), Arnold & Hatzopoulos (2000), Lefly (1994)], the prevalence of PB seems to be evident. It was observed that in the IAP, no matter the nature of the benefits generated by the proposed project, this technique is relied heavily upon. The emergent propensity appeared to be the higher use of ROCE which seems to gain support among firms (in contrast to Sangster 1993). Moreover, this technique is more prevalent than DCF techniques.

While other studies (Pike 1996, McIntyre & Coulthurst 1986) reported an increase in the use of the DCF techniques, this study shows lower popularity of these techniques, at least in the BACMs. This new shift in the attitudes toward the DCF techniques might be a sign of acknowledging their failure to capture the whole range of benefits associated with new projects, especially strategic ones whose outcomes are not convertible into cash flows in the short-term. This looks as if it paved the way for the adoption of the strategic approach for strategic projects. However, a financial case is still required for such projects as expressed by one interviewee:

"Well, I would still always prepare the cash flows, just to make sure that we knew what the implications on the profit and loss and the cash would be, because I only need to factor that in. We would never be casual enough to say 'Oh yes, we know we need a new, whatever, half a million pounds. We'll go away and do it.' We would always need to assess the financial impact." [Jill, L].

This study provides similar findings to previous ones regarding the use of more than one capital budgeting technique in the IAP. However, these techniques have not been given the

same weight in the combination. It appears that firms rely on one or two techniques as primary, and some as secondary. In addition, there are no shared attitudes about which techniques should be primary or secondary. Each firm has its own primary and secondary techniques that suit its investment strategy. Nevertheless, a general propensity can be noticed in the fact that most large companies use IRR (as the case in Arnold & Hatzopoulos 2000), then PB whereas small companies rely upon ROCE and then use PB.

The contrasting findings of this study to previous ones regarding the prevalence of the investment appraisal techniques could be due to the time interval between this study and the others (more than 10 years time interval) so this might reflect new attitudes. Also it could be ascribed to the type of industries in which each study was carried out and companies involved in each study.

7.3.2. The strategic approach

The involvement of the strategic approach (MJ factors and the ROA) in the IAP tends to be in terms of discussions in meetings more than a formal appraisal approach. It was observed that directors bring their experience and own judgement, in some way, into the IAP. In addition, they recognised the ROA factors. However, this has not been crystallised in a formal process of approving projects on the basis of this approach. Therefore, the adoption of this strategic approach in the IAP appears to take place informally. This could be ascribed to poor knowledge and little understanding of the link between MJ factors and the ROA in the IAP. It was noticed that directors do not recognise that bringing MJ factors (past experience, intuition and own judgement) into the IAP increase the chance of applying ROA and approve projects with growth options. This provided evidence to support the view that informal adoption of this approach may be taking place in this industry.

The incorporation of the strategic approach in the IAP seems to vary widely among companies. While it is a one-off incident in some firms, it is more frequent in others. Furthermore, it varies from project to another. It was noticed that this approach is more likely to be applied to long-term projects whose returns cannot be converted into cash flows in the short-term. Therefore, the strategic approach is used to justify the project on the basis of strategic benefits that would contribute to the achievement of the business strategy by

exploiting the future opportunities. This has affected the assessment criteria in the IAP as explained by an interviewee:

"Interviewer: For me it looks like you use different techniques for different projects?

Interviewee: It can be, yes. Not everything would be supported by a discounted cash flow, correct." [David, VL].

7.3.3. Complementary status

It was noticed that the strategic approach is sometimes used as a complementary approach for the financial analysis. The effectiveness of the strategic approach in the IAP was perceived as very low by firms. Consequently, few projects are approved purely of the basis of the strategic approach. Most directors seem to place high value in figures. Therefore, economic arguments of the proposed projects come first, if the financial analysis shows a shortfall in the returns required, given the fact that the project is a strategic one, then the strategic approach is used to check for any strategic benefits that might compensate for the financial losses.

This combination of the two approaches in the IAP is not equal. It seems that this combination is affected by the contextual factors explained at the outset of this chapter. For example, it was noticed that while companies tend to use a combination of financial techniques (PB and ROCE) together with MJ factors for projects with growth options, MJ factors seem to be more important than the financial ones for such projects. This meant that the nature of the project influences the extent of the deployment of either approaches in the IAP. When the financial analysis proved that the expected returns match the required criteria, little attention is paid to the strategic approach. However, when the strategic benefits appear to be attractive, firms still do the financial analysis to see the impact on the financial situation of the company. This might justify the use of PB and ROCE for projects with growth options to supplement the strategic approach. It was noticed that few projects might be assessed purely on the basis of the strategic approach in exceptional conditions. These conditions are created when most of the factors that facilitate the application of the ROA and MJ factors exist (high risk projects, positive attitudes towards risk, well-experienced analysts, availability of funds, and alignment of the outcomes of the proposed project with business strategy).

This complementary status of the appraisal approaches seems to distinguish this study from previous ones that focused on the financial returns from proposed projects. Therefore, the IAP is not a static, single criterion process. It is dynamic, multi-criteria process with many influential parties interacting and contributing to the decision about the validity of the proposed project. This complementary status is expected to enhance the possibility of approving projects that would have been rejected on the basis of one assessment approach alone.

It should be stressed that, although there is no formal adoption of the strategic approach, this approach seemed to be adopted in conjunction with the financial analysis, perhaps as a part of a general appraisal process. This reflects the early stages of the recognition of the role of MJ and the ROA in the IAP.

7.4. Characteristics of the IAP

Having explained the IAP and the factors that affect this process, the general features of this process can be summarised as the following:

1. The nature of the benefits generated by the proposed project is the primary criterion for selecting the assessment criteria and approaches.

2. The resources available for investments are the crucial factor in implementing the projects.

3. Financial analysis is the dominant approach in the IAP and is given priority over the strategic approach. In exceptional circumstances, the strategic approach might be deployed. These circumstances might be moving to a new business, appraising investments with growth options, high risk environment, and availability of experienced analysts. These conditions enhance the possibility of deploying MJ and the ROA in the IAP.

4. The integration between the appraisal criteria seems to feature in the IAP for most companies. The complementary status of both appraisal approaches (financial analysis

and the strategic approach) has widened the scope of the potential projects to be undertaken.

5. The complexity of the context within which the IAP is conducted makes the process take different directions in different conditions. This dynamic property reflects the interrelationships between the elements of the IAP. Therefore, the IAP is not a static one with specific procedures as depicted in previous models.

6. Analysts' experience and judgement could widely influence the outcomes of the IAP.

7. No firms employ the ROA in the IAP in any formal sense. Where they do it, it seems to be part of an overall strategy (holding a portfolio of investments) where some projects might generate cash flows in the short-term and others with growth options that can be converted into cash in the long term. This is consistent with the findings of Busby & Pitts' (1997) study where managers reported the importance of the ROA in the SIDs, but few firms have formal systems for valuing them. Therefore, in this industry (BACMs), the application of the ROA in the IAP appears to be implicit and at early stages.

8. Investment expenditure comprises expenditure on ongoing activities, plus acquisitions, new projects. The involvement of the strategic approach in the IAP seems to be mainly restricted to acquisition and new projects. It rarely applies to ongoing activities (*e.g.* replacement, expansion projects).

7.5. The involvement of MJ factors in the SIDs

It is necessary not only to view MJ factors in the context of the IAP, but also in the light of the SID-making process. It was observed that the involvement of MJ factors in the SIDs is more prominent than in the IAP. Part of this appears to be the failure of the financial analysis to capture all benefits related to proposed projects. Therefore, MJ factors have not been used solely as an appraisal approach but also as a decision-making approach. Therefore, while a simple decision criterion might be used in the IAP, multiple criteria are used in SID-making process.

As is the case in the IAP, the financial criteria are given priority over MJ factors in the SID-making process. The use of MJ factors appears to be restricted to growth projects whose financial returns are marginal. However, growth projects with a negative NPV seem to be rejected. While this reflects the financial orientation attitudes, it also indicates the cautious attitudes towards this approach as companies rarely use it on its own. This might highlight again issues of experience in using this approach and dealing with risk as well. This complementary status has featured most of the firms involved in this study. An example of integrating MJ factors into the SID-making process is illustrated by one interviewee:

"Interviewer: Does this mean that you think there are limitations of these financial techniques?

Interviewee: Yes, I think there are limitations to all financial techniques. I think there are limitations to financial statements generally in companies. I think the whole point of having financial metrics is actually to provide signposts and to raise warning signs and make sure people focus on things. I don't think that the financial metrics necessarily drive the decision...clearly if a project came along, it was a growth project, and showed a negative net present value, you'd look at it and think, you know, chances are we won't actually do that. And the judgement tends to be exercised more in terms of, particularly the projects which show marginal returns, but also when you look at projects the whole issue is about how credible is the proposal that's being put forward....So there's a whole bunch of judgements that get brought into it in addition to financial metrics." [Ken, VL].

The focus on the financial analysis appears to be due to the focus on the financial objectives of the decision-making process. These financial objectives are varied and can be summarised in the following:

- Maximizing IRR.
- Maximizing cash flows.
- Maximizing NPV.
- Maximizing economic profit.
- Maximizing market share.
- Maximizing earnings per share.

Therefore, less attention was paid to projects with growth options whose financial returns cannot be realised in the short-term. Subsequently, there is less involvement of MJ factors in the decision-making process.

7.6. The key findings of the research

The key findings of this study can be summarised as the following:

1. A variety of definitions of the IAP were identified, ranging from structured, with low interference from assessors to unstructured, where fewer financial constraints are involved. While this reflects the diversity of the contexts within which the IAP is conducted, it also implies the variety of criteria in use.

2. The results of this research revealed that many of the firms involved in this study are using an approach consistent with the ROA in the IAP. In this study, it is referred to as the strategic approach where MJ factors (past experience, intuition and own judgement) are deployed in the IAP when assessing projects with growth options. This study concluded that there is no formal application of ROA as it has not been recognised formally in the IAP.

3. The IAP is not static. It is a dynamic one with all parties involved interacting and influencing each other, although there is no clearly defined way for appraising all projects. Each project is unique and requires a different way of appraisal.

4. The outcomes of the IAP are not merely economic. The IAP might result in accepting projects with non-quantifiable outcomes (growth options) which contribute to the growth of the company in the long-term.

5. The IAP is not merely managed by finance people, but is also a socio-political process involving a variety of individuals with varying interests.

6. The involvement of the ROA in the IAP is at an early stage and associated to the extent to which MJ factors are deployed in the IAP. It takes a form of analysts' intuitions rather

than a formal part of the IAP. It is concluded that some firms have the potential to adopt the ROA in this industry.

7. The strategic approach, whilst being acknowledged as useful and important, was placed in a supportive role to the financial analysis. In this sense, a complementary status of these two approaches is evident. This combination seems to be the ideal form of appraisal in this industry. It was perceived as a coherent and robust appraisal that considers a wide range of benefits associated with the implementation of the project.

8. A risky business environment creates a proper background for the potential adoption of the strategic approach. However, this risk is treated differently among firms. While small companies are less capable of influencing risk and business environment changes, large ones can hold a portfolio of investments to diversify risk. Therefore, small firms are more sensitive to changes in the business environment and might endure a higher degree of loss if compared with large ones.

9. There is a need for more coherent understanding by the finance directors of the risk management process in order to capture a wider range of benefits associated with the proposed projects. While this allows for more integration of risk management into the IAP, it also allows more involvement of MJ and the ROA in the IAP.

10. The employment of MJ factors (past experience, intuition and own judgement) in the IAP for risky and strategic projects appeared to be more of an individual's intuition than an application of the known financial techniques. Therefore, the extent to which these factors are deployed for such projects varies according to the beliefs and commitments of the individuals involved.

11. Highly-structured companies are less likely to adopt the strategic approach due to a formal and long chain of communications. This seems a feature of large companies where fixed financial rules (*e.g.* hurdle rate, payback) should be met in the IAP. This makes it difficult for MJ factors and the ROA to be applied.

12. The complementary status of the strategic approach in the IAP is evident. The approach is used to complement the financial analysis and is rarely used on its own to approve a

proposed project. Lack of knowledge about MJ and the ROA in general (thinking and modelling aspects) contributes to the attitudes of reluctance in using it.

13. The involvement of the strategic approach in the investment decision-making process is prominent and more influential than in the IAP. It is used when the financial analysis shows less attractive financial returns from the projects.

14. Strong, clear, communications, informal discussions, and an unstructured appraisal process seem to facilitate the application of the strategic approach. These factors characterise SMEs more than very large ones.

15. Mixing criteria in both the IAP and decision-making process seems to be evident. Which dominates is determined by the objectives of the project and investment policy for the company. However, a formal financial analysis seems to be essential for any project. MJ factors seem to be relied on heavily when moving to new area of investments.

16. The appraisal criteria and the structure of the IAP seem to be affected, in addition to the nature of the project, by the beneficiary of the project. Firms are more likely to apply financial techniques for projects undertaken for customer interests than their own projects. There is a tendency to apply the strategic approach for "own projects". This reflects the recognition of the strategic benefits associated with some projects that are necessary for sustainable growth.

7.7. Theoretical development

Having presented the research results that are derived from the research findings illustrated in Chapters 5 and 6, the question now is "how is the data related to the theory?" In other words, "are there clear implications for practice? Are the findings useful?".

The answer for these questions rests in the introduction of new framework of the IAP that incorporates MJ and the ROA in the IAP. The combination of both is referred to as the strategic approach as they are essential in considering the growth options attached to the proposed projects in the IAP. These growth options are excluded from the IAP when

proposed projects are assessed on the basis of the financial analysis alone. The implications of the research findings on the IAP development can be demonstrated in supporting the viability of this framework.

There is strong evidence to support the theoretical framework developed in Chapter 3. This framework (Figure 7.2), which represents a new orientation in the IAP by incorporating the strategic approach, seems to be valid and does exist in firms in one way or another. While this framework differs from other models in depicting the IAP as a dynamic one, it follows the same logic. The main aim of the IAP is selecting projects that achieve business strategy, in contrast to older models that focused on the financial returns as an approach of achieving this goal. This framework introduced a parallel way of achieving this purpose by undertaking projects that contribute indirectly towards achieving this goal. Such projects are essential for the long-term growth of the firm and their financial returns might not be perceivable directly in themselves but in their contribution towards supporting other activities in the firm, thus, supporting the long-term strategy by ensuring a sustainable growth for the firm.

7.7.1. The IAP as a dynamic process

In previous models, the IAP is depicted as a sequence of stages to be followed. However, here, it is depicted as a flexible process with three possibilities (three routes) based on the interaction between the factors that influence the IAP.

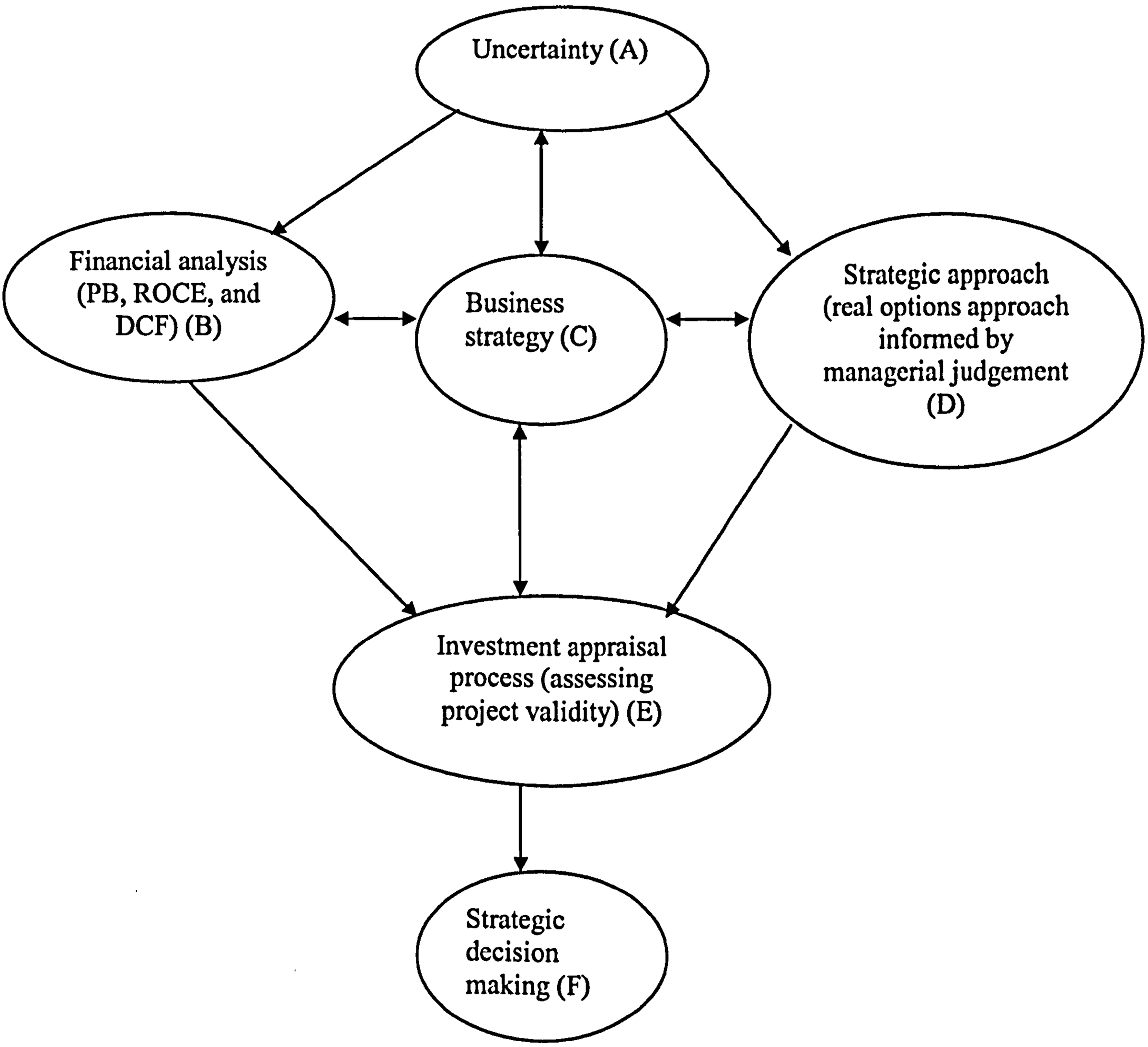
While enhancing business strategy remains the centre of the IAP, three routes seem to contribute to this goal: the financial route, the strategic route, and a combination of both routes.

- **The Financial Route (FR) [A, B, C, E, and F]**

This route is similar to the traditional route of the IAP presented by previous models and is expressed by the letters A, B, C, E, and F in the developed model in this research. This route represents the IAP in firms that consider the financial returns of project to be the essential way of enhancing business strategy. In firms that follow this route, the IAP seems to be dominated by financial constraints and hurdle rates to be met. While this structured form of

the IAP seems to select projects that ensure sufficient financial returns, it does not allow for projects whose financial returns are not perceivable in the short-term to be undertaken. Furthermore, it limits the analysts' contribution to the IAP. Therefore, this form dominates the financially-orientated firms that are less likely to undertake projects with growth options.

Figure 7.2. The Strategic Investment Appraisal Process as a Dynamic Process



- **The Strategic Route (SR) [A, D, C, E, and F]**

This route is expressed by the letters A, D, C, E, and F in the developed model. This route seems to represent firms that are less financially-orientated and are prepared to override the financial analysis in order to achieve non-financial returns (growth options) of the project. This represents strategically-orientated firms. According to this route, the belief is that enhancing business strategy can be achieved through undertaking projects that contribute to the sustainability of the business strategy regardless of their financial returns. However, a full financial analysis case is prepared for such projects and a comparison is made between the perceived strategic benefits and the expected financial consequences (profit, loss, cash flows). A judgement is made about the validity of the project based on this comparison. The decision here is more likely to be based on the ROA and MJ factors (past experience, intuition and own judgement) rather than financial hurdles. Therefore, projects with growth options have a better chance of approval than in other routes. This flexible structure of the IAP seems to allow for the potential adoption of the ROA and thus, capture a wider range of benefits associated with the proposed project than in the case of another route.

- **The Integrated Route (IR)**

This route represents a combination of both routes. This route features firms that hold a portfolio of investments containing some investments with financial returns in the short-term and other investments with growth options that contribute to the sustainability of the cash flows. In addition to differentiating between projects according to their outcomes, a distinction is made also between the outcomes from the same proposed project. Therefore, a full financial appraisal case is made for each project to assess both types of benefits, before linking these benefits to the business strategy. Subsequently, for a project with strategic benefits that outweigh the financial ones, given the fact that alignment between the outcomes of this project and firm's business strategy is ensured, the strategic route is followed (A, D, C, E, F). In contrast to this, when financial returns outweigh the strategic ones, given the fact that alignment between the outcomes of this project and firm's business strategy is ensured, the financial route is followed.

This dynamic characteristic of the IAP introduced in this study (represented in these three routes of appraisal of which strategic and integrated ones are new) has led, in turn, to

amendments in the outcomes of the investment decision-making process. While in the financial analysis (traditional) route there is one of two fixed answers to a proposed project (either accept or reject), now, according to this framework there are other outcomes introduced (wait, progress, abandon). These new outcomes of the investment decision-making process actually reflect the flexibility in the IAP. This flexibility is demonstrated in reacting to the changes in the business environment (*i.e.* new information, business risk). Therefore, this framework can be seen not only as a valuation tool, but also as strategic tool and in this strategic application lies its importance and distinction from other models developed so far in this discipline.

7.7.2. The impact of the IAP context on its structure

The context of the IAP seems to influence the decision about which route to adopt in appraising a proposed project. There are a number of issues to be considered here, mainly: perception of business strategy and how to achieve it, funds available, analysts and decision-makers' experience, risk attached to the proposed projects, and the nature of benefits generated by the proposed project (financial and / or strategic). These issues cannot be viewed in isolation from each other. Recognising the interaction between them is essential to establishing a sound understanding of the IAP mechanism. This helps in establishing solid ground for making and supporting the SIDs.

The different perceptions of the business strategy have led to different approaches in the IAP. The financial route seems to feature those companies that believe in short-term earnings as a mechanism of achieving the business objectives. Therefore, projects are selected on their financial contribution (cash flows, NPV) rather than long-term benefits. In contrast, those who consider business strategy as a sustainable process, look at the projects that achieve this strategy in the long-term. Therefore, they are more likely to take the strategic route due to strategic projects being chosen for this purpose.

While availability of funds and the flexible structure of the IAP might tempt firms to adopt the strategic approach, high risk might have an adverse impact unless accompanied with an experienced team that can deal with risk and recognise the strategic benefits related to such projects. Moreover, analysts and decision-makers' attitudes towards risk play a significant

role in this concern. Those who perceive risk in a positive way and are able to mitigate it, are more likely to take a strategic route in contrast to those who perceive risk in a negative way and mitigate it by manipulating the application of the financial techniques (*e.g.* higher hurdle rate, shorten pay back period, conservative cash flow forecast).

Culture also seems to influence the route that the IAP might take. Some might be less keen about short-term earnings and focus on the long-term benefits. Subsequently, they are more likely to take the strategic route in the IAP. While this reflects different perceptions of the business strategy, it also indicates different approaches to achieving it. International differences appear to be important in terms of the international collaborations particularly at the strategic level.

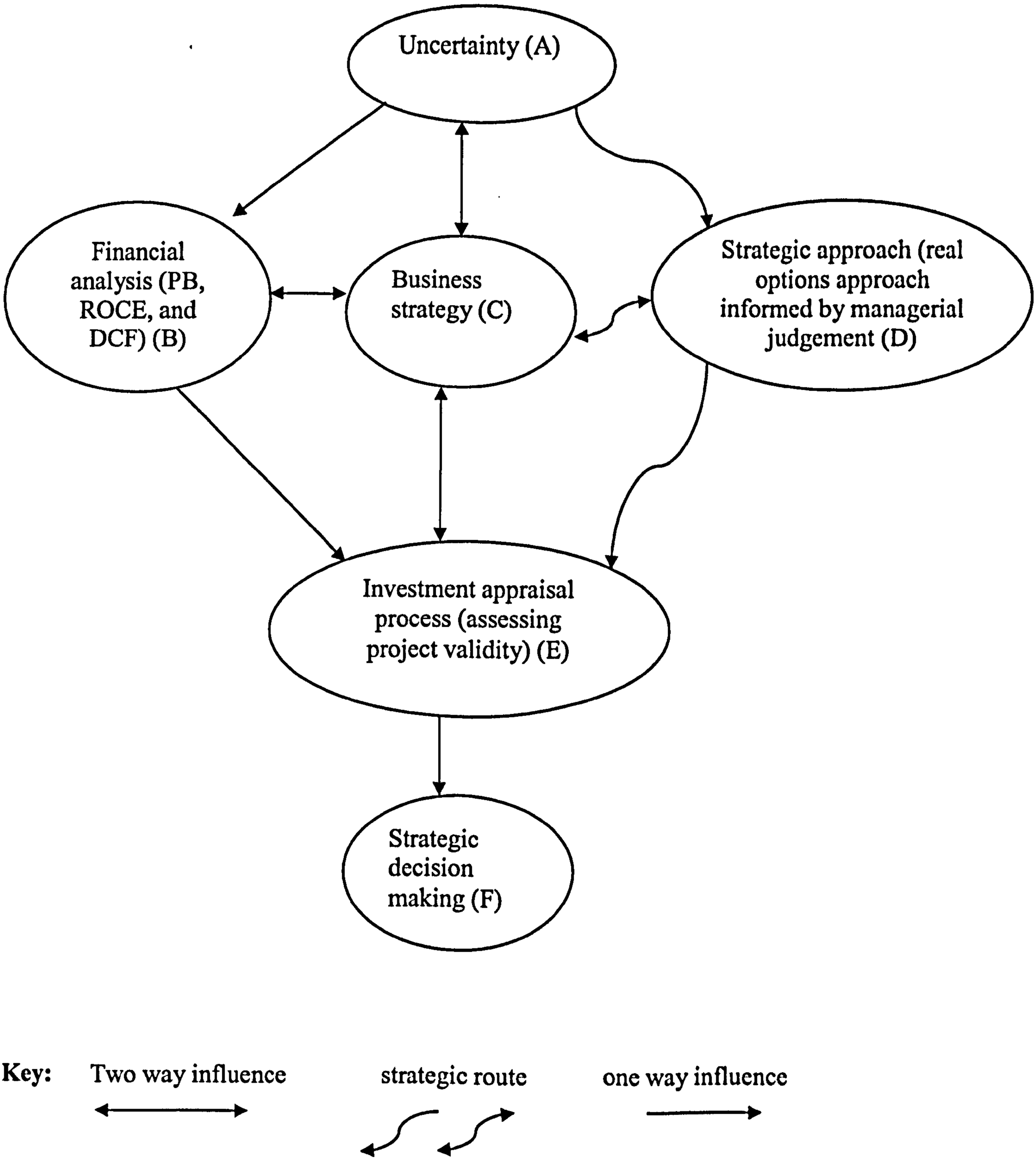
Since the project outcomes can be financial or strategic or a combination of both, this is significant in deciding which appraisal approach should be applied. Given the fact that the project's outcomes are in line with business strategy, the financial route is more likely to be used for projects with financial returns and the strategic route for projects with strategic benefits. The complementary status appears when the benefits of the project are complementing each other.

In summary, three information sets about proposed projects are required in order to specify the mode of appraisal:

1- Financial analysis: expected cash flows, financial hurdles.
2- Risk analysis: analysis of the impact of risk on the project's outcomes.
3- Strategic analysis: future opportunities that might be created by the project that can be converted to cash flows at a later date.

Given the context of the IAP in this industry (BACMs), the structure of the IAP seems to be idiosyncratic. There is no single structure. The three forms seem to exist in practice. However, there is more of a tendency towards the financial route than the other two routes. While this might signal the financial orientation propensity of the IAP in this industry, it indicates the early signs of moving towards a more strategic approach than in the past. This new direction has not yet been recognised formally in the IAP in this industry. Therefore, the strategic investment appraisal process in this industry can be depicted as the following:

Figure 7.3. The Strategic Investment Appraisal Process in the BACMs



7.8. The credibility of the research findings

Conducting research and deriving findings from the research process does not mean that the research process is completed. The most important aspect of the research process is the scientific one where the findings need to be scrutinised to check whether they do reflect the facts and can be repeated. Therefore, there are two aspects of the research findings' credibility. The first one is "findings reflecting the facts" or what is known as validity. Another aspect is "findings can be repeated", or what is known as reliability.

Since the findings are the product of the research process, the credibility of these findings is derived from the credibility of the procedures and the approaches that have led to these results.

7.8.1. The reliability of the research findings

Basically, this refers to the consistency of the research results. In other words, whether the results of the study are repeatable. The findings are claimed to be reliable if they can be obtained by another researcher following the same research procedures.

It is claimed (Gill & Johnson 1997) that by using highly-structured questionnaires to gather data in a form that is quantitatively analysable, survey-based research is usually regarded as easily replicable and hence reliable. The coherent procedures followed in developing and testing the research instruments (questionnaire and interview) has contributed to reliable results. Both instruments were tested prior to the main study (piloting the questionnaire, conducting mock interviews). The use of a reliable data source (FAME) and reliable analytical procedures (SPSS) and template analysis enhanced the reliability of the findings. All these procedures are documented to allow replication.

The most significant aspect of reliability was the use of standardized tools (standardized questionnaire, interview schedule and asking the questions precisely as they are worded and in the same order that they appear on the schedule). This manifested itself in the consistency of the data analysis procedures. No unusual results or contradicting test results were obtained in the statistical analysis or in the thematic analysis of the interviews. No difficulties were faced in coding and assigning paragraphs in the transcripts to related themes. This

demonstrates the fact that the respondents and the interviewees have understood the questions in the same way. Many shared attitudes and opinions among directors were observed. This enhanced the reliability of the findings of this research.

The detailed procedures followed to ensure research reliability are illustrated in Chapter 4 (4.6.1). The documentation of research procedures facilitates the replication of the study by other researchers.

In addition to ensuring the reliability of the research instruments and data collection procedures, efforts were made to ensure the reliability of the measures of the study's concepts as suggested by Bryman (2001). This is facilitated by the wide coverage of literature related to concepts included in the framework developed. Each concept is clearly defined and the elements that constitute each concept were specified.*

These defined concepts and constructs were measured using commonly-used measures that proved to be valid and reliable (statements embedded in questions). Moreover, these measures were deployed in previous studies in this area of research and yielded reliable results. Similarly, the scales used in this study (nominal and ordinal scales) are the most commonly used scales in scientific research and have been repeatedly used in previous studies. These procedures reflect the reliability in measuring concepts and constructs.

While concepts and constructs can be measured quantitatively when dealing with quantitative data, for data gathered by interviews, it is claimed (Silverman 1993) that "authenticity" rather than reliability is often the issue in qualitative research The aim is usually to gather an "authentic" understanding of people's experiences and it is believed that "open-ended" questions are the most effective route towards this end (*ibid*).

To ensure the authenticity of the interviews, all questions were of an open-ended nature and interviewees were given ultimate freedom to express their views and attitudes. This manifests itself in the use on non-academic language in the transcripts and quotes used in Chapter 6. Therefore, interviews provided an accurate and clear picture of the respondents' behaviour and attitudes.

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* Refer to Chapter three (section 3.6.3)

7.8.2. The validity of the research findings

While reliability refers to the possibility of replicating the research procedures that generated the findings, validity is concerned with the integrity of the conclusions that are generated from a piece of research (Bryman 2001). It is argued (Mason 2002) that if the research is valid, it means that you are observing, identifying or "measuring" what you say you are. Therefore, validity is often associated with the 'operationalization' of concepts (*ibid*). There are a number of different types of validity measurement as explained in Chapter 3, most of which revolve around two issues:

1- The accuracy of the measurement process: this is commonly known as construct validity. It refers to the extent to which the measure reflects the concept that is supposed to be denoting (Bryman 2001). More specifically, does the scale encoded into a set of questions actually measure the variable it is supposed to measure (Gill & Johnson 1997). It is argued (Bryman 2001) that this can be established by asking people with experience or expertise in a field whether the measure seems to be capturing at the concept that is the focus of the attention. Protocol analysis (Ericson & Simon 1993) was used to provide a sound validity of the research measures. Copies of the questionnaire were distributed electronically to several experts at the Business School who were asked to give any thoughts that occur to them when answering the questions (what each question is about?). This helped in wording the questions and the selection of the specific expressions that reflect the concept under investigation.

To increase construct validity during data collection process, multiple sources of evidence are used. This ensured the establishment of a chain of evidence. This tactic (Yin 2003) is thought to enhance the validity of the research findings. Since multiple sources generate different kind of data, comparing different kinds of data (*e.g.* quantitative and qualitative) and different methods (triangulation) to see whether they corroborate one another is claimed to enhance this validity as well (Silverman 2001). Moreover, the extent to which triangulation produces similar results is claimed to be a measure of confidence in the findings and the validity of the underlying theory (Abdel-khalik & Ajinkya 1979). This is because triangulation of research methods helps in the development of converging lines of inquiry. Consequently, any findings or conclusions are likely to be much more convincing, trusted and accurate if they are based on several different sources of information (Yin 2003, Tashakkori & Teddli 2003).

The deployment of two research methods (questionnaire and interviews) in this research is thought to improve the validity of the research findings. Given the fact that each method has it advantages and disadvantages (as illustrated in Chapter 4), and "different techniques and procedures will have different effects, it makes sense to use different methods to cancel out the *'method effects' that will lead to greater confidence being placed in your conclusions."* (Saunders *et al.* 2007, P. 147).

2- External validity (generalizability): this concerns whether the findings can be generalized beyond the confines of the particular context in which the research was conducted (Bryman 2001). It is claimed (Yin 1994) that the most common form of generalisation is statistical generalisation because the researcher investigator has ready access to formula to determine the confidence with which generalisations can be made, depending mostly upon the size and internal variation within the universe and the sample. However, Gill & Johnson (1997) claimed that surveys are considered to be relatively weak in internal validity, as compared with experiment, because of difficulties in their control of rival hypotheses.

Furthermore, they argue that survey research is often considered to be relatively low in ecological validity since it lacks naturalism and gives little opportunity for the respondents to articulate the ways in which they personally conceptualize and understand the matters of interest. Therefore, validity is low under the positivistic paradigm and high under the phenomenological paradigm (Collis & Hussey 2003) because the researcher under the phenomenological paradigm aims to gain full access to the knowledge and meaning of those involved in the phenomenon.

To provide internal and external validity for this research, mixed method research was undertaken in collecting and analysing the data. Finance directors from a wide diversity of firms participated in the survey designed to study attitudes towards the effectiveness and value of introducing the concept of MJ and the ROA into the IAP. This is followed by fieldwork in order to investigate the research problem in the natural settings. This is thought to enhance the validity of research results since it allows the retention of the holistic and meaningful characteristics of real-life events (Yin 2003).

7.9. The applicability of the research findings

The aim of conducting research is to produce information of value. This can take the form of solving specific problems and / or adding to the general knowledge of a specific discipline in terms of "know-how".

7.9.1. Applied research

This kind of research is designed in such a way as to arrive at practical findings that solve a specific problem that exists within an organisation. The scope of applicability is very important here; the wider the scope of applying the research findings, the more scientific and useful the findings.

7.9.2. Basic research

This is also referred to as fundamental or pure research, it is to improve our understanding of general issues without emphasis on its immediate application. Basic research is regarded as the most academic form of research since the principal aim is to make a contribution to knowledge (Collis & Hussey 2003).

While this study attempted to contribute to the investment appraisal discipline through the introduction of the new appraisal model, it helped in formulating a sound basis for appraising projects in this industry. It highlighted the significant role of MJ and the ROA in the IAP. The incorporation of MJ and the ROA into the IAP is very useful to capture the full range of benefits generated by the proposed projects. Some of these benefits are important for the sustainability of the stream of income in the long-term.

Since companies invest continuously to grow and survive, the IAP is conducted in most firms. However, while the context might vary among industries, the essence of the appraisal process is the same. Therefore, applying this new model to other industries might be considered, especially those with a similar context to BACMs.

7.10. Summary

This chapter has discussed the results of the empirical study from two data sources in a number of contexts. The contextual factors appear to shape the IAP. Therefore, the IAP takes different forms in different contexts. This dynamic property of the IAP makes it adaptable and applicable in different industries.

In this industry, only informal adoption of the strategic approach is evident. A comparison between research results and previous studies' results showed new propensity in appraisal behaviour. The implications of these results on theory have been expressed in the introduction of a new strategic investment appraisal model that incorporates MJ and the ROA into the IAP. The research findings credibility check showed a sound credibility of the research findings.

Chapter 8

Conclusions, Limitations, and Implications of this Research

8.1. Introduction

Having presented the research results in the previous chapter, this chapter presents the general conclusions together with the context under which the research was conducted. The main thrust of this research is the perception of the IAP as a dynamic process with different possible outcomes based on the interaction between factors that influence this process. This research is linked to the extant literature of capital budgeting and real options by means of showing the implications of this research for both bodies of literature. In addition, the importance of the research findings to the managers in making a sound SIDs was also highlighted. The constraints within which the research was conducted were identified. These constraints not only have limited the scope of the research but also shaped the direction this research took in investigating the topic. Suggestions for further research were proposed and advocated.

8.2. Research conclusions

Based on the data analysis and the results presented in the preceding three chapters (Chapters 5, 6, and 7) the following conclusions can be drawn:

- The central argument in this research relied on a distinction between two types of appraisal approaches in the IAP, the financial analysis approach and the strategic approach. This distinction has been drawn on the basis of the diverse outcomes that might be generated from proposed projects. While the outcomes of some projects can be expressed in terms of financial returns, for other projects, the outcomes cannot be converted into cash flows in the short-term but expressed in terms of growth options that sustain the long-term growth of the firm. This research proposed an integrated framework for SIDs that takes into account the value of these growth options attached to a proposed project in the IAP through the involvement of MJ and the ROA in the IAP. This research found that the strategic approach is appropriate where investments

in the present create choices in the future. Key to the application of either of these approaches is the risk attached to the proposed project. Financial analysis seemed to be more appropriate for projects whose returns can be estimated in financial terms in more certain circumstances, the strategic approach seemed more appropriate for projects with growth options in highly uncertain circumstances. Consequently, this framework sets out a mechanism of better understanding as to how MJ and the ROA can be integrated into the IAP. This integration appears to stimulate undertaking more risky projects in the IAP. However, while there is evidence to suggest the implicit adoption of the strategic approach in the IAP in this industry (BACMs), it is still totally unrecognised as a formal appraisal approach in the IAP.

- Although there has been some discussion of the importance of the strategic approach in the financial management literature, the idea of integrating it into the IAP has not been crystallised into a formal model. In this research, an attempt has been made to highlight the synergies between financial analysis on one hand and MJ and the ROA on the other at the strategic level. Though it has long been known that the financial returns from the proposed projects contribute to the achievement of the firm's business strategy, this research provides evidence of the significant role of the strategic approach in this respect. While the financial analysis captures the financial returns from the proposed projects, the strategic approach captures the strategic opportunities (growth options) attached to the proposed project. The exploitation of such opportunities contributes to sustaining the growth of the firm. Given the diverse nature of projects in this industry (*i.e.* acquisition, expansion, design, development and production of new components), the adoption of the strategic approach for long-term projects is more likely than for short-term projects which are linked closely to the relatively short life cycle of the models of the motor car (5-6) years. Therefore, the strategic approach becomes more likely to be adopted in more strategic, capability-oriented, and less discrete investments.

- Whilst the use of the financial analysis and the strategic approach in the IAP might be seen as complementary, it is not an equitable relationship when considering the organisational factors. Such factors (communications, structure, firm size, individual attitudes towards the growth options, individual attitudes towards risk, funds

available) seem to influence the deployment of either approach in the IAP. In this research, for example, there is evidence to suggest that in large multi-division firms there are likely to be major tension between those who "propose the project" and those who "make the decision". These disagreements arise from different perspectives in realizing the benefits attached to the proposed projects by different people at different levels in the organisation. Such disagreements might result in rejecting projects with a good business case or *vice versa* depending on the negotiating power of either party. Hence, there has to be acknowledgement and understanding of these factors and the appropriate environment that suit the application of either approach in order to come close to a more consistent credibility of the SIDs.

- In the IAP, it seems that there is a need for far more recognition of the contribution of MJ and the ROA in this process. This highlights the importance of more training of the individuals to carry out the IAP when strategic projects are considered. In many cases, the emphasis placed on the financial returns appeared not to be necessarily the priority of the appraisal process. As such, much more emphasis needs to be placed on understanding and acknowledging that IAP requires personal involvement reflected in their experience, intuition and own judgement in order to make this process more robust and coherent.

- Although the financial techniques ignore the importance of flexibility, companies consider these techniques when assessing the strategic investments alongside MJ factors. This complementary status in this regard seems not only to widen the scope of the choices available for decision-makers but also provides a clearer picture of the potential benefits associated with the proposed projects. Thus, decision-makers can decide whether to invest now or to take preliminary steps reserving the possibility of investment in the future. These steps create payoffs linked to further choices down the line where the appraisal and development occur in stages, each pursued or abandoned according to the results of its predecessor. This shift in the IAP appears to be due to the different response to uncertainty between financial approach and the strategic approach. While the general attitude under the financial approach implies "fear of uncertainty and minimize investment", it is the opposite under the strategic approach where it implies "seek gains from uncertainty and maximize learning". This new

perception of uncertainty is crucial in exploiting the wide range of potentially profitable investment opportunities.

- There is strong evidence to suggest that the IAP is a dynamic process rather than a static one. Its shape and format vary depending on the business risk, aim of the proposed project and the skills of the assessors. The main elements of this process seem to interact with each other to produce a variety of possible outcomes. In contrast to previous models, where the IAP is depicted as a sequence of stages, the appraisal model developed in this research depicts the IAP as a dynamic process with fewer fixed procedures enhanced by mutual impact of the appraisal stages. In other words, under the financial analysis, the IAP is carried out assuming a fixed multi-year investment model against a fixed expectation of annual returns. Such static investment plans tend to narrow the vision and lead to one-time decisions. However, by integrating the strategic approach (MJ and the ROA) into the IAP, this process becomes dynamic where it is often possible to change course dynamically or even abandon a multi-year investment project once it has been undertaken. Therefore, this incorporation of MJ and the ROA into the IAP opens up a wider range of possible actions, and is crucial to the usefulness of real options as a strategic rather than a valuation model. Key to the IAP is the business strategy and the risk attached to the proposed project. Whenever the business strategy is defined, the investment opportunities that feed into this strategy are exploited taking account of the risk attached to such investment opportunities. Consequently, the appropriate investment appraisal approach can be deployed to ensure the achievement of the adopted business strategy. This dynamic feature of the IAP suggested in this research has led to the creation of several routes in the IAP. These routes allow the assessment of a variety of investment opportunities based on the interaction between the main elements of the IAP.

8.3. Research implications

Since this research has focused on the integration of the strategic approach into the IAP in order to help managers reach a proper SID based on sound justifications, the main disciplines that have been enriched by this research are capital budgeting, real options and the decision-

making process. A summary of the implications of this research for these domains is illustrated below:

- **Implications for the capital budgeting literature:** this research has demonstrated the importance of incorporating the strategic approach into the IAP. By doing so, several contributions were made to this discipline: first, the important role of the context of the IAP in this integration was highlighted. More attention is paid in this research to the strategic benefits generated from the proposed projects. These strategic benefits have not been accommodated into the valuation equation in the IAP in the past. Although some research has tackled the strategic orientation in the IAP (*e.g.* Carr & Tomkins 1998), there is little explanation about how to take account of these strategic benefits in the IAP. Furthermore, no attempt was made in the literature to develop a framework that clearly explains the mechanism by which projects with growth options are assessed and under what conditions. In this research, the strategic approach (MJ plus the ROA) is suggested as a suitable approach to take account of these growth options. This approach is considered to be the main approach to take account of such intangible benefits in the IAP. While, in the literature, each of the financial analysis and the strategic approach has been discussed separately, there has yet to be a study devoted to integrate both in the IAP. For that reason, this research could be regarded as a step forward towards linking both approaches in the IAP. Second, this research identifies three routes that the IAP might take. These routes arise from the different contexts in which the IAP might take place. The different elements in this context (business risk, business strategy, analysts, project nature, funds, *etc*...) influence the SIDs. Considering the interaction between these elements has led to new alternatives in the decision-making process. While, traditionally, there is one decision (either yes or no), now there are other choices for the project (wait, defer, abandon). Third, this research has contributed to the capital budgeting literature by showing how the context of the IAP might influence the SIDs as well as the involvement of the strategic approach in the IAP. Therefore, this research furthers the discussion on the link between these.

- **Implications for the real options literature:** This study highlights how best to integrate the ROA into the IAP and the important role of MJ in this respect. By doing so, the conditions under which the ROA can be deployed are identified. One of the key conditions seems to be the business risk. The strong link between business risk and the ROA implied that the ROA is more appropriate for risky projects. The application of the ROA appears to be more associated with strategically-orientated projects. This underlines the significant role of the ROA in achieving a firm's business strategy. This achievement takes the form of exploiting the growth options attached to the proposed projects, consequently, gaining access to a potentially sustainable stream of cash flows in the long-term.

- **Managerial implications:** this study could be considered of great importance for managers for two main reasons. First, managers can use the framework developed in this study to capture a wider range of benefits associated with the proposed project than using one appraisal approach alone. This is of particular importance when appraising projects with growth options and when the business risk is high. Second, managers can use this framework to understand the interaction between different elements of the IAP and how the contextual factors might play a significant role in determining the investment appraisal approach to be adopted in the IAP. Therefore, the implementation of the developed framework may increase the number of choices available for managers and enhance the credibility of the SIDs.

8.4. Research objectives revisited

Having arrived at the research results and conclusions, the key question remains whether the research objectives have been met. Therefore, it is thought worthwhile to re-visit the research objectives outlined in the first Chapter (1.7) to scrutinise the extent to which the empirical study served the research objectives and whether results and conclusions obtained provide adequate answers to the research objectives.

The answers to the research objectives are illustrated in the detailed analysis conducted in Chapters 5 & 6 as well as analysis of the research results in Chapter 7. In summary, the strategic approach (MJ and the ROA) is still largely unrecognised formally among BACMs.

Signs of implicit adoption of the strategic approach prove to be evident with more than two thirds of surveyed firms showing a strategic orientation. The adoption within the firm seems to vary depending on the structure of the IAP in each firm [(structured process, structured process with flexibility (semi-structured), unstructured process (flexible process)], the context of the IAP this includes: types of communications (formal and informal), directors' attitudes towards risk (*e.g.* risk aversion has limited the adoption of the strategic approach in some firms), assessors' culture (some are more strategically orientated than others, for example, the Japanese tend to be more prepared to adopt the strategic approach than British counterparts), analysts' competence (unfamiliarity with the ROA due to less exposure to this approach and projects that necessitate the deployment of this approach have contributed to less involvement of this approach in the IAP, lack of knowledge and experience in assessing risky projects).

As in previous studies, PB is found to be the most popular technique among capital budgeting techniques. However, and in contrast to some previous studies, this study reports a lower use of DCF techniques and a higher use of ROCE. While MJ factors and the ROA seem to be more important than the financial techniques in assessing projects with growth options, two financial techniques (PB and ROCE) are relied upon as well, to some extent, for such project. The complementary status of the two approaches appears to feature in many firms.

Flexibility in the IAP and achieving competitive advantage for the firm seem to be the main benefits from adopting the strategic approach. This flexibility seems to widen the scope of the opportunities available for investments. Difficulties relate to quantifying the strategic benefits generated by the projects with growth options and the difficulty of supporting the investment decision regarding these projects seem, to some extent, to influence the decision to adopt the strategic approach in the IAP. However, the most significant factors in this respect seem to be funds, risk attached to the proposed project, skills, and the decision-maker's culture. The role of MJ factors in the SIDs seems to be limited when companies set financial constraints (*e.g.* hurdle rate, minimum rate of return, or limited amounts to be invested). Key shareholders seem to influence the SIDs.

In the IAP, The shortfalls in the financial analysis could be compensated by the benefits that might be generated by the strategic approach and *vice versa*. Directors seem to be aware of the aspects of flexibility generated by the ROA and, to some extent, they consider them in the IAP. However, in many cases, these aspects are considered in conjunction with the financial

analysis. Given the financial orientation in this industry, high risk projects are more likely to be rejected. MJ factors are used as a risk technique in many cases especially when investing in businesses where directors have experience. But when moving to new business, risk techniques are more likely to be adopted. A strong link is evident between risk and MJ and the ROA.

The IAP is not only about the financial returns from the proposed project but also about growth options embedded within that project. Therefore, financial analysis merely is not the appropriate approach for all types of projects. The framework developed in this study integrates both approaches in a way that enables the directors to make sound SID. This process (IAP) seems to be a dynamic one with many possibilities (routes) in assessing the proposed project. For more specific comparison, the research objectives and the location of the corresponding answers are shown in Table 8.1.

Table 8.1. Checklist of Research Objectives

Research objectives (1.7)	Location in the thesis
Descriptive	
• To establish the prevalence of the ROA and MJ factors among BACMs in the UK. This is reflected both by the proportion of firms considering ROA and using MJ factors, and also in terms of the intensity of using MJ within the single firm to capture the real options (*i.e.* degree of rigour).	Refer to: (5.11.1), (5.12.1), (6.5.2), (6.5.3), (6.8.1)
• To explore the prevalence of the orthodox capital budgeting techniques amongst BACMs and to update previous studies in this respect.	Refer to: (5.9) & Table (5.17)
• To establish the relative importance of MJ factors compared with the capital budgeting techniques in the IAP when assessing projects with growth options.	Refer to: (5.12.2), (6.5.3)
• To identify the main benefits enjoyed by incorporating the ROA into the IAP.	Refer to: (5.12.3), (6.8.2), (6.8.3)
• To identify the main difficulties associated with using MJ factors for assessing projects with real options.	Refer to:n(5.12.4), (6.5.3)
• To describe the SIDs in the BACMs in order to identify the role of MJ factors in the decision-making process.	Refer to: (6.7)
Analytical	
• To establish the relative importance of growth options embedded in the project compared with financial rewards in the IAP.	Refer to: (6.8.2), (6.8.1)
• To explore the extent to which finance directors recognise strategic benefits (growth options) as a key element of the investment when judging it.	Refer to: (5.12.3), (6.8.2)
• To identify the main elements in the context within which the IAP is undertaken that influence the deployment of MJ factors.	Refer to: (7.2)
• To identify the extent to which the risk associated with the project influences the use of MJ factors in the IAP.	Refer to: (5.12.5), (6.6), (6.8.3), (7.2.2)
Theoretical	
• The study will try to extend the IAP to one which combines strategic and financial approaches.	Refer to: (7.3)
• To develop a framework of the IAP based on the findings of the empirical study that enhances the ability of finance managers to make sound SIDs.	Refer to: (7.5), (7.7)

8.5. Reflections on the research contribution

This research takes a more advanced step from previous studies by stressing the importance of the dynamic features of the IAP created by the incorporation of MJ and the ROA in the IAP. In general, three contributions distinguish this research. First, this research extended the concept of the IAP from financial returns (tangible benefits reflected in cash flows) to strategic opportunities. This is demonstrated by exploring how the existence of growth options can prompt MJ and the ROA deployment. This integration of MJ and the ROA (strategic approach) into the IAP seems to enhance the credibility of the investment decision regarding the proposed projects and widen the scope of the investment opportunities available. Second, while risky projects traditionally often have been viewed negatively, this research advocates that risk informed by favourable contextual factors (experienced people, funds, flexible structure and good communications) encourages the use of the strategic approach while, at the same time, lowering the sense of "risk aversion" in the IAP. This meant some projects can be accepted on the basis of strategic gains only rather than on short-term cash flows. Finally, and as this approach (strategic approach) is still widely unrecognised in this industry, this research opens a new avenue of research on how growth options can be transformed and integrated into the IAP through the strategic approach. This can potentially lead to more effective SIDs.

8.6. Limitations of the research

It is a matter of fact that no research is complete. Different researchers might investigate the same topic in different ways and reach similar results. However, there are general considerations that might restrict the way the topic is tackled. Crucial to these considerations are the nature of the topic and the aim of the research itself. While adopting the most convenient approach in this study, some limitations could be identified as follows:

- The deployment of MJ and the ROA in the IAP in order to capture the growth opportunities is one of many mechanisms that can facilitate the process of making good strategic investment decisions (SIDs). Other mechanisms, such as comparative analysis (comparing the expected financial outcomes and the expected value of the options), and strategic planning can play an important role in this respect. By focusing

on the link between MJ and the ROA in this research, is admittedly a limitation of this research. However, it is thought that focusing on a single topic and investigating it in depth is thought to be more expedient than studying the broad topics, especially in the case of this topic which is still largely unheard of amongst this population.

- Most companies involved in this research are of smaller size if compared to other studies conducted in this field. While this is considered as a matter of fact that the researcher has to deal with, this research afforded an interesting opportunity for the first time to compare the investment behaviour among companies in the same industry in one country. Few researchers have had this chance. Some researchers did study the same industry (automotive industry) across many countries (*i.e.* Carr *et al.* 1998), however, the emphasis in this research has to be on sustained investment behavioural differences among one industry in one country.

- Taking account of the preceding limitation, the results from this research have to be interpreted cautiously. While sound triangulation was achieved in this research, data from non-participants [very small companies with incomplete financial reports (more likely to be workshops rather than companies) in the FAME data base] could have shown different attitudes. Therefore, careful attention should be paid when generalising the research results to the whole industry. However, since the IAP is the common process among different industries by which the proposed projects are assessed, attempts could be made to apply the developed framework in this research for other industries. While the context of the IAP might vary among industries, the logic of the IAP is still the same.

- It should be recognised that the difficulty in accessing some confidential data has restricted the choices available for conducting this research. For example, companies' documents relating to strategic plans, decision-making meeting proceedings, and financial analysis of the past and present projects are of a sensitive nature and were not available. Should such data have been accessible, different approaches (*e.g.* a case study) could have been adopted in this research.

8.7. Directions for future research

This research has provided a framework of integrating MJ and the ROA into the IAP. Therefore, it could be considered a step forward in a long process of developing a body of empirically verifiable generalisations and explanations of the investment assessment phenomenon. Since this research represents an early stage of understanding the role of MJ and the ROA in the IAP, which resulted in the IAP being perceived as a dynamic process, four directions for future research seem most promising:

The first potentially fruitful area for future research lies in expanding the application of the developed framework to other industries where the context of the IAP might imply a more complex set of relationships between relevant determinants of the IAP. This would be of particular importance in assessing the predictive validity of the framework not only because the risk level varies amongst different industries but also because this will allow for cross-industries comparison. Therefore, the most influential determinants in integrating MJ and the ROA into the IAP for each industry can be identified. Furthermore, the relative importance of these determinants across industries can be explored.

The second opportunity for future investigation, having relaxed the constraints imposed on the research design (*i.e.* the fourth limitation in research limitations mentioned in the preceding paragraph), is to limit the scope of the research to specific companies either in the same industry or from different industries, that have initiated projects with growth options on the basis of the strategic approach only and / or at least prepared, assuming having the capabilities, to pursue such risky projects. Investigating such companies in greater depth using longitudinal design would allow valuable information about the progress of the adoption of this strategic approach, how these firms have managed and / or are planning to manage these projects over time and exploring difficulties experienced and / or predicted in the adoption of the strategic approach in the IAP. Consequently, given that such projects are high-risk endeavours, there might presumably be a number of growth option projects given up. It is plausible that investigating how such projects came to such an end and what the consequences for the firm would be, is an interesting extension of this research.

Given that this research focused on the investment decisions related to projects with growth options in the manufacturing industry, an obvious extension of this research is to look at investment decisions concerning other types of investments and in different settings. It might be a fruitful area of enquiry for the finance theory literature to find out how other contextual factors, other than those included in this research, might affect the involvement of the strategic approach in the IAP, whether these two approaches, financial analysis and the strategic approach, are interchangeable, and under what conditions this might happen.

The final avenue for further research is to study how the practical aspects of the ROA (RO modelling) can be integrated into the IAP. It might be useful to combine ROA modelling and compare it with the financial calculations. Therefore, in future work, the vision is that research on RO modelling can be integrated with the probability topics to create a more coherent understanding in terms of how probability analysis and the RO modelling come together as a package to lower and mitigate the risk. Subsequently, managers might be less reluctant to undertake risky, but more strategic, projects.

8.8. Summary

In this research, an attempt was made to understand how the integration of the strategic approach (MJ and the ROA) into the IAP contributes to a sound strategic investment decision regarding the proposed projects. In the process, both financial analysis and the strategic approach were combined while taking into account the contextual factors that influence the use of either approach. It is hoped that the development of the strategic investment appraisal model in this research could be considered as a reasonable attempt towards advancing work on the capital budgeting literature and provide practitioners with a sound method to use in practice.

Appendices

Appendix 1: the questionnaire

The questionnaire

Section A.

1- Name (optional): ----------

2- Position in the company: ----------

3- Academic and professional qualifications: ----------

4- How long have you been working for this company, in years? ---------

5- How would you describe your organisation? (Please tick one)

Head office

Business unit

Stand-alone

Other (please specify) .....

6- What is the company's latest turnover in GBP? (Please tick the appropriate box)

Over 800 millions

400 to less than 800 millions

100 to less than 400 millions

20 to less than 100 millions

13 to less than 20 millions

5 to less than 13 millions

2 to less than 5 millions

Less than 2 millions

Section B.

1. Please rank the following capital budgeting techniques on a scale ranging from 1 (least usage) to 4 (high usage) in your company's investment appraisal.

Payback method (PB)	
Internal Rate of Return (IRR)	
Net Present Value (NPV)	
Return on Capital Employed (ROCE)	

2. How important is each of the following factors/techniques in assessing investments with growth options (projects whose benefits are difficult to quantify).Please circle as appropriate.

Technique /factors	**Not important**	**Slightly important**	**Moderate important**	**important**	**Extremely important**
Payback method (PB)	1	2	3	4	5
Return on Capital Employed (ROCE)	1	2	3	4	5
Internal Rate of Return (IRR)	1	2	3	4	5
Net Present Value (NPV)	1	2	3	4	5
Past experience	1	2	3	4	5
Intuition and own judgement	1	2	3	4	5

3. How many project proposals are undertaken every year?
Please enter the number in the brackets (-----)

4. Were there investment proposals which have been rejected in the past, but had they been undertaken would have had significant benefits for the company?

Yes No

5. How often do you rely mainly on your own judgement, past experience and intuition to make a decision about new investments? Especially, when their benefits are difficult to quantify in financial terms. Please tick the appropriate box.

Never rarely frequently always

6. Have you adopted the Real Options approach in investment appraisal process? If so, please specify the year of adoption. ☐

7. Which of the following risk appraisal techniques are used to assess project risk in your company? (Please tick as many as apply).

Simulation	
CAPM/Beta analysis	
Probability analysis	
Sensitivity analysis	
Certainty equivalent	
Conservative cash flow forecasts	
Shorten payback period	
Raise required rate of return	

Section C.

Please indicate, by circling the appropriate number, the extent to which you agree with the corresponding statement.

	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
1. We periodically review the likely effect of changes in our business environment (*e.g.* risk, competitors' behaviour) on our firm.	1	2	3	4	5
2. Projects with no or low levels of risk are likely to be assessed using DCF.	1	2	3	4	5
3. When assessing high risk projects, we apply a higher discounted rate.	1	2	3	4	5
4. We almost always use discounted cash flows (DCF) techniques for evaluating new projects.	1	2	3	4	5
5. Projects that do not offer positive Net Present Values (NPV) are not accepted.	1	2	3	4	5
6. Managers are preoccupied with short-term earnings.	1	2	3	4	5
7. Discounted cash flows (DCF) techniques are biased against long-term projects.	1	2	3	4	5
8. DCF method is inappropriate for investments that have strategic implications.	1	2	3	4	5
9. Sometimes, it is necessary to override financial appraisal techniques and undertake projects regardless of their financial returns.	1	2	3	4	5
10. Breaking the project into a number of stages is better than committing to an entire project.	1	2	3	4	5

	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
11. We sometimes defer the investment decision to a more appropriate time.	1	2	3	4	5
12. It is essential to establish a factory with capacity in excess of the immediate requirements.	1	2	3	4	5
13 We prefer projects that lead to subsequent investments, even if their financial returns are negligible.	1	2	3	4	5
14. Sometimes, we undertake projects with no or low financial return in order to achieve competitive advantage over our competitors.	1	2	3	4	5
15. Managers' past experience is a critical factor when assessing high-risk projects.	1	2	3	4	5
16. Managers' intuition and judgement are important decision- making tools when uncertainty is high.	1	2	3	4	5
17. Strategic benefits associated with new investments are difficult to quantify.	1	2	3	4	5
18. It is difficult to back the decision to undertake risky projects	1	2	3	4	5
19. Sound investment is measured by not only financial returns but also contribution to the agreed business strategy.	1	2	3	4	5

* Please tick the following box and supply contact details, if you would like to receive a copy of the findings of this research

Many thanks for your cooperation and consideration.

Appendix 2: Interview guide

The interview guide was developed to ensure sufficient coverage of the themes included in the framework developed in Chapter 2. These themes are:

- The investment appraisal process in general.
- The use of financial appraisal techniques.
- Treatment of risk.
- The use of the managerial judgement for investments with growth options.
- Decision-making process.
- Business strategy.

The interview questions (Appendix 3) were designed to translate previous themes. For each key question a set of follow-up questions were asked depending on the interviewee's reaction and answer to the main question.

Interview guide

Interview guide for finance directors involved in the investment appraisal process

Introduction

- Interviewee introduces him/herself.

Description of the appraisal process

- Stages.
- People involved.
- Source of investment ideas.
- Assessment criteria in general.
- What problems the mangers experience in appraisal process.

Financial assessment of the proposed investment

- Financial techniques in use.
- How important are the financial techniques.
- Overriding these techniques.
- Limitations of these techniques.
- Factors influence the use of these techniques.

Risk treatment

- Techniques in use.
- Attitudes towards risky projects.
- Assessment of risky projects.

The strategic approach in the IAP

- Importance of this approach.
- Factors influence the use of the real options and MJ.
- Conditions under which MJ is used.
- What problems the managers encounter when deploying MJ in the IAP.

Business strategy

- Type of projects selected for investment.
- Impact of those projects on business strategy.
- The impact of the appraisal process on business strategy.

Decision –making process

- Parties involved.
- The context within which the investment decision is made.
- Factors affect the decision- making process.

Personal view about the appraisal process.

Appendix 3: Interview questions

The main questions are:

1- Could you please describe the process of investment decision- making process in your company?

2- Are there any fixed rules of accepting of rejecting investment proposals? In other words, are there any "red lines" that should not be exceeded?

3- What do you consider as the limitations of the financial appraisal techniques?

4- How do you assess risky projects?

5- Do you adopt different investment criteria for different projects?

6- In what situations you override measures of financial value?

7- Sometimes, it is necessary to undertake projects regardless their financial returns. How would you comment?

8- Under what circumstances you use your intuition and your own judgement to evaluate the investments proposals?

9- Does breaking the project into a number of phases better than committing to an entire project?

10- Projects with negative NPV can be valuable growth options if the company can put off the investment decision for a while. How would you comment?

11- In your view, what are the difficulties that prevent you from using your experience, intuition and own judgement in appraisal process?

12- When appraising the investments proposals, do you classify projects to short-term with no or little strategic options and long-term with big strategic options and little cash flows?

13- Projects with high risk might be preferred when growth options are involved, how would you react to this argument?

14- Under what circumstances real option gains priority in the appraisal process?

15- How do you view real options and MJ in relation to DCF techniques?

16- What is your personal view about investment appraisal process in your company?

Thanks for your time, wishing s/he success in his/ her career.

Appendix 4: initial template

Initial template

1- The Investment Appraisal Process (IAP)

1- Description

i. Stages.
ii. Outcomes.
iii. Parties involved.
iv. Source of investment ideas.

2- Criteria in use

i. Financial techniques.
ii. ROA and MJ factors.

3- Factors affect the use of either techniques

i. Fund.
ii. Type of project.
iii. Customer influence.
iv. Communication.
v. Company status.

2- Risk assessment

1- Techniques in use.
2- Attitudes towards risky projects.
3- Assessment of risky projects.
4- Impact of risk on the business strategy.
5- Impact of risk on the investment decision.

3- Decision making-process

1- The role of finance director.
2- Factors affect the decision- making process.

i. Company investment policy.
ii. Head office influence.
iii. Company vision.

3- Bottom-up process.
4- Top-down process.
5- Parties involved.
6- The context within which the investment decision is made.

4- The strategic approach and appraisal process

1- Factors influence the use of this approach.
2- Conditions under which this approach is used.
3- What problems the managers encounter when deploying MJ in the IAP.

5- Business strategy

1- Type of projects selected for investment.
2- Impact of those projects on business strategy.
3- The impact of the appraisal process on business strategy.

Appendix 5: the final template

The final template

1- The Investment Appraisal Process

1- Generation of investment ideas
   i. Source of investment ideas.

2- Description

   i. Stages.
   ii. Outcomes.
   iii. Flexibility.
   iv. Parties involved.
   v. Financial considerations.
   vi. Non-financial considerations.
   vii. Considering business environment.
   viii. Future opportunities.

3- Appraisal criteria in use

   i. Financial techniques.

      1. PayBack (PB).
      2. Return On Investment (ROI).
      3. Discounted Cash Flows (IRR).
      4. Discounted Cash Flows (NPV).
      5. Discounted Cash Flows (both).

   ii. MJ factors.

      1. Past experience.
      2. Intuition and Own Judgement.

   iii. Mixing methods.

4- Factors affect the use of either techniques

   i. Fund.
   ii. Risk involved.
   iii. Assessor's attitude towards risk.
   iv. Communication.
   v. Company status.
   vi. Company investment policy.
   vii. Project size (value).
   viii. Project purpose.
      1. Serve the company.
      2. Serve customer.

2- Risk assessment

1- Attitudes towards risky projects.
2- Assessment of risky projects.

i. Risk transfer.
ii. Risk averse.
iii. Techniques in use.

3- Impact of risk on the business strategy.
4- Impact of risk on the investment decision.

3- Decision making-process

1- The role of finance director.
2- Factors affect the decision- making process.

i. Company investment policy.
ii. Company size.
iii. Head office influence.
iv. Company vision.
v. Personal commitment.
vi. Risk associated with new project.
vii. Negotiation process (communication).
viii. Decision-makers' background.
ix. Decision-makers' culture.
x. Project nature.
xi. Setting priorities.

3- Process format

i. Bottom-up process.
ii. Top-down process.

4- Parties involved.
5- The context within which the investment decision is made.
6- Consensus.

4- The strategic approach and appraisal process

1- Factors influence the use of this approach.
2- Conditions under which this approach is used.

i. Legal requirements (environment, health and safety).
ii. Customer pressure.
iii. Gaining competitive advantage.
iv. Future growth.
v. Increase capacity.
vi. Efficiency.
vii. Large investment (strategic).

viii. Securing business.

3- What problems the managers encounter when deploying MJ in the IAP.
   i. Funding major projects.
   ii. Limited experience.
   iii. Communication.
   iv. Head office control.

5- Business strategy

1- Type of projects selected for investment.
2- Impact of those projects on business strategy.
3- The impact of the appraisal process on business strategy.

Appendix 6: List of interviewees

Company name,size & geographical location, participation in survey	Iterviewees & interview tool	experience	position	Type of firm	Size Category	Notes
1- A, £45 millions, Dorset, participant	Mrs Jill Rushton (Face to face)	3 yrs in this firm and 10yrs in other companies	Group Finance Director	Head office	L (Large)	Business unites in Cezck and Germany
2- B, £ 900,000, Dorset, non-participant	Ms Gail Marsh (Face to face)	14 years	Company Secretary and Director	Stand-alone	S (Small)	
3- C, £44 millions, Salisbury, non-participant	Mr. Philip Everitt (Face to face)	3.5 yrs in this firm and 13yrs in other companies	Director of Finance & HR	Business unit	L (Large)	Head office is in Germany
4- D, £63 millions, Oxfordshire, non-participant	Mr.Nigel Smith (Face to face)	30 years	Group Finance Director	Business unit	L (Large)	Head office is in Japan
5- E, £15 millions, Shropshire, participant	Mr. Alan Weston (by phone)	13 years	Finance Director	Stand-alone	M (Medium)	
6- F, £ 65 millions, Deeside Flintshire, participant	Mr Nick Munster (by phone)	4 years in this plant	Finance Director & Plant Manager	Business unit	L (Large)	Second largest supplier in Europe,HD in France.165 subsidiaries in Europe
7- G, £24 millions, West Glamorgan, non-participant	Mr.Ian Charmmings (by phone)	6 years	Finasncial Controller	Business unit	M (Medium)	Head office in Japan,sites worldwide
8- H, £180 millions, Norfolk, participant	Mr. James Stronach (by phone)	20 years	Group Finance Director	Head office	(VL) Very large	
9- I, over £ 800 millions, London, participant	Mr Ken Leaver (by phone)	6 years	Finance Director	Head office	(VL) Very large	Business units around the world
10- J, £215 millions, Dyfed, Swansea, participant	Mr. David Campell (by phone)	15 years	Group Finance Director & General Manager	Head office	(VL) Very large	
11- K, £8 millions, Staffordshire, participant	Mr. Paul Wilde (by phone)	9 years	Group Finance Director	Head office	S (Small)	Business units in France and China

Appendix 7: sample characteristics in relation to Formal adoption of the Real Options Approach

N.P. **FRAOROMS** stands for: Formal Adoption of Real Options Approach

Table 1:

FRAOROMS and Position in the company

Count

Formal Adoption of Real Options Approach (ROA)	**Position in the company**				**Total**
	Finance Director	Managing Director	Chief Executive Officer	Accountant	
No	23	9	2	2	36
No answer	17	18	2	0	37
Total	40	27	4	2	73

Table 2:

FRAOROMS * Type of Company

Count

Formal Adoption of Real Options Approach (ROA)	**Type of Company**				**Total**
	Head Office	Business Unit	Stand alone	other	
No	9	16	11	0	36
No answer	11	9	16	1	37
Total	20	25	27	1	73

Table 3:

FRAOROMS * Real Options Approach Adoption

Count

Formal Adoption of the ROA		**Real Options Approach Adoption**				**Total**
		Never	Rarely	Frequently	Always	
FRAOROMS	No	2	12	18	4	36
	No answer	0	12	19	5	36
Total		2	24	37	9	72

Table 4:

FRAOROMS * Respondents experience

Count

Formal Adoption of Real Options Approach (ROA)		FRAOROMS		Total
		No	No answer	
Respondents experience recoded	1-5 years	12	12	24
	6-10 years	11	6	17
	11-15 years	2	6	8
	16-20 years	6	5	11
	21-25 years	0	1	1
	26-30 years	1	3	4
	31-35 years	3	2	5
	over 36 years	1	2	3
Total		36	37	73

Table 5:

FRAOROMS * MJ

Count

Formal Adoption of Real Options Approach (ROA)		MJ		Total
		NMJOs	MJOs	
FRAOROMS	No	14	22	36
	No answer	12	24	36
Total		26	46	72

Table 6:

FRAOROMS * company turnover

Count

Formal Adoption of Real Options Approach (ROA)		company turnover				Total
		Less than £2 Millions	£2 to less than £20 Millions	£20 to less than £100 Millions	Over £100 Millions	
FRAOROMS	No	3	17	10	6	36
	No answer	7	12	13	5	37
Total		10	29	23	11	73

Table 7:

FRAOROMS * Academic Qualifications, Batchelor

Count

Qualifications		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Academic Qualifications, Batchelor	has not got Batchelor	14	17	31
	has got Batchelor	18	17	35
Total		32	34	66

Table 8:

FRAOROMS * Academic Qualifications, Master

Count

		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Academic Qualifications, Master	has not got Master	31	33	64
	has got Master	1	1	2
Total		32	34	66

Table 9:

FRAOROMS * Academic Qualifications, MBA

Count

		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Academic Qualifications, MBA	has not got MBA	28	28	56
	has got MBA	4	6	10
Total		32	34	66

Table 10:

FRAOROMS * Academic Qualifications, PHD

Count

		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Academic Qualifications, PHD	has not got PHD	31	33	64
	has got PHD	1	1	2
Total		32	34	66

Table 11:

FRAOROMS * Professional Qualifications,ACA

Count

		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Professional Qualifications, ACA	has not got ACA	29	30	59
	has got ACA	3	4	7
Total		32	34	66

Table12:

FRAOROMS * Professional Qualifications, FCA

Count

		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Professional Qualifications, FCA	has not got FCA	23	26	49
	has got FCA	9	8	17
Total		32	34	66

Table 13:

FRAOROMS * Professional Qualifications, FCMA

Count

		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Professional Qualifications, FCMA	has not got FCMA	28	32	60
	has got FCMA	4	2	6
Total		32	34	66

Table 14:

FRAOROMS * Professional Qualifications, other

Count

		Formal Adoption of Real Options Approach (ROA)		Total
		No	No answer	
Professional Qualifications, other	has not got other professional qualifications	24	27	51
	has got other professional qualifications	8	7	15
Total		32	34	66

Appendix 8: the breakdown of MJ factors among study groups

	MJ			
	NMJOs		MJOs	
	The importance of Past Experience in assessing investments with Growth Options	The importance of Intuition & Own Judgement in assessing investments with Growth Options	The importance of Past Experience in assessing investments with Growth Options	The importance of Intuition & Own Judgement in assessing investments with Growth Options
Not important	1	1	2	1
Slightly important	5	9	2	3
Moderate important	5	8	8	6
Important	**12**	**6**	**15**	**21**
Extremely important	**3**	**2**	**19**	**15**
Total	26	26	46	46

Appendix 9:

Table (A): Central tendency statistics of MJOs

	N		Median	Mode	Percentiles		
	Valid	Missing			25	50	75
The importance of PB in assessing investments with Growth Options	45	1	**4.00**	**5**	3.00	4.00	5.00
The importance of ROCE in assessing investments with Growth Options	44	2	**3.00**	**3(a)**	3.00	3.00	4.00
The importance of IRR in assessing investments with Growth Options	44	2	2.00	1	1.00	2.00	3.00
The importance of NPV in assessing investments with Growth Options	44	2	2.00	1	1.00	2.00	2.75
The importance of Past Experience in assessing investments with Growth Options	46	0	**4.00**	**5**	3.00	4.00	5.00
The importance of Intuition & Own Judgement in assessing investments with Growth Options	46	0	**4.00**	**4**	4.00	4.00	5.00

a Multiple modes exist. The smallest value is shown

Appendix 9 (continue)

Table (B): Central tendency statistics of NMJOs

	N		Median	Mode	Percentiles		
	Valid	Missing			25	50	75
The importance of PB in assessing investments with Growth Options	26	0	**3.00**	**3**	2.75	3.00	4.00
The importance of ROCE in assessing investments with Growth Options	26	0	**3.50**	**4**	3.00	3.50	4.00
The importance of IRR in assessing investments with Growth Options	26	0	**3.50**	**4**	2.00	3.50	4.00
The importance of NPV in assessing investments with Growth Options	26	0	**3.00**	**2(a)**	2.00	3.00	4.00
The importance of Past Experience in assessing investments with Growth Options	26	0	**4.00**	**4**	2.75	4.00	4.00
The importance of Intuition & Own Judgement in assessing investments with Growth Options	26	0	3.00	2	2.00	3.00	4.00

a Multiple modes exist. The smallest value is shown

Appendix 9 (continue)

Table (C): Comparison of the Mean and SD value of appraisal techniques for the two groups of companies

	MJ			
	NMJOs		MJOs	
	Mean	SD	Mean	SD
The importance of PB in assessing investments with Growth Options	**3.27**	1.151	**3.82**	1.267
The importance of ROCE in assessing investments with Growth Options	**3.35**	1.018	**3.32**	1.196
The importance of IRR in assessing investments with Growth Options	**3.31**	1.289	2.18	1.126
The importance of NPV in assessing investments with Growth Options	**3.15**	1.317	1.93	1.087
The importance of Past Experience in assessing investments with Growth Options	**3.42**	1.065	**4.02**	1.085
The importance of Intuition & Own Judgement in assessing investments with Growth Options	2.96	1.038	**4.00**	.966

*Based on a 5-point Likert Scale ranging from 1, "not important", to 5, "extremely important"

Appendix 10: Definition of company size according to 1985 Companies Act.

criterion	Small	Medium	Large
Turnover	≤ £1.4m	≤ £5.75m	> £5.75m
Gross Assets	≤ £0.7m	≤ £2.8m	> £2.8m
Employees	≤ 50	≤ 250	> 250

Appendix 11: Definition of company size in Mills and Herbert study

Criteria	Small	Medium	Large
Capital Expenditure	< £ 20m	£ 20m-50m	> £ 50m
Turnover	< £ 250m	£250m-750m	> £ 750m
Profit before Interest and Tax	< £ 25m	£25m-75m	> £ 75m

Appendix 12: Presentational template

Presentational template

- **The investment appraisal process (IAP)**

  1- Generation of investment ideas

    - External source (customers)
    - Internal source (within the company)

  2- Describing the IAP.

    - Direction of the appraisal process
    - Construction of the appraisal process

  3- Appraisal criteria in use.

    - Financial criteria in the IAP
    - Limitations of financial appraisal techniques
    - MJ factors and the ROA in the IAP
    - mixing criteria
    - Factors affecting the use of either approaches
      - The shortage of fund
      - Risk involved
      - Decision-maker's culture
      - Lack of skills

- **Risk associated with proposed projects**
  - Attitudes towards risk
  - Assessment of risky projects
  - Risk transfer
- **The Strategic Decision-Making process**
  - Selling investment decision
  - Financial constraints
  - Decision-making empowerment

- Reaching a consensus

- **The strategic approach**
  - Perception of MJ factors
  - Perception of ROA factors
    - Technical importance
    - Growth
    - Staging and abandonment
    - Postponement of the investment decision (timing)
  - Motives for deploying MJ factors and ROA factors in the IAP
  - Factors influence the use of MJ factors
    - Assessors' competence
    - Future growth

- **Business strategy**
  - Perception of business strategy
  - Business strategy as the centre of appraisal process

List of references

ABDEL-KADER, M. G. AND DUGDALE, D., 1998. Investment in advanced manufacturing technology: a study of practice in large UK companies. *Management Accounting Research,* 9 (3), 261-284.

ABDEL-KHALIK, A. R. AND AJINKYA, B. B., 1979. Empirical research in accounting: a methodological viewpoint. *American Accounting Association.* Accounting Education Series, No. 4, 1-73.

ABEL, A., 1983. Optimal investment under uncertainty. *American Economic Review,* 73, 228-233.

ABEL, A., 1984. The effects of uncertainty on investment and the expected long-run capital stock. *Journal of Economic Dynamics and Control,* 7, 39-53.

ADLER, R.W., 2000. Strategic investment decision appraisal techniques: the old and the new. *Business Horizons,* 43 (6), 15-22.

ADNER, R. AND LEVINTHAL, D., 2004. What is not a real option: considering boundaries for the application of real options to business strategy. *Academy of Management Review,* 29 (1), 74-85.

AKALU, M. M., 2003. The process of investment appraisal: the experience of 10 large British and Dutch companies. *International Journal of Project Management,* 21 (5), 355-362.

ALKARAAN, F. AND NORTHCOTT, D., 2006. Strategic capital investment decision-making: a role for emergent analysis tools? A study of practice in large UK manufacturing companies. *The British Accounting Review,* 38 (2), 149-173.

ALVESSON, M. AND DEETZ, S., 2000. *Doing Critical Management Research.* London: Sage.

AMRAM, M. AND KULATILAKA, N., 1999. *Real Options: Managing Strategic Investment in an Uncertain World.* Harvard Business School Press: Boston.

ANDERSON, T. J., 2000. Real options analysis in strategic decision making: an applied approach in a dual options framework. *Journal of Applied Management Studies,* 9 (2), 235-255.

ANGELIEN, K. G., 1993. Case studies on real options. *Financial Management*, 22 (3), 259-271.

ARNOLD, G. C. AND HATZOPOULOS, P. D., 2000. The theory-practice gap in capital budgeting: evidence from the United Kingdom. *Journal of Business Finance and Accounting,* 27 (5 & 6), 603- 626.

ARNOLD, G. C., 2002. *Corporate Financial Mana*gement. 2nd ed. Harlow: Pearson Education.

ARNOLD, T. AND SHOCKLEY, J. L., 2003. Real options, corporate finance, and the foundations of value maximization. *Journal of Applied Corporate Finance,* 15 (2), 82- 88.

ARYA, A., FELLINGHAM, J. C. AND GLOVER, J. C., 1998. Capital budgeting: some expectations to the net present value. *Issues in Accounting Edition,* 13 (3), 499-508.

ARZAC, E. R., 1986. Do your business units create shareholder value? *Harvard Business Review,* 64 (1), 121-126.

ASHFORD, R. W., DYSON, R. G. AND HODGES, S. D., 1988. The capital investment appraisal of new technology: problems, misconceptions and research directions. *The Journal of the Operational Research Society,* 39 (7), 637-642.

BALDWIN, C., 1991. How capital budgeting deters innovation and what to do about it. *Research Technology Management*, 34 (6), 39-45.

BALDWIN, C. AND CLARK, K. B., 2000. *Design Rules: The Power of Modularity.* Cambridge, MA: MIT Press.

BALL, J., 1991. Short termism-myth or reality. *National Westminster Bank Quarterly Review,* August, 20-30.

BALNAVES, M., CAPUTI, P., 2001. *Introduction to Quantitative Research Methods: An Investigative Approach.* London: Sage.

BARWISE, P., MARSH, P. AND WENSLEY, R., 1987. Strategic investment decisions. *Research in Marketing,* 9, 1-57.

BARWISE, T. P., MARSH, P. AND WENSLEY, R., 1989. Must strategy and finance clash? *Harvard Business Review,* 67 (5), 85-90.

BENAROACH, M AND KAUFFMAN, R. J., 1999. A case for using real options pricing analysis to evaluate information. *Information Systems Research,* 10 (1), 70-86.

BERTAUX, D. AND BERTAUX-WIAME, I., 1981. Life stories in the bakers' trade. *In*: D. BERTAUX, ed. *Biography and Society: the Life History Approach in the Social Sciences.* London: Sage.

BILLINGTON, C., 2003. A real options perspective on supply chain management in high technology. *Journal of Applied Corporate Finance,* 15 (2), 32-43.

BIRNBERG, J. G., SHIELDS, M. D. AND YOUNG, M. S., 1990. The case for multiple methods in empirical management accounting research. *Journal of Management Accounting Research,* Fall, 33-66.

BLACK, F. AND SCHOLES, M., 1973. The pricing of options and corporate liabilities, *Journal of Political Economy,* 81 (3), 637- 654.

BLACK, R., T.1999, *Doing Quantitative Research in the Social Sciences: An Integrated Approach to Research Design, Measurement and Statistics.* London: Sage.

BOWMAN, E. H. AND HURRY, D., 1993. Strategy through the option lens, an integrated view of resource investments and the incremental-choice process. *Academy of Management Review,* 18 (4), 760-774.

BOWMAN, E. H. AND MOSKOWITZ, G. T., 2001. Real options analysis and strategic decision making. *Organisation Science,* 12 (6), 772-777.

BREALEY, R. A. AND MYERS, S. C., 1988. *Principles of Corporate Finance.* 3rd ed. New York: McGraw Hill.

BREALEY, R. A. AND MYERS, S. C., 2000. *Principles of Corporate Finance.* 6th ed. London: McGraw Hill.

BREKKE, K. AND SCHIELDROP, B., 2000. Investment in flexible technologies under uncertainty. *In:* M. BRENNAN AND L. TRIGEORGIS. *Project Flexibility, Agency, and Competition: New Developments in the Theory and Application of Real Options.* Oxford: Oxford University Press, 34-49.

BRENNAN, M. AND SCHWARTZ, E., 1985. Evaluating natural resource investments. *Journal of Business,* 58 (2), 135-157.

BRENNAN, M. AND TRIGEORGIS, L., 2000. Project Flexibility, Agency, and Competition: New Developments in the Theory and Application of Real Options. Oxford: Oxford University Press.

BRINBERG, J. G., TUROPOLEC, L. AND YONG, S. M. 1983. The organisational context of accounting. *Accounting, Organisations and Society*, 8, 111-129.

BROMWICH, M. AND BHIMANI, A., 1991. Strategic investment appraisal. *Management Accounting,* 72 (9), 45-48.

BROOKFIELD, D., 1995. Risk and capital budgeting: avoiding the pitfalls in using NPV when risk arises. *Management Decision,* 33 (8), 56-59.

BROYLES, J., 2003. *Financial Management and Real Options*. Chichester: John Wiley & Sons.

BRYMAN, A., 1989. *Research methods and organisation studies.* London: Unwin Hyman.

BRYMAN, A., 2001. *Social Research Methods*. Oxford: Oxford University Press.

BRYMAN, A. AND CRAMER, D., 2005. *Quantitative Data Analysis with SPSS 12 and 13.* Hove, East Sussex: Routledge.

BUEHLER, K. S. AND PRITSCH, G., 2004. Running with risk. *The McKinsey Quarterly,* November, No.4.

BURCHER, P. G. AND LEE, G. L., 1997. *The Challenge of Investing in Advanced Manufacturing Technologies*. Birmingham: Aston Business School.

BUSBY, J. S. AND PITTS, C. G., 1997. Real options in practice: an exploratory survey of how finance officers deal with flexibility in capital appraisal. *Management Accounting Research,* 8 (2), 169-186.

BUSBY, J. S. AND PITTS, C. G., 1998. *Assessing Flexibility in Capital Investment.* London: CIMA.

BUTLER, R., DAVIES, L., PIKE, R. AND SHARP, J., 1991. Strategic investment decision-making: complexities, politics and processes. *Journal of Management Studies,* 4 (28), 395-415.

BUTLER, R., DAVIES, L., PIKE, R., AND SHARP, J., 1993. *Strategic Investment Decisions: Theory, Practice and Process*. London: Routledge.

BYRNE, P., 1995. Fuzzy analysis a vague way of dealing with uncertainty in real estate analysis? *Journal of Property Valuation and Investment*, 13 (3), 22-31.

CARR, C., 1990. *Britain's competitiveness: the management of the vehicle components industry*. London: Routledge.

CARR, C., TOMKINS, C. AND BAYLISS, B., 1991. Strategic controllership-a case study approach. *Management Accounting Research*, 2, 89-107.

CARR, C., TOMKINS, C. AND BAYLISS, B., 1994a. Financial or strategic controls? An Anglo-German case study. *European Management Journal*, 12, 102-113.

CARR, C., TOMKINS, C. AND BAYLISS, B., 1994b. Strategic investment decisions: a comparison of UK and West German practices in the motor component industry. *ICAE & W*: October, Averbury, Aldershot.

CARR, C. AND NG, J., 1995. Total cost control: Nissan and its UK supplier partnerships. *Management Accounting Research*, 6 (2), 347-365.

CARR, C., TOMKINS, C., 1996. Strategic investment decisions: the importance of SCM. A comparative analysis of 51 case studies in U.K, U.S. and German companies. *Management Accounting Research*, 7 (2), 199-217.

CARR, C., TOMKINS, C., 1998. Context, culture and the role of the finance function in strategic decisions. A comparative analysis of Britain, Germany, the U.S. and Japan. *Management Accounting Research*, 9 (2), 213-239.

CARR, C., 2006. Russian strategic investment decision practices compared to those of Great Britain, Germany, the USA, and Japan. *International Studies of Management and Organisation,* 36 (4), 82-110.

CASSELL, C., BUEHRING, A., SYMON, G., JOHNSON, P., AND BISHOP, V., 2005. *Qualitative Management Research: A Thematic Analysis of Interviews with Stakeholders in the Field.* ESRC Benchmarking Good Practice in Qualitative Management research, ESRC Grant Number H33250006.

CBI AND ACA. 1998. *Target Practice: How Companies Approach their Key Capital Investment Decisions.* London: CBI & ACA.

CHAN, F. T., CHAN, M. H., LAU, H. AND IP, R., 2001. Investment appraisal techniques for AMT: a literature review. *Integrated Manufacturing Systems,* 12 (1), 35-50.

CHEN, S., 1995. An empirical examination of capital budgeting techniques: impact of investment types and firm characteristics. *The Engineering Economist*, 40 (1), 145-170.

CHEUNG, J., 1993. Managerial flexibility in capital investment decisions: insights from real-options literature. *Journal of Accounting Literature*, 12 (3), 29-66.

CIMA, 1996. *Management Accounting: Official Terminology*. London: CIMA.

CLARKE, I., MACKANESS,W. AND BALL, B., 2003. Modelling Intuition in Retail Site Assessment (MIRSA): making sense of retail location using retailers' intuitive judgements as a support for decision-making. *International Review of Retail, Distribution & Consumer Research,* 13 (2), 175-194.

COLE, G. S., 1987. The survival of US manufacturing-the ultimate management decision. *International Journal of Technology Management*, 2 (1), 75-87.

COLLINS, J. AND HUSSEY, R., 2003. *Business Research: A Practical Guide to Undergraduate and Postgraduate Students,* 2nd ed. Basingstoke: Palgrave Macmillan.

COOLICAN, H., 1992. *Research Methods and Statistics in Psychology*. London: Hodder & Stoughton.

COOPER, D. J., 1975. Rationality and investment appraisal. *Accounting and Business Research*, 18, Summer, 198-202.

COPELAND, T. E. AND WESTON, J. F., 1988. *Financial Theory and Corporate Policy*. 3rd ed. Reading, MA: Addison-Wesley.

COPELAND, T. E. AND WEINER, J., 1990. Proactive management of uncertainty. *The McKinsey Quarterly*, No.4.

COPELAND, T. E. AND KEENAN, T. K., 1998. How much is flexibility worth? *The McKinsey Quarterly*, McKinsey & company, No.2.

COPELAND, T. E., 2001. The real-options approach to capital allocation. *Strategic finance,* 83 (4), 33-37.

COPELAND, T. AND HOWE, K. M., 2002. Real options and strategic decisions. *Strategic Finance,* 83 (10), 8-11.

CORNELL, B., 1993. *Corporate Valuation: Tools for Effective Appraisal and Decision-Making.* USA: Irwin Inc.

COVIN, J. G., SLEVIN, D. P., AND HEELEY, M. B., 2001. Strategic decision making in an intuitive vs. technocratic mode: structural and environmental considerations. *Journal of Business Research,* 52 (1), 51-67.

COX, J. C., ROSS, S. A. AND RUBINSTEIN, M., 1979. Option pricing: a simplified approach. *Journal of Financial Economics,* 7 (3), 229-263.

CRESWELL, J., 1994. *Research design: quantitative and qualitative approaches.* Thousand Oaks. CA: Sage.

CURRAN, J. AND BLACKBURN, R. A., 2001. *Researching the Small Enterprise.* London: Sage.

DEAN, J., 1951. *Capital Budgeting: Top-Management Policy on Plant, Equipment, and Product Development.* New York: Columbia University Press.

DEMPSEY, M. J., 2003. A multidisciplinary perspective on the evaluation of corporate investment decision making. *Accounting, Accountability and Performance,* 9 (1), 1-33.

DEMSKI, J. S., 1994. *Managerial Uses of Accounting Information.* Boston: Kluwer Academic Publications.

DENSCOMBE, M., 1998. *The Good Research Guide.* Open University Press.

DEY, I., 1993. *Qualitative Data Analysis: A User-Friendly Guide for Social Scientists.* London: Routledge.

DILLMAN, D. A., 2000. *Mail and Internet Surveys: The Tailored Design Method.* 2nd ed. New York: Wiley.

DIXIT, A., 1989. Entry and exit decisions under uncertainty. *Journal of Political Economy,* 97 (3), 620-638.

DIXIT, A., 1992. Investment and hysteresis. *Journal of Economic Perspectives,* 6 (1), 107-132.

DIXIT, A. K. AND PINDYCK, R. S., 1994. *Investment Under Uncertainty.* Princeton, N.J: Princeton University Press.

DIXIT, A. K. AND PINDYCK, R. S., 1995. The options approach to capital investment. *Harvard Business Review,* 73 (3), 105-115.

DIXIT, A. AND PINDYCK, R., 2000. Expandability, reversibility, and optimal capacity choice. *In:* M. BRENNAN AND L. TRIGEORGIS. *Project Flexibility, Agency, and Competition: New Developments in the Theory and Application of Real Options.* Oxford: Oxford University Press, 50-69.

DOYLE, P., 1992. Marketing and strategic management. *In: Marketing Manager's Yearbook.* London: AP Information Services, 17-23.

DRURY, C., 1988. *Management and Cost Accounting.* 2nd ed. London: Chapman & Hall.

DRURY, C., BRAUND, S., OSBORNE, P., AND TAYLES, M., 1993. *'A Survey of Management Accounting Practices in UK Manufacturing Companies'.* ACCA research report No. 32.Glasgow: ACCA.

DRURY, C. AND TAYLES, M., 1997. The misapplication of capital investment appraisal techniques. *Management Decision*, 35 (2), 86-95.

DUGDALE, D. AND JONES, T.C., 1991. 'Discordant voices: accountant's views of investment appraisal'. *Management Accounting,* November, 59, 54-56.

DUGDALE, D. AND JONES, T. C., 1994. Finance, strategy and trust in investment decision-making. *Management Accounting*, 72 (4), 52-56.

DUGDALE, D. AND JONES, C., 1995. Financial justification of advanced manufacturing technology. *In:* D. AHTON AND C. JONES. *Issues in Management Accounting.* 2nd ed. Englewood Cliffs, NJ: Prentice Hall.191-213.

DYSON, R. G., 1990. *Strategic Planning: Models and Analytical Techniques.* Chichester: John Wiley & Sons.

EASTERBY-SMITH, M., THROPE, R. AND LOWE, A., 1991. *Management Research: An Introduction.* London: Sage.

ECONOMIST, 1999. Keeping all options open. *The Economist*, 14th August.

EISENHARDT, K. M., 1989. Building theories from case studies research. *Academy of Management Review,* 14 (4), 532-550.

ERICSON, K. A. AND SIMON, H. A., 1993. *Protocol Analysis: Verbal Reports as Data.* Cambridge: MIT Press.

FAMA, E. AND MILLER, M., 1972. *The Theory of Finance.* New York: Holt, Rinehart & Winston.

FARBEY, B. AND TARGETT, F., 1993. IT investment: a study of methods and practices. *Management today,* Oxford: Butterworth-Heinemann.

FIELD, A., 2000. *Discovering statistics using SPSS for windows.* London: Sage.

FIELDING, N., 2001. Ethnography. *In*: N. GILBERT, 2nd ed. *Researching Social Life.* London: Sage.

FINCH, J. AND MASON, J., 1990. Decision taking in the fieldwork process: theoretical sampling and collaborative working. In: R. G. Burgess, ed. *Studies in Qualitative Methodology,* 2, 25-50.

FINNIE, J., 1988. The role of financial appraisal in decisions to acquire advanced manufacturing technology. *Accounting and Business Research,* 18 (70), 133-139.

FOLTA, T., 1998. Governance and uncertainty: the trade-off between administrative control and commitment. *Strategic Management Journal,* 19, 1007-1028.

FOLTA, T. AND MILLER, K. D., 2002. Real options in equity partnerships. *Strategic Management Journal,* 23, 77-88.

FOLTA, T. B. AND O'BRIEN, J. P., 2004. Entry in the presence of duelling options. *Strategic Management Journal,* 25, 121-138.

FOLTA, T., JOHNSON, D. AND O'BRIEN, J., 2006. Uncertainty, irreversibility, and the likelihood of entry: an empirical assessment of the option to defer. *Journal of Economic Behaviour & Organization,* 61, 432-452.

GARUD, R., KUMARASWAMY, A., AND NAYYAR, P., 1998. Real options or fool's gold? Perspective makes the difference. *Academy of Management Review,* 23 (2), 212-214.

GAVETTI, G. AND LEVINTHAL, D., 2000. Looking forward and looking backward: cognitive and experiential search. *Administrative Science Quarterly,* 45 (1), 113-140.

GHAURI, P. AND GRØNHAUG, K. 2002. *Research Methods in Business Studies: A Practical Guide.* Harlow: Pearson Education.

GHAURI, P. AND GRØNHAUG, K., 2005. *Research Methods in Business Studies: A Practical Guide.* 3rd ed. Harlow: Prentice Hall.

GHEMAWAT, P., 1992. *Sustainable Advantage.* New York: Free Press.

GILL, J. AND JOHNSON, P., 1997. *Research Methods for Managers.* 2nd ed. London: Paul Chapman.

GILL, J. AND JOHNSON, P., 2002. *Research Methods for Managers.*3rd ed. London: Sage.

GOEDHART, M. H. AND HADEN, P., 2005. Emerging markets are not as risky as you think. *McKinsey Quarterly Anthology*, McKinsey & Company.

GRAHAM, J. R.AND HARVEY, C. R., 2001. The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics*, 60, 187-243.

GRANT, R. M., 2002. *Contemporary Strategy Analysis.* 4th ed. Oxford: Blackwell.

GRANT, R. M., 2005. *Contemporary Strategy Analysis.* 5th ed. Oxford: Blackwell.

HAMMERSLEY, M., 1992. *What's Wrong with Ethnography: Methodological Explorations?.* London: Routledge.

HARRIS, E. P., 1999. Project risk assessment: a European field study. *The British Accounting Review*, 31 (3), 347- 371.

HARRIS, E. P. AND EMMANUEL, C. R., 2000. *Managerial Judgement and Risk Assessment in Strategic Investment Decisions (SIDs).* Department of Accounting & Finance. University of Glasgow, working paper series.

HARTMAN, R., 1972. The effects of price and cost uncertainty on investment. *Journal of Economic Theory,* 5, 258-266.

HAYES, R. H. AND ABERNATHY, W. J., 1980. Managing our way to economic decline. *Harvard Business Review*, 58 (4), 67-77.

HAYES, R.H. AND GARVIN, D. A., 1982. Managing as if tomorrow mattered. *Harvard Business Review,* 60 (3). 71-79.

HAYES, R.H. AND WHEELWRIGHT, S. C., 1984. *Restoring our Competitive Edge: Competing through Manufacturing.* New York: John Wiley & Sons.

HIRSHLEIFER, J., 1958. On the theory of optimal investment decision. *Journal of Political Economy*, 66, August, 329-352.

HO, S. S. M. AND PIKE, R. H. 1991. Risk analysis in capital budgeting contexts: simple or sophisticated? *Accounting and Business Research*, 21(83), 227-238.

HODDER, J. E. AND RIGGS, H. E., 1982. Pitfalls in evaluating risky projects. *Harvard Business Review,* 60 (3), 128-135.

HODDER, J. E., 1986. Evaluation of manufacturing investment: a comparison of US and Japanese practices. *Financial Management,* 15 (1), 17-24.

HOFSTEDE, G., 1991. *Culture and Organisations.* London: McGraw-Hill.

HOFSTEDE, G., 2002. Images of Europe: past, present and future. *In*: M. WARNER AND P. JOYNT, ed. *Managing Across Cultures: Issues and Perspectives.* London: Thomson Learning.

HOPPER, T. AND POWELL, A., 1985. Making sense of research into the organisational and social aspects of management accounting: A review of its underlying assumptions. *Journal of Management Studies*, 22, 429-465.

HOUSE, R. J., JAVIDAN, M., HANGES, P. AND DORFMAN, P., 2002. Understanding cultures and implicit leadership themes across the globe: an introduction to project globe. *Journal of World Business,* 37 (1), 3-10.

HOWELL, S. AND JAGLE, A., 1997. Laboratory evidence on how managers intuitively value real growth options. *Journal of Business Finance & Accounting,* 24 (7 & 8), 915-935.

HURRY, D., MILLER, A. T. AND BOWMAN, E. H., 1992. Calls on high-technology: Japanese exploration of venture capital investments in the United States. *Strategic Management Journal,* 13, 85-101.

HUSSEY, J. AND HUSSEY, R., 1997. *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*. Basingstoke: McMillan Business.

IRANI, Z. AND LOVE, P., 2001. The propagation of technology management taxonomies for evaluating investments in information systems. *Journal of Management Information System,* 17 (3), 159-173.

JACOBS, M. T. 1991. *Short-Termamerica: Causes and Cures of our Business Myopia.* Boston: Harvard Business School Press.

JANKOWICZ, A., D., 1991. *Business Research Projects for Students.* London: Chapman & Hall.

JANKOWICZ, A., D., 2005. *Business Research Projects for Students.* 4th ed. London: Thomson Learning.

GILL, J. AND JOHNSON, P., 2002. *Research Methods for Managers.* 3rd ed. London: Sage.

KAEN, F. R., 1995. *Corporate Finance.* Cambridge, Mass: Blackwell.

KAKATI, M. AND DHAR, U. R., 1991. Investment justification in flexible manufacturing systems. *Engineering Costs and Production Economics*, 21(3), 203-209.

KAPLAN, R. S., 1984. Yesterday's accounting undermines production. *Harvard Business Review,* 62 (4), 133-139.

KAPLAN, R. S., 1986. Must CIM be justified by faith alone? *Harvard Business Review*, 64 (2), 87-95.

KAPLAN, R. S. AND ATKINSON, A. A., 1998. *Advanced Management Accounting.* International edition. Englewood Cliffs, NJ: Prentice Hall.

KAYE, G. R., 1994. *Financial Planning Models: Construction and Use.* London: Academic Press.

KEMNA, A., 1993. Case studies on real options. *Financial Management,* 22 (3), 259-271.

KENSINGER, J. W., 1988. The capital investment project as a set of exchange options. *Managerial Finance,* 14 (2 & 3), 16-27.

KERLINGER, F. N., 1986. Foundation of behavioural research. 3rd ed. Fort Worth, TX: Holt, Rinehart and Winston International edition. *Cited In:* R. T. BLACK, 1999. *Doing Quantitative Research in the Social Sciences: An Integrated Approach to Research Design, Measurement and Statistics,* London: Sage.

KESTER, W. C., 1981. Growth options and investment: a dynamic perspective on the firm's allocation of resources. Unpublished doctoral dissertation, Harvard University, Cambridge, MA. *Cited In*: R. G. McGRATH, W. J. FERRIER, A. L. MENDELOW., 2004. Real options as engines of choice and heterogeneity. *Academy of Management Review,* 29 (1), 86-101.

KESTER, W.C., 1984. "Today's options for tomorrow's growth". *Harvard Business Review*, 62 (2), 153- 161.

KEWLEY, S., 2001. Japanese automotive manufacturing investment in the UK and the euro debate. *European Business Journal*, 13 (4), 167-179.

KIM, D. AND KOGUT, B., 1996. Technological platforms and diversification. *Organisation Science,* 7, 283-301.

KING, N., 1998. Template analysis. *In*: G. Symon, and C. Cassell, *Qualitative Methods: An Analysis in Organizational Research.* London: Sage.

KING, N., 2004. Using templates in the analysis of data. *In*: C. M. CASSELL AND G. SYMON, ed. *Essential Guide to Qualitative Methods in Organizational Research.* London: Sage.

KING, P., 1975. Is the emphasis of capital budgeting theory misplaced? *Journal of Business Finance and Accounting*, 2 (1), 69-82.

KINNEAR, P. R. AND GRAY, D. C., 2004. *SPSS 12 Made Simple.* East Sussex: Psychology Press.

KNIGHT, F. H., 1921. *Risk, Uncertainty and Profit.* New York: Kelley and Millman Inc.

KOGUT, B., 1991. Joint ventures and the option to expand and acquire. *Management Science,* 37, 19-33.

KOGUT, B. AND KULATILAKA, N., 1994. Operating flexibility, global manufacturing, and the option value of a multinational network. *Management Science,* 40 (1), 123-139.

KRINSKY, I. AND MILTENBURG, J., 1991. Alternate method for the justification of advanced manufacturing technologies. *International Journal of Production Research*, 29 (5), 997-1015.

KULATILAKA, N. AND MARCUS, J., 1992. Project valuation under uncertainty: when does DCF fail? *Journal of Applied Corporate Finance,* 5 (3), 92-100.

KULATILAKA, N. AND PEROTTI, E. C., 1998. Strategic growth options. *Management Science,* 44 (8), 1021-1031.

LAMMING, R., 1993. *Beyond Partnership: Strategies for Innovation and Lean Supply.* London: Prentice Hall.

LARZARSFELD, P. E., 1958. Evidence and inference in social research. *Daedalus*, 87, 99-130. Cited in: A. BRYMAN, AND D. CRAMER, 2005. *Quntitative Data Analysis with SPSS12 and 13.* Hove, East Sussex: Routledge.

LEE, J., 1988. Capital budgeting under uncertainty: the issue of optimal timing. *Journal of Business Finance and Accounting*, 15 (2), 155-168.

LEE, S. H., PENG, M. W. AND BARNEY, J. B., 2007. Bankruptcy law and entrepreneurship development: a real options perspective. *Academy of Management Review,* 32 (1), 257-272.

LEFLY, F., 1994. Capital investment appraisal of advanced manufacturing technology. *International Journal of Production Research*, 32 (12), 2751-2776.

LEFLY, F., 1996. Strategic methodology of investment appraisal of AMT projects: a review and synthesis. *The Engineering Economist*, 41 (4), 345-363.

LEFLY, F., 1997. The sometimes overlooked discounted payback method. *Management Accounting*, 75 (10), 36-38

LEFLY, F., 2000. The FAP model of investment appraisal. *Management Accounting*, 78 (3), 28-32.

LESLIE, K. J. AND MICHAELS, M. P., 2000. The real power of real options, *McKinsey Quarterly Anthology: On Strategy*, McKinsey & Company.

LEVY, H. AND SARNAT, M., 1994. *Capital Investment and Financial Decisions.* 5th ed. Hemel Hempstead: Prentice Hall.

LEWIN, C., 2004. *Research Methods in the Social Sciences.* London: Sage.

LOCK, D., 2000. *Project Management.* 7th ed. Aldershot: Gower.

LUEHRMAN, T. A., 1998. Investment opportunities as real options: getting started on the numbers. *Harvard Business Review,* 76 (4), 51-67.

LUMBY, S., 1994. *Investment Appraisal and Decision Making.* 5th ed. London: Chapman & Hall.

LUMBY, S. AND JONES, C., 1999. *Investment Appraisal and Financial Decision.* 6th ed. London: Thomson.

LUMIJARVI, O. P., 1991. Selling of capital investments to top management. *Management Accounting Research*, 2, August, 171-188.

MACDOUGALL, S. L. AND PIKE, R. H., 2003. Consider your options: changes to strategic value during implementation of advanced manufacturing technology. *Omega,* 31 (1), 1-15.

MAJD, S., AND PINDYCK, R. S., 1987. Time to build, option value, and investment decisions. *Journal of Financial Economics,* 18 (1), 7-27.

MANLY, F., 1992. *The Design and Analysis of Research Studies.* Cambridge: C.U.P.

MARSH, P. R., BARWISE, T. P., THOMAS, K. AND WENSLEY, J. R. C., 1988. Strategic investment decisions in large diversified companies. *Centre for Business Strategy Report Series*, London: London Business School.

MARSH, P., 1990. *Short-Termism on Trial.* London: Institutional Fund Managers' Association.

MASON, J., 2002. *Qualitative Researching.* 2nd. London: Sage.

MAYLOR, H., 1999. *Project Management.* 2nd ed. London: Financial Times.

McCARTHY, J. AND MONKHOUSE, H. P., 2003. To open or not to open- or what to do with a closed copper mine. *Journal of Applied Corporate Finance*, 15 (2), 56-66.

McCORMACK, J., Le BlANC, R. AND HEISER, G., 2003. Turning risk into shareholder wealth in the petroleum industry. *Journal of Applied Corporate Finance*, 15 (2), 67-75.

McDONALD, R. AND SIEGEL, D., 1986. The value of waiting to invest. *Quarterly Journal of Economics,* 101 (4), 707-728.

McDONALD, R., 2000. Real options and rules of thumb in capital budgeting. *In:* M. BRENNAN AND L. TRIGEORGIS. *Project Flexibility, Agency, and Competition: New Developments in the Theory and Application of Real Options.* Oxford: Oxford University Press, 13-33.

McGRATH, R. G., 1999. Falling forward: real options reasoning and entrepreneurial failure. *Academy of Management Review,* 24 (3), 13-30.

McGRATH, R. G., FERRIER, W. J. AND MENDELOW, A. L., 2004. Real options as engines of choice and heterogeneity. *Academy of Management Review,* 29 (1), 86-101.

McINTYRE, A. D. AND COULTHURST, N. J., 1986. *Capital Budgeting Practices in Medium-Sized Business-A Survey.* London: CIMA.

MEGGINSON, W., SMART, S. AND GITMAN, L., 2007. *Corporate Finance.* 2nd ed. Mason, USA: Thomson Education.

MEHRENS, W. W. AND LEHMANN, I. J., 1984. *Measurement and Evaluation in Education and Psychology.* 3rd ed. New York: Holt, Rinehart and Winston.

MEREDITH J. R. AND SURESH, N. C., 1986. Justification techniques for AMT. *International Journal of Production Research*, 24 (5), 1043-1057.

MERRET, A. J. AND SYKES, A., 1980. *The Finance and Analysis of Capital Projects.* 2nd ed. London: Longmans.

MERTON, R., 1973. Theory of rational option pricing. *Bell Journal of Economics and Management Science*, 4 (1), 141-183.

MERTON, R., 1998. Applications of option-pricing theory: twenty-five years later. *American Economic Review,* 88, 323-349.

MILLER, M. AND MODIGLIANI, F., 1961. Dividend policy, growth, and the valuation of shares. *Journal of Business,* 34, October, 411-433.

MILLER, K. D. AND REUER, J., 1996. Measuring organisational downside risk. *Strategic Management Journal,* 19, 497-514.

MILLER, K. D., 2002. Knowledge inventories and managerial myopia. *Strategic Management Journal,* 23, 689-706.

MILLS, R. W. AND HERBERT, P. J. A., 1987. *Corporate and Divisional Influence in Capital Budgeting: A Study of Corporate and Divisional Capital Budgeting Practice in Large UK Companies.* London: CIMA.

MILLS, R.W. 1988. Capital budgeting techniques used in the UK and the USA. *Management Accounting*, 66 (1), 26-27.

MILLS, R.W., 1994. *Finance, Strategy and Strategic Value Analysis: Linking two Key Business Issues.* Lechlade, Glos: Mars Business Associates.

MINTZBERG, H., RAISINGHANI, D. AND THEORET, A., 1976. The structure of 'unstructured' decision processes. *Administrative Science Quarterly,* 21 (2), 246-275.

MINTZBERG, H., 1987.Crafting strategy. *Harvard Business Review*, 65 (4), 66-75.

MINTZBERG, H., 1994. *The Rise and Fall of Strategic Planning.* Hemel Hempstead: Prentice Hall.

MORONE, J. AND PAULSON, A., 1991. Cost of capital: the managerial perspective. *California Management Review,* 33 (4), 9-32.

MOSER, C. AND KALTON, G., 1993. *Survey Methods in Social Investigation.* 2nd ed. Aldershot: Dartmouth.

MUKHERJEE, T. K., 1987. Capital budgeting surveys: the past and the future. *Review of Business and Economic Research,* Spring, 37-56.

MURPHY, K. R. AND DAVIDSHOFER, C. O., 1991. *Psychology Testing: Principles and Applications.* 2nd ed .Englewood Cliffs, NJ: Prentice Hall.

MYERS, S. C. AND TURNBULL, S. M., 1977. Capital budgeting and the capital asset pricing model: good news and bad news. *Journal of Finance,* 32, 321-333.

MYERS, S. C., 1977. Determinants of corporate borrowing *Journal of Financial Economics,* 5 (2), 147-176.

MYERS, S. C., 1984. Finance theory and financial strategy, *Interfaces,* 14 (1), 126-137.

MYERS, S. C., 1996. Fischer Black's contributions to corporate finance. *Financial Management,* 25 (4), 95-103.

NEALE, B. AND McELROY, T., 2004. *Business Finance: A Value-Based Approach.* Harlow: Prentice Hall.

NEUMAN, W. L., 2000. *Social Research Methods.* 2nd ed. London: Ally & Bacon.

NICHOLS, N., 1994. Scientific management at Merck: an interview with CFO Judy Lewent. *Harvard Business Review,* 72 (1), 89-105.

NIEUWENHUIS, P. AND WELLS, P., 1997. *The Death of Motoring? Car Making and Automobility in the 21st Century.* Chichester: John Wiley & Sons.

NISHIGUCHI, T., 1994. *Strategic Dualism: A New Alternative for Industrial Society.* Oxford: Oxford University Press.

NORTHCOTT, D., 1995. *Capital Investment Decision-Making.* London. Dryden Press.

PARTINGTON, D., 2002. *Essential Skills for Management Research.* London: Sage.

PATTON, M, Q., 2002. *Qualitative Research & Evaluation Methods.* 3rd ed . London: Sage.

PESKETT, R., 1999. Beyond DCF. *Management Accounting,* 77 (10), 60-69.

PETTY, J. W., SCOTT, D. F. AND BIRD, M. M., 1975. The capital expenditure decision-making process of large corporations. *The Engineering Economist*, Spring, 159-172.

PHELAN, S. E., 1997. Exposing the illusion of confidence in financial anlysis. *Manageemnt Decision,* 35 (2), 163-168.

PIKE, R, H., 1988. Investment appraisal: the capital budgeting revolution. *Management Accounting*, 66 (9), 28-30.

PIKE, R. H., 1996. A longitudinal study of capital budgeting practices. *Journal of Business Finance and Accounting*, 23 (1), 79-92.

PIKE, R. H., SHARP, J. AND PRICE, D., 1989. AMT investment in the larger UK firms. *International Journal of Operations and Production Management,* 9 (2), 13-26.

PIKE, R. AND NEALE, B., 1996. *Corporate Finance and Investment: Decisions and Strategies*. 2nd ed. Hemel Hempstead, Herts: Prentice Hall.

PIKE, R. AND NEALE, B., 2006. *Corporate Finance and Investment: Decisions & Strategies.* 5th ed. Harlow: Prentice Hall.

PINDYCK, R. S., 1991. Irreversibility, uncertainty, and investment. *Journal of Economic Literature,* 29 (3), 1110-1148.

PORTER, M. E., 1980. *Competitive Strategy*. New York: The Free Press.

PORTER, M. E., 1992. *Capital Choices: Changing the Way America Invests in Industry.* Boston: Council on Competitiveness, Harvard Business School Press.

PUTTERILL, M., MAGUIRE, W., AND SOHAL, A. S., 1996. Advanced manufacturing technology investment: criteria for organisational choice and appraisal. *Integrated Manufacturing Systems.* 7 (5), 12-24.

RAIMOND, P., 1993. *Management Projects: Design, Research and Presentation.* London: Chapman & Hall.

RAPPAPORT, A., 1986. *Creating Shareholder Value: The New Standard for Business Performance.* New York: The Free Press.

RAPPAPORT, A., 1992. CFOs and strategists: forging a common framework. *Harvard Business Review,* 70 (3), 84-91.

REMENYI, D., WILLIAMS, B., MONEY, A. AND SWARTZ, E., 1998. *Doing Research in Business and Management: An Introduction to Process and Method.* London: Sage.

REMENYI, D., MONEY, A., SMITH, M. AND IRANI, Z., 2000. *The Effective Measurement and Management of IT Cost and Benefits.* 2nd ed. Computer weekly-professional information systems text books series. Oxford: Butterworth-Heinemann.

REUER, J. AND LEIBLEIN, M., 2000. Downside risk implications of multinationality and international joint ventures. *Academy of Management Journal,* 43, 203-214.

REUER, J. J. AND TONG, T. W. 2005. Real options in international joint ventures. *Journal of Management,* 31 (3), 403-423.

RHYS, G., 2004. The motor industry in an enlarged EU. *The World Economy,* 27 (6), 877-900.

RHYS, G., 2005. Competition in the auto sector: the impact of the interface between supply and demand. *International Journal of Automotive Technology and Management,* 5 (3), 261-283.

ROBSON, C., 1993. *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*. Oxford: Blackwell.

ROBSON, C., 2002. *Real World Research*. 2nd ed. Oxford: Blackwell.

ROSS, M., 1986. Capital budgeting practice of twelve large manufacturers. *Financial Management*, 15 (4), 6-21.

ROSS, S. A., 1976. The arbitrage theory of capital asset pricing. *Journal of Economic Theory,* 13 (3), 341-360.

RUMELT, R. P., 1987. Theory, strategy and entrepreneurship .*In*: D. J. Teece, ed. *The Competitive Challenge: Strategies for Industrial Innovation and Renewal*. New York: Harper & Row.

RUPERT, B., 1999. Avoiding pitfalls in investment appraisal. *Management Accounting,* 77(10), 22.

RYAN, P. AND RYAN, G., 2002. Capital budgeting practices of the fortune 1000: how have things changed. *Journal of Business and Management,* October.

SANGSTER, A., 1993. Capital investment appraisal techniques: A survey of current usage. *Journal of Business Finance and Accounting*, 20 (3), 307-332.

SAUNDERS, M., LEWIS, P. AND THORNHILL, A., 2000. *Research Methods for Business Students*. 2nd ed. London: Prentice Hall.

SAUNDERS, M., LEWIS, P. AND THORNHILL, A., 2003, *Research Methods for Business Students*. 3rd ed. Harlow: Prentice Hall.

SAUNDERS, M., LEWIS, P., THORNHILL, A., 2007. *Research Methods for Business Students.* 4th ed. Essex: Prentice Hall.

SCAPENS, R. W. AND SALE, J. T., 1981. performance measurement and formal capital expenditure controls in divisionalised companies. *Journal of Business Finance and Accounting*, 8 (3), 389-419.

SCAPENS, R.W., 1990. Researching management accounting practice: the role of case study methods. *The British Accounting Review*, 22 (3), 259-281.

SEKARAN, U., 2003. *Research Methods for Business: A Skill Building Approach.* 4th ed. New York: John Wiley & Sons.

SELLTIZ, C., JAHODA, M., DEUTSCH, M. AND COOK, S., 1964. Research methods in social relations. New York: Holt, Rinehart and Winston. *Cited in:* D., SILVERMAN. 2001. *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction.* 2nd ed. London: Sage.

SHANK, J., 1996. Analysing technology investment-from NPV to SCM. *Management Accounting Research*, 7 (2), 185-197.

SHARP, D. J., 1991. Uncovering the hidden value in high-risk investments. *Sloan Management Review*, 32 (4), 69-74.

SHERIDAN, T., 1986. How to account for manufacturing. *Management Today,* August.

SILVERMAN, D., 1993. *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction*. London: Sage.

SILVERMAN, D., 2001. *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction.* 2 nd ed. London: Sage.

SKINNER, W., 1978. *Manufacturing in the Corporate Strategy*. New York: John Wiley & Sons.

SLAGMULDER, R., BRUGGEMAN, W. AND WASSENHOVE, L., 1995. An empirical study of capital budgeting practices for strategic investments in CIM technologies. *International Journal of Production Economics,* 40, 121-152.

SLAGMULDER, R., 1997. Using management control systems to achieve alignment between strategic investment decisions and strategy. *Management Accounting Research,* 8 (1), 103-139.

SMALL, M. H. AND CHEN, J., 1995. Investment justification of AMT: an empirical analysis. *Journal of Engineering and Technology Management,* 12 (1 & 2), 27-55.

SMART, A.U., BARRAR, P., McCOSH, A. M. AND LLOYD, A. A., 2002. Incorporating competitive advantage into the process technology investment decision. *Journal of Manufacturing Technology and Management,* 4 (5), 401-419.

SMITH, H., 1975. *Strategies of Social Research: The Methodological Imagination.* Englewood Cliffs, NJ: Prentice Hall.

SMITH, D. AND MURRAY, K. 1997. Coping mechanisms: the use of informal techniques to deal with the uncertainty of investment decisions. *Research Foundation Management Report.* London: CIMA.

SMITHON, S. AND HERSCHHEIM, R., 1998. Analysing information systems evaluation: another look at an old problem. *European Journal of Information Systems, 7* (3), 34-52.

SPRONK, V. J. AND WIJST, N. V., 1996. Analyzing risk and performance using the multi-factor concept. *European Journal of Operational Research,* 93, 173–184.

STAINER, A., GHOBADIAN, A., LIU, J. AND STAINER, L., 1996. Strategic investment appraisal for advanced manufacturing technology. *International Journal of Materials and Product Technology*, 11 (1 & 2), 76-88.

STARK, A. W., 2000. Reap options, (dis) investment decision-making and accounting measures of performance. *Journal of Business Finance and Accounting*, 27(3 & 4), 313- 329.

STRAUSS, A., AND CORBIN, J, M., 1990. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques.* Newbury Park, Calif: Sage.

STUTELY, M., 2003. *Numbers Guide: The Essentials of Business Numeracy.* London: Bloomberg Press.

TABCHNICK, B. G. AND FIDELL, L. S., 2001.*Using Multivariate Statistics.* 4th ed. USA: Pearson Education.

TASHAKKORI, A. AND TEDDLI, C., 2003. *Handbook of Mixed Methods in Social and Behavioural Research.* Thousand Oaks, CA: Sage.

THOMAS, R., 2001. Business value analysis: coping with unruly uncertainty. *Strategy & Leadership.*29 (2),63-78.

TOMBARI, H. A., 1978. To buy or not to buy? weighing capital investments. *Production Engineering,* March.

TOMKINS, C., 1991. *Corporate Resource Allocation: Financial, Strategic and Organisational Perspectives.* Oxford: Blackwell.

TRIANTIS, A. J. AND HODDER, J. E., 1990. Valuing flexibility as a complex option. *Journal of Finance,* 45 (2), 549-565.

TRIANTIS, A. AND BORISON, A., 2001. Real options: state of the practice, *Journal of Applied Corporate Finance,* 13 (2), 34-45.

TRIANTIS, A., 2006. Realizing the potential of real options: does theory meet practice? *In:* J. RUTTERFORD, M. UPTON AND D. KODWANI. 2006. *Financial Strategy.* 2nd ed. Chichester: John Wiley & sons.

TRIGEORGIS, L., 1988. A conceptual options framework for capital budgeting. *Advances in Futures and Options Research,* 3, 145-167.

TRIGEORGIS, L., 1993. Real options and interactions with financial flexibility. *Financial Management,* 22 (3), 202-224.

TRIGGEORGIS, L., 1997. *Real Options: Managerial Flexibility and Strategy in Resource Allocation.* 2nd ed. Cambridge, MA: MIT Press.

TROMPENAARS, F. AND HAMPDEN-TURNER, C., 1997. *Riding the Waves of Culture: Understanding Cultural Diversity in Business.* London: Nicholas Braeley.

VERMEULEN, J. E., VAN DER WIJST, S. AND VAN DER WIJST, N., 1996. Analyzing risk and performance using the multi-factor concept. *European Journal of Operational Research,* 93, 173-184.

WALLACE, R. S. O. AND MELLOR, C. J., 1988. Non-response bias in mail accounting surveys: A pedagogical note. *The British Accounting Review*, 20 (3), 131-139.

WARD, K., 1993. *Corporate Financial Strategy*. Oxford: Butterworth- Heinemann.

WERNER, M., 2004. Real options: finding comfort in a "learn and adapt" world. *Valuation Strategies*, 7 (3), 18-25.

WHEELWRIGHT, S. C. AND HAYES, R. H., 1985. Competing through manufacturing, *Harvard Business Review*, 63 (1), 99-109.

WILLIAMS, J. T., 1991. Real estate development as an option. *Journal of Real Estate Finance and Economics,* 4, 191-208.

WRIGHT, M.G., 1990. *Using Discounted Cash Flow in Investment Appraisal*.3rd ed. London: McGraw-Hill.

YEO, K. T. AND QIU, F., 2003. The value of management flexibility-a real option approach to investment evaluation. *International Journal of Project Management*, 21 (5), 243-250.

YIN, R. K., 2003. *Case Study Research: Design and Methods.* 3rd ed. Thousand Oaks.CA: Sage.

www.smmt.co.uk/data services/industry analysis (access November 2003).

www.smmt.co.uk/data services/industry analysis (access July 2005).

www.smmt.co.uk/data services/industry analysis (access November 2007)