DEVELOPING A DECISION- MAKING MODEL THAT BEST CLOSES THE GAP BETWEEN STRATEGY AND THE CAPITAL INVESTMENT PROCEDURE FOR CADBURY SOUTH AFRICA

By

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DECLARATION

"I Brendan David Wilson hereby declare that:

- The work in this research paper is my own original work;
- All sources used or referred to have been documented and recognised; and
- This research paper has not been previously submitted in full or partial fulfilment of the requirements for an equivalent or higher qualification at any other recognised education institution"

ABSTRACT

This study addresses the fact that the current Cadbury investment appraisal process does not adequately address the strategic implications of many capital investment decisions. Although attempts are made to quantify, in financial terms, the strategic benefits from a given investment, it appears that many perceived benefits are left out of the appraisal process because they lack precise financial quantification, resulting in managers placing greater reliance on the qualitative dimensions of their investment decision-making such as judgement and intuition.

The current Cadbury process is based on the unequivocal advice that academics give to organisations and to managers about how to appraise large-scale capital investment projects. The use of discounted cash flow techniques, based upon the discounting of decision contingent cash flows at the organisations opportunity cost of capital is regarded as the definitive investment appraisal technique. On this, the academic literature is clear.

Whilst there are strong theoretical justifications for the use of discounted cash flow based models, managers continue to use non-DCF appraisal techniques such as payback irrespective of their theoretical shortcomings. The lack of use of a sophisticated risk assessment model is also disappointing, with Cadbury ignoring individual project risk and adopting a naive approach.

Finally, this study indicates that Cadbury managers need not be forced into choosing either an economic/normative approach or a strategic/managerial approach to capital-investment decision-making but that rather a hybrid approach, including both the economic and strategic dimensions of choice, is more applicable for effective strategy incorporation.

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CHAPTER 1

THE PROBLEM AND ITS SETTING

1.1 INTRODUCTION AND BACKGROUND

1.1.1 Introduction

Investment decisions are among the most important decisions made by organisations. The capital budgeting process governs the way in which managers at various levels produce and share information about proposed investments and determines how they are evaluated.

The capital budgeting literature has primarily focused on the financial evaluation of an investment and proposes that the process is like a “black box” where a manager can assess risk, choose the right discount rate and generate net present value which then leads to perfect decisions that maximise the organisation’s wealth (Brealey & Myers, 1991: 215). Organisations produce detailed documents that guide managers as to how this process works for their organisation. These documents explain what constitutes a successful project by detailing the required information, the format, the discount rate, the risk factors and the required measures.

In a multinational organisation managers far removed from the impact of the decision make the final decision based on information generated by managers who are. The following quotation raises certain questions: “Figures can’t lie, but liars can figure” (Anonymous). The inclusion of this quotation is not to suggest that managers are liars, but rather that a manager who really believes in the benefits of a particular investment will feed valid numbers into the “black box” investment process that will generate the correct answer for project approval even if he/she is not the final decision-maker. This is similar to the agency issue, which organisations face, where managers place personal goals ahead of organisational goals- the goal in this instance might be the acceptance of a project (Gitman, 2003: 19).

Organisations recognise the agency issue and establish incentive systems to induce truthful evaluation and number inputs. The inclusion of strategy into this conventional “black box” model of investment appraisal is thus made extremely challenging as strategic investments do not fit the model correctly and are hence usually eliminated by the model, or, strategically minded managers input numbers into the “black box” that guarantee a positive outcome and position the strategic investment. Organisations usually do have a methodology in place to deal with strategic investments but this often requires a written justification and the investment is then qualitatively evaluated. How senior managers make “non black box” decisions is not known (Brealey & Myers, 1991: 215).

The lack of rigour, where capital budgeting decisions are made through a less formal process of deriving consensus among top managers could lead to situations in which weak projects are justified on an *ad hoc* basis, all in the name of strategy. This indicates that the “black box” model has certain failings, particularly with regard to strategic investments.

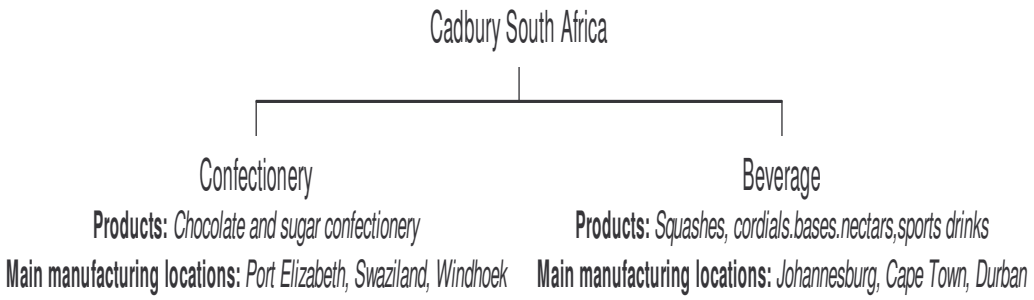
Cadbury South Africa as a multinational company experiences the problems highlighted above with the “black box model” and a model that overcomes the limitations of the “black box model” and the lack of analytical discipline that often characterises qualitative evaluation strengthening the strategic aspects will ensure its continued growth.

1.1.2 Cadbury South Africa

Cadbury South Africa is one of 137 manufacturing operations within the Cadbury Schweppes group worldwide and forms part of the Europe, Middle East and Africa (EMEA) business region as divided by Cadbury Schweppes. Cadbury South Africa was part owned until 2000 when Cadbury Schweppes bought out the 45 per cent minority shareholders (Coetzee, 2005).

The head office for Cadbury South Africa is based in Johannesburg, which is also the site of the main distribution depot. Cadbury South Africa is split into confectionery and beverage with manufacturing sites located in the major centres and is spread out across three countries; South Africa, Namibia and Swaziland (refer to Diagram 1) (Coetzee, 2005).

Diagram 1: Group Structure Cadbury South Africa



Source: Author's own construction

The technology installed on the various sites ranges from 60-year-old equipment to the latest. The largest and most complex manufacturing site is located in Port Elizabeth. It was established in 1930 and consists of chocolate and sugar confectionery. The majority of capital expenditure occurs at the Port Elizabeth site (Coetzee, 2005).

Cadbury South Africa has an approximate R 3 billion turnover per annum and on average spends in the region of R 200 million on capital projects including information technology and distribution (Coetzee, 2005).

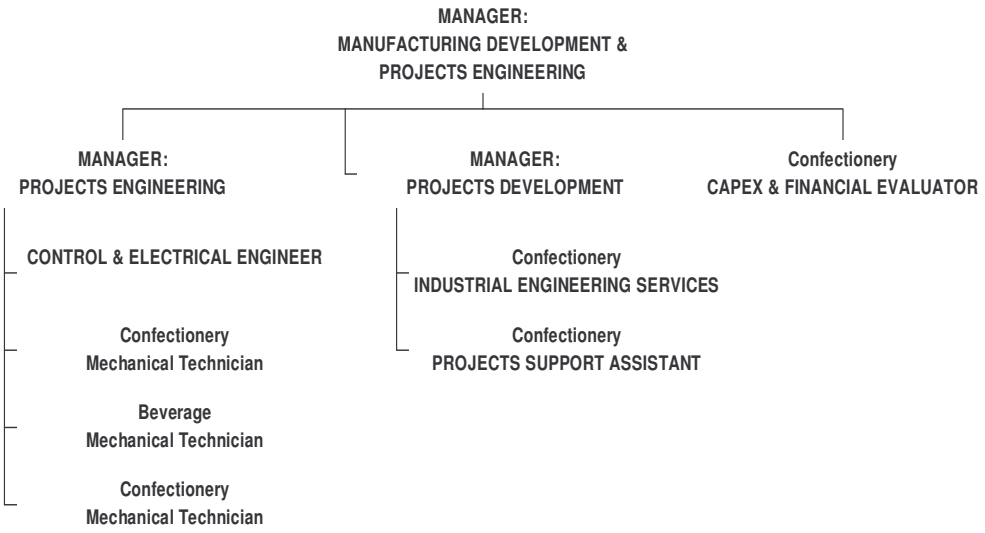
The beverage and confectionery streams were run as separate business units until the end of 2004. At the beginning of 2005, they were combined under one board becoming Cadbury South Africa. This has resulted in the organisation undergoing a restructuring, where synergies in the areas of logistics and customer operations were utilised. Certain common support functions including financial, projects, risk management and quality were centralised for the two streams (Coetzee, 2005).

Capital expenditure is tightly controlled by Cadbury Schweppes and all capital expenditure has to follow a resource allocation model (RAM) process. The financial indicators are calculated using proprietary software (HOLT EVALUATOR). This software is used to create a common base across the various regions with regard to capital expenditure evaluation because Cadbury Schweppes is valued by the market on a discounted cash flow basis, but is managed on an economic profit basis (Cadbury Schweppes, 2005). Various approval levels for capital expenditure exist from local, regional and Group

based on pound sterling value. Group fixes the exchange rate for conversion to pound sterling for approval values (Cadbury Schweppes, 2005).

The capital expenditure for Cadbury South Africa, excluding information technology and distribution is the responsibility of the Manufacturing Development and Projects engineering manager who is responsible for the generation of the approval documentation (RAM) and the implementation of the larger engineering capital projects (refer to Diagram 2)(Coetzee, 2005).

Diagram 2: Organogram for Project department



Source: Author's own construction

1.2 MAIN PROBLEM

Cadbury South Africa has a detailed resource allocation model (RAM) procedural manual that lays down the how, why and what of generating a capital expenditure proposal and details the self-imposed criteria that will be used as decision rules to capital expenditure going forward. These are:

- Cash Payback, tax charged (0 – 3 years)
- Internal rate of return (IRR) (>25%)
- Profitability index (PI) (>100%)

These measures, by the manual's own admission, focus purely on gaining better cash flow for the organisation and any projects that fall outside of these parameters need to have a compelling written motivation (Cadbury Schweppes, 2005). The foregoing raises two questions. Firstly, and bearing in mind that the company's stated objective is to maximise shareholder wealth *in the long term*, how will this objective be achieved if Cadbury Schweppes' current criteria for capital investment decision-making are all based upon generating cash flow benefits in the short term? Secondly, how might the company link its strategic requirements with a capital expenditure procedure that rewards short-term gains?

Many definitions of strategy exist in the literature but the following definition by Johnson and Scholes (2002: 10) contains the main characteristics:
"*Strategy is the direction and scope of an organisation over the long term, which achieves advantage for the organisation through its configuration of resources within a changing environment and to fulfil stakeholder expectations*". According to this definition, strategy has the following characteristics:

- It is long term.
- Gains advantage for the organisation.
- Involves change.
- Is unique to the organisation, due to its unique configuration.
- Must meet stakeholder expectations.

These characteristics lead to the following problem, which will be addressed by this research:

An investigation into the existing gap between strategy and the capital investment procedure for Cadbury South Africa.

1.3 SUB-PROBLEMS

In order to develop a research strategy that addresses and solves the main problem, the following sub-problems and hypotheses have been identified:

Sub-Problem 1

How and to what degree are capital investment decisions accepted on financial criteria?

Hypothesis 1

Capital investment decisions are only accepted on financial criteria.

Sub-Problem 2

To what extent is the use of accounting concepts continuing, in the face of discounted cash flow calculations?

Hypothesis 2

Although three financial measures are calculated and presented, Payback is the only measure accepted by most decision-makers.

Sub-Problem 3

How and to what extent, do strategic investments promote intervention by management to ensure positive results?

Hypothesis 3

Management manipulates cash flows to ensure a positive result when a project is strategic of nature or if the majority of benefits are intangible in order to gain acceptance within the purely financially based evaluation criteria.

The importance of attaining greater clarity on the main problem and sub-problems is highlighted by several factors. These factors make effective capital investment decisions imperative and include:

- The sensitivity of the economy to the volatile changes in the local, national and global environment.
- The high levels of Rand expenditure on the acquisition of goods and services by engineering projects.

- The opening up of international markets and creation of opportunities for global expansion.
- Priority setting criteria are not consistently applied to all projects.
- Companies are focusing on functional efficiency instead of strategy.
- Most top managers play little if any role in the early studies of knowledge acquisition, concept investigation and basic design of a development effort.
- Top managers tend to have an insular focus on technology projects, which can result in actual management performance being below perceived performance.
- Lack of top management buy-in is the principal reason that projects fail.

The future development of effective investment decisions in line with corporate objectives will have important ramifications for engineering projects at Cadbury South Africa.

1.4 THE DELIMITATIONS

1.4.1 Basis for the model

It is intended in this study to develop a model from the current literature that Cadbury South Africa's managers can use to assist decision-making regarding capital expenditure. The aim of the study is to develop this model by integrating what the literature reveals as alternatives to the usual financial capital budgeting process and how this model can be included in the existing procedure. The model will be specifically aimed at strategic investments as these are the type of investments that usual generate problems under the current investment process. The study does not intend to create a new system of capital expenditure evaluation, only a tool that can be used in support of the existing system to allow more effective decision-making.

1.4.2 Management level

As previously mentioned in section 1.1.2, the capex proposal system has various levels of approval, namely, local, regional and group. The study will be limited to the senior managers, middle managers and directors of Cadbury responsible for decision-making regarding Cadbury South Africa. All other levels such as junior managers and team leaders are excluded.

1.4.3 Subject of evaluation

According to Horngren, Foster and Datar (1997: 781) the capital expenditure process can be broken up into five distinct interrelated steps.

1. Proposal generation
2. Review and analysis
3. Decision-making
4. Implementation
5. Follow-up

It is intended in this study to focus only on the review and analysis and the decision-making steps of the capital expenditure process, with particular emphasis on how to include strategic organisational goals within a process that by default eliminates strategic projects.

The objective is to develop a model that can be used to justify those projects that are strategically important but are rejected as their financial evaluation fails the current decision criteria.

1.4.4 Geographic location

Cadbury South Africa is part of Cadbury Schweppes; therefore, the same capital process is followed throughout the Cadbury Schweppes organisation. This means that no geographic location that falls within the Cadbury group is excluded.

1.5 DEFINITION OF KEY TERMS

1.5.1 Capital expenditure

Gitman (2003: 356) defines capital expenditure as " an outlay of funds by the firm that is expected to produce benefits over a period of time greater than one year". The definition highlights the key factors, benefits and period greater than one year. Levy and Sarnat (1982: 15) define capital expenditure as "an investment decision that management commits current resources to in order to secure a stream of benefits in future years".

For the purpose of this study, *capital expenditure* will be defined as the investment of an organisation's funds in projects that will produce benefit over a period greater than one year.

1.5.2 Benefits

Gitman (2003: 361) defines a benefit for a capital expenditure as a cash inflow that is a direct result of the capital expenditure. Horngren et al (1997: 781) state that the benefits can be both quantitative and qualitative and although capital expenditure analysis emphasises financial quantitative factors, qualitative factors play an important role.

For the purpose of this study, *benefit* will be defined as the financial and other qualitative aspects that positively impact on an organisation because of the implementation of a capital expenditure proposal.

1.5.3 Black Box

Brealey and Myers (1991: 215) define a 'black box' as something that is accepted and used but not understood. For example, a computer is a black box as all users do not understand the exact workings or can fix it, but it can be used.

For the purpose of this study, *black box* will be defined as something that is used but not understood.

1.6 ABBREVIATIONS

1.6.1 CAPEX

Capex is the abbreviation used for capital expenditure.

1.6.2 DCF

DCF is the abbreviation used for discounted cash flow.

1.6.3 RAM

RAM is the abbreviation for Resource Allocation Model.

1.7 ASSUMPTIONS MADE

It is assumed that the middle managers, senior managers and directors of Cadbury South Africa, as well as group middle and senior managers are representative of the decision- makers that will utilise the developed model.

It is assumed that differences in cultures are nullified, with regard to capital investment and that a Cadbury culture is prevalent with regard to capital

investment hence results are applicable throughout the organisation irrespective of the geographical location of the sample.

It is further assumed that the alternative models that will be identified from the literature study are relevant and applicable to the needs of Cadbury South Africa.

1.8 IMPORTANCE OF THE STUDY

Salvatore (2001: 619) states that the application of new technological breakthroughs may lead to new and better production methods, changes in consumer tastes may make an organisation's existing products outdated and give rise for entirely different products, while mergers with other organisations may significantly strengthen an organisation's position. The above opportunities are typical capital expenditure type opportunities and are strategic in nature. An organisation's management team needs to be alert to explore these and other opportunities (Salvatore, 2001:620).

According to Northcott (1992: 26), capital expenditure is an important determinant of the future success of an organisation and this decision-making is not an easy task. According to Salvatore (2001: 620), reasons for this are that major capital expenditure projects are mostly irreversible and capex decision-making usually involves substantial financial outlay in return for future, uncertain returns. Poor capex decisions do not only misdirect financial resources, but can also undermine the future strategic development and operations of an organisation negatively impacting on the organisation's wealth-creating opportunities (Northcott, 1992: 28). The above indicates that strategic capital expenditure decision-making is of critical importance to an organisation.

Cadbury South Africa, as part of the Cadbury group, has a detailed Resource Allocation Model; this model does have limitations in that it focuses on certain financial criteria that determine a project's possible acceptance. The present financial rules are currently focused on short-term benefits and this makes strategic type investments difficult to justify. Over time, this could erode Cadbury South Africa' s ability to maintain its current market position. A model that assists with justifying strategic investment decisions will improve Cadbury

South Africa's ability to maintain its dominant market position as well as its stated vision of ensuring continued wealth-creation for its shareholders in the long term.

1.9 METHOD OF THE STUDY

This study is intended to develop a model for use by Cadbury South Africa managers and group managers to assist with decision-making regarding capital expenditures that operate in conjunction and in support of the existing process model. The following procedure will be adopted to solve the main and sub-problems:

1.9.1 Literature survey

The traditional "black box" model of capital investment analysis will be reviewed and alternative, more strategic- based models will be reviewed and presented.

1.9.2 Empirical study

An empirical study consisting of the following will be conducted:

1.9.2.1 E-mail survey

An email survey will be conducted among middle managers, senior managers and directors of the Cadbury Organisation using a questionnaire prepared by the researcher, using information from the literature survey. The reason for choosing these three management levels is that they decide what capital expenditure proposals are presented or approved and hence should be able to give a good indication of the current capital investment procedure.

1.9.2.2 Measuring instrument

The measuring instrument will take the form a comprehensive questionnaire, developed by the researcher.

1.9.2.3 Sample

The Cadbury Schweppes hierarchal list will be used to gain the names and email addresses of all current middle managers, senior managers and directors in the organisation who are involved with capital investment decisions.

1.9.2.4 Statistical analysis of data

At the time of drafting the questionnaire, relevant statistical procedures for interpreting and analysing the data will be discussed with a statistician.

1.9.2.5 Development of a decision-making model

The answers from the questionnaire and models from the literature study will be combined, to propose a model that can be added to the existing capital investment process.

1.10 STRUCTURE OF THE STUDY

The study has been divided into five chapters with the following content:

Chapter 1:	Problem statement and definition of concepts.
Chapter 2:	Literature review and theoretical framework.
Chapter 3:	Research design and methodology.
Chapter 4:	Presentation and discussion of results.
Chapter 5:	Conclusion and recommendations.

CHAPTER 2

2 REVIEW OF THE RELATED LITERATURE

2.1 INTRODUCTION

The objective of this chapter is to explore what the literature states regarding the "black box" model of capital budgeting where a manager can assess risk, choose the right discount rate and generate net present value which then leads to perfect decisions that maximise the organisation's wealth (Brealey & Myers, 1991: 215). Alternative, strategic, models will be included to allow the proposal of a hybrid model that can be utilised by Cadbury South Africa in support of its existing resource allocation model that is based on the "black box model". The postulated hybrid model will allow senior management to improve their evaluation of capital investment proposals, particularly strategic capital investment proposals.

2.1.1 Area of evaluation

The subject of capital budgeting has been part of the theory of corporate finance since 1919 when decision-making focused on the "humanities" rather than the "economic science" (Dempsey, 1996: 1). The capital budgeting process can be subdivided into four stages according to Dempsey (1996: 1), namely:

- Identification and development of project proposals;
- Financial evaluation of projects;
- Implementation of projects; and
- Project review.

The focus of the majority of the finance literature is related to the financial evaluation of projects which started in the late 1950's with the move away from the "humanities" towards the "economic science", which occurred with the development of discounted cash flow (DCF) calculations (Buckley, 1996: 17; Dempsey, 1996; Johnson, 1994:79; Northcott, 1992:50; Brealey & Myers, 1991: 73-94).

The DCF calculations consisting of net present value (NPV) and internal rate of return (IRR) has been considered the most effective method of analysis of capital investment analysis (Buckley, 1996: 17; Dempsey, 1996; Johnson, 1994:79; Northcott, 1992:50; Brealey & Myers, 1991: 73-94).

Ryan (2002) in reviewing past empirical studies of capital budgeting practices by managers, noted the increasing preference in use of the discounted cash flow analysis, in particular the preference of use of NPV as the preferred capital budgeting tool, indicating a match between academic theory and practice.

Trigeorgis and Mason (2001: 47) and Hall (1998: 22) found in their research that many corporate managers overrule the analysis results from the DCF techniques and use non-financial criteria in order to accommodate strategic considerations. Their conclusions are in conflict with the findings of Ryan (2002).

Pike and Wolfe (1988: 100) found that how investment decision-makers actually made their decisions when faced with a strategic decision was still not clearly defined and this was confirmed by Gitman (2003:445) and Mekonnen Akalu (2002) who have postulated that despite NPV and IRR delivering good decisions, a more strategic approach has been emerging towards capital budgeting decisions in practice.

The above indicates a conflict between theory and practice with regard to strategy and capital budgeting. In order to explore this gap between strategy and capital budgeting theory and practice the literature review will include four areas:

1. **How capital investment impacts on the value of an organisation,**
2. **The link between capital investment and the strategy of an organisation by briefly exploring strategy and then briefly identifying the relevant cash flows and describing the "black box" model by examining its components of decision criteria and risk,**
3. **The gap that exists between strategy and capital investment, and**
4. **Current models that the literature suggests as methods of closing the gap between strategy and capital investment.**

2.2 IMPACT OF CAPITAL BUDGETING ON THE VALUE OF AN ORGANISATION

Strategy, capital investment and the value of an organisation are all linked with each other in that they share the common purpose of achieving maximum wealth for the shareholder. What constitutes the wealth of an organisation is not the objective of this review but has been the objective of numerous texts (Gitman, 2003; Northcott, 1992; Bierman & Smidt, 1980). It is sufficient to note that the wealth of an organisation can be defined as the value of the share price of its stock, which is based on the timings of its cash flows, their magnitude and their risk (Gitman, 2003: 16).

Capital budgeting has an impact on the wealth of an organisation as it is normally responsible for all expenditures that produce benefits longer than one year (Aggarwal, 1993: 10; Bierman & Smidt, 1980: 4). Typical investments covered by capital budgeting are buildings, machinery, advertising campaigns, and information technology equipment.

The time span of capital budgeting determines the impact that it has on the wealth of the organisation as the continued wealth or success of the organisation is dependent on the decisions made at the present time while committing the resources of the organisation in exchange for future benefits. The commitment of resources in terms of time and money in investments that may only deliver benefits to the organisation after a period of time, emphasises the importance of the accuracy of capital budgeting and the effect that it can have on the wealth of the organisation (Aggarwal, 1993: 10; Northcott, 1992:4; Seitz, 1990: 3; Bierman & Smidt, 1980: 4). The closer the expected benefits are to the present, the less the potential exists of negatively impacting on the wealth of the organisation, as opposed to benefits that accrue over a longer period of time that increase the risk of a negative result.

Of all the resources that capital investment can absorb, money can be considered as the most important, as money can usually acquire the other resources. This dictates that money needs to be used as effectively as possible, which links with the goal of capital expenditure -wealth maximisation- which occurs when the benefits of an investment exceed its original cost (Seitz, 1990:3).

Review of the above indicates that the wealth of an organisation is directly linked to the capital budgeting process in that the goal of capital budgeting is to increase the wealth of the organisation. Capital budgeting occurs over a period greater than one year by definition. This then appears to tie it into the strategy of the organisation. The following section will review how capital budgeting and strategy are linked.

2.3 LINK BETWEEN CAPITAL BUDGETING AND STRATEGY

Wealth-maximising organisational strategy supports financial performance objectives, and wealth-maximising financial decisions support organisational strategy (Seitz, 1990: 563). Both of these need to be in harmony if an organisation is to create long-term sustainable wealth. There is, however, a potential bias against strategy within an organisation's capital budgeting process (Seitz, 1990: 563). This will be explored in the following section. The objective of this section is to indicate that synergies exist between strategy and capital budgeting.

2.3.1 Strategy

According to Shrivastava (1994:5), strategy is a concept that helps executives to manage both the efficiency and the effectiveness of an organisation. It aligns or matches the organisation with its environment. Bourgeois (1996:95) states that there is no genuine definition for strategy, but rather general ideas shared by managers. These ideas include a plan for the future, setting goals and steps to reach them, methods to face competition, mission, course of action, integrated decisions, and a battle plan.

Seitz (1990: 550) concluded that strategy for an organisation is the definition of what business it is in as well as how it will position itself in relation to its competitors. This was built on the military definition of strategy, which simply stated, is that strategy is the preparation for battle while tactical decisions are ones that are made during the battle.

Bierman and Smidt (1980:3) in converting this statement into financial terms postulates that strategic investment decisions involve large sums of money, and normally result in a departure from the way an organisation usually does something, while a tactical decision involves relatively small amounts of money and maintains the organisation's way of doing things.

The organisation's strategy must be supported by the capital budgeting policy as the strategy creates the opportunities and the capital budgeting policy needs to insure that these opportunities are utilised. The difference between strategic investment and tactical investment should also be clearly defined.

Brealey and Myers (1991: 267) see this problem as a strategic fit between what they define as "bottom-up" and "top down" processes where the tactical aspect would be when a proposal originates from a functional manager "bottom-up" as opposed to proposals from senior management "top-down", which could be considered to be more strategic in nature.

2.3.2 Relevant cash flows

The evaluation of capital expenditure alternatives requires that an organisation determines the relevant cash flows. These are the incremental cash outflow (Investment) and the resulting subsequent cash inflows (Gitman, 2003: 360).

A conventional pattern project includes three basic components (Gitman, 2003: 361; Johnson, 1994; Seitz, 1990):

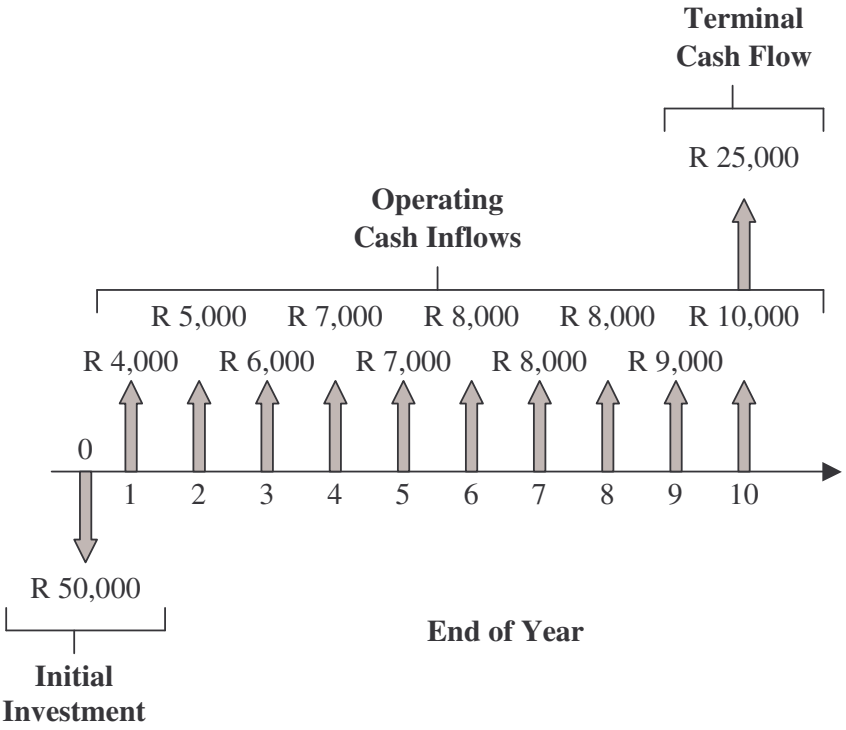
1. An initial investment – relevant cash outflow for a proposed project at time zero.
2. Operating cash inflows –the incremental after-tax cash inflows resulting from execution of a project during its life.

3. Terminal cash flow- the after-tax non-operating cash flow occurring in the final year of the project. It is usually attributable to liquidation of the project.

These three cash flows are depicted in Diagram 3

Diagram 3: Cash flow components

Time line for major cash flow components



Source: Adapted from Gitman (2003: 361)

2.3.3 Capital budgeting

Capital budgeting traditionally has been understood to be an ordered process where information flows into some "black box" where it is digested and turned into recommendations for action (Northcott, 1992:9). Northcott (1992), Brealey and Myers (1991) have been among some who have challenged this traditional "black box" theory of capital budgeting. The "black box" theory proposes that a manager can assess risk, choose the right discount rate and generate net present value which then leads to perfect decisions that maximise the organisation's wealth (Brealey & Myers, 1991: 215).

Capital budgeting as a process can be divided into four stages; identification and development of investment proposals; financial evaluation of projects; implementation of projects; and project review. The scope of this study concentrates on the first two.

The financial evaluation portion has a number of tools to determine the wealth that a project can create for the organisation; these methods can be split into accounting based concepts and economic based concepts (Northcott, 1992: 26).

Five of the principal methods for evaluating capital projects are as follows:

1. Payback period (PP)
2. Accounting rate of return (AROR)
3. Net present value (NPV)
4. Internal rate of return (IRR)
5. Profitability index (PI)

Most large companies according to Ryan (2002) utilise all, one or more of these methods when evaluating capital projects. Cadbury Schweppes, as previously mentioned, utilises three of these, namely: Payback period, internal rate of return and profitability index when evaluating capital projects.

2.3.3.1 Accounting concepts

From an accounting perspective, long term financial success is measured via profitability, while short term financial success is measured on liquidity (Buckley, 1996: 17; Northcott, 1992: 31). Liquidity concerns are translated into questions of how quickly an investment can repay its cost (Horngren et al, 1997: 782). Probability considerations have been translated into questions concerning the profit return generated by a capital investment on the investment it represents (Northcott, 1992: 29).

Two main analysis techniques have arisen from the accounting perspective, Payback period (PP) and accounting rate of return (AROR), also known as the return on capital employed (Gitman, 2003: 387).

2.3.3.1.1 Payback Period (PP)

Payback period (PP) is concerned with liquidity and calculates the number of years to recapture the initial investment in a project. If the Payback period calculated is less than some predetermined required Payback period, the proposal is accepted (Northcott, 1992: 27). The major shortcoming of this method is that it ignores the benefits that occur after the Payback period and so cannot be viewed as a measure of profitability over a project's entire life (Buckley, 1996: 17). PP calculation is represented by equation 1.

$$PP = \frac{\text{Initial investment outlay}}{\text{Annual net cash receipt}} \qquad \text{----------} 1$$

This Payback period is often referred to in the literature as simple Payback and according to Northcott (1992: 49), this simple Payback can be improved, by discounting the cash inflows at the appropriate discount rate and determining the time period for recovery of the initial investment. The discounted Payback period (DPP) now incorporates the economic concept of the time value of money, increasing the investment recovery time and hence takes more of the investment's cash inflows into account (Northcott, 1992: 49). The second advantage of DPP is that the accept /reject criteria are not only based on an arbitrary value set by an organisation but the investment can be considered as successful if it pays back within its expected life span (Northcott, 1992:50).

DPP still ignores cash flow after the investment's Payback period - a disadvantage that it shares with PP. It retains it ability to focus on liquidity where appropriate and remains a relatively simple analysis method to compute and understand (Northcott, 1992:50).

2.3.3.1.2 Accounting rate of return (AROR)

Accounting rate of return (AROR) compares the profitability of a capital expenditure to the capital employed in the investment. One of the problems with this method is the selection of which way to represent profit and capital employed (Thomas, DeLorenzo & Bray, 5). According to Northcott (1992: 31) two different representations of AROR are in general use, this can be incorporated as the initial capital employed in the investment or the average capital employed over the life of the investment. AROR is represented by equation 2.

$$AROR = \frac{\text{Average accounting profit per annum}}{\text{Initial capital employed}} \qquad \text{----------} 2$$

2.3.3.2 <u>Economic concepts</u>

From an economic perspective, less emphasis is placed on liquidity and profitability and more on the maximization of shareholder wealth and the consideration of risk (Salvatore, 2001: 619; Northcott, 1992: 34). The combination of wealth maximisation objectives and risk considerations has led to the development of capital investment evaluation techniques different to the accounting techniques. Key to understanding the economic concepts is the time value of money. According to Gitman (2003: 150) the concept of the time value of money is simply illustrated by thinking about an interest –earning bank account. Cash deposited in a bank account today earns interest on it causing a larger amount of money to be received in the future. The rate of interest earned reflects the anticipated inflation, the risk of lending money to the bank, and the value that the bank must pay to persuade the investor to forgo the immediate use of the money. Two main techniques based on the time value of money exist for the evaluation of capexes, net present value (NPV) and the internal rate of return (IRR) (Northcott 1992: 38).

2.3.3.2.1 Net present value (NPV)

According to Horngren et al (1997: 783) the net present value technique finds the expected net monetary gain or loss from a capex proposal by discounting all expected future cash inflows and outflows to the present point in time, using the required rate of return. Projects with a positive NPV are considered acceptable as the return of these projects exceeds the cost of capital (Horngren et al, 1997: 783). The NPV calculation is represented by equation 3.

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} - CF_o \qquad \text{- 3}$$

CF_t = cash infows

CF_o = initial investment

k = discount rate

n = number of periods

2.3.3.2.2 The internal rate of return (IRR)

The internal rate of return focuses on finding the discount rate at which the NPV of the project would be zero. This means that the IRR is the rate of return earned by the project itself, and equates the present value of future cash flows to the initial outlay (Horngren et al, 1997: 785). If the IRR is greater than the cost of capital, the project is acceptable (Gitman, 2003: 403).

2.3.3.2.3 The profitability index (PI)

The profitability index (PI) is associated to NPV. NPV is the deviation between the project value and cost. Profitability index is the ratio of project value to cost (Johnson, 1994: 81). The profitability index indicates how much the investment in total is going to return as a value over time, compared with the total investment. The profitability index indicates the effectiveness of the capital spent (Cadbury Schweppes, 2005). The PI is represented by equation 4.

$$PI = \left[\sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} \right] \div CF_o \qquad \text{- 4}$$

CF_t = cash inflows

CF_o = initial investment

k = discount rate

n = number of periods

A positive NPV will result in a PI greater than one, and vice versa. A PI that is greater than one indicates an attractive investment (Seitz, 1990: 51).

The presentation of the above concepts has been done in order to clarify their use in the exploration of the gap between strategy and capital budgeting. To summarise, the most important of these are Internal Rate of Return (IRR), Payback Period (PP), Profitability Index, Accounting rate of return (AROR) and net present value (NPV).

2.3.4 Risk

Visser (2004:301) quotes Haimes (1998) as proposing the following generic definition of risk as "a measure of the probability and severity of adverse effects". Risk is applicable to various areas and is defined differently in different areas. Risk is an abstract concept, and Visser (2004:302) proposes that it has two dimensions, namely (a) the probability of a particular result occurring and (b) the impact that the result will have should it occur. Risk with reference to capital budgeting is explored below.

2.3.4.1 What is risk in capital budgeting?

Gitman (2003: 427) defines risk with regard to capital budgeting as follows:

" The chance that a project will prove unacceptable; or more formally, the degree of variability of cash flows".

The risk is due to the variability of the expected cash inflows as the expected expenditure or cash outflows can usually be determined with a large degree of certainty. The cash inflows are usually determined from a number of variables linked to revenues, expenditures and taxes. Examples are cost of raw materials, labour rates, utility costs, level of sales. The risk is a result of the interaction of the underlying variables (Gitman, 2003:427).

The assessment of risk for a capital expenditure is an evaluation of the probability that the cash inflows will be large enough for project assessment.
There are two methodologies of dealing with risk, namely, behavioural and explicit. Behavioural approaches enable management to get a "feel" for the risk levels while explicit methods overtly recognise risk.

2.3.5 Behavioural risk approaches

To allow managers to capture the variability of cash inflows and thereby capture the risk, the literature suggests that three techniques are commonly used to generate a "feel". These techniques originate from operations management research, namely:

1. Sensitivity analysis
2. Simulation analysis
3. Decision tree analysis

(Gitman, 2003: 428-431; Northcott, 1992:89; Seitz, 1990: 201-209)

2.3.5.1 Sensitivity analysis

This method assesses risk by using several possible values for a given variable; such as cash inflows to calculate which variable has a significant impact on the decision-making criteria (Gitman, 2003:429). If a change in the variable has little effect on the outcome, then that variable does not need to have a high level of accuracy and can be considered to be of little risk. If a small change in the value of a variable has a high impact on the outcome, then the accuracy of that variable is critical and can be considered a sensitive variable (Nothcott, 1992:93). A sensitive variable that has a high risk could have an influence on the acceptance of the proposed investment. The benefits of sensitivity analysis according to Northcott (1992: 93) are that (a) it allows for the identification of variables that need to have a high level of accuracy in their estimation and (b) it identifies capital investments that have high risk due to their changeable key variables.

The limits of sensitivity analysis are that it could give ambiguous results as the values assigned to the variables for analysis are the opinions of managers and might be extremely flawed giving erroneous results (Brealey & Myers, 1991:218).

The second limitation according to Brealey and Myers (1991:218) of sensitivity analysis is that the variables could be interrelated and the evaluation of the variables in isolation would not be of any benefit as the other variables could have an impact on the outcome in reality.

2.3.5.2 Simulation analysis

This analysis method is similar to sensitivity analysis but differs in that rather than altering one variable at a time, multiple variables are altered and treated as if they are risky (Gitman, 2003: 431; Nothcott, 1992:91; Seitz, 1990:201).
The most commonly used simulation model is the Monte Carlo technique that derives its name from the use of values that are randomly drawn, but with the probability of each draw controlled to approximate the actual probability of occurrence.

According to Nothcott (1992:92), to implement a Monte Carlo simulation a manager has to:

1. Identify the important variables of the capital investment;
2. Determine the range of these variables;
3. Give probabilities to the range of the variables;
4. Develop an application to run the simulation.

The output of the model gives the manager an expected result and a range of alternative results after a large number of itineration that allows management to gain an opinion of the risk of the proposed capital investment (Nothcott, 1992:92). The limitations of this analysis are that the input is dependent on the decision-maker, and depends on the accuracy and unbiased input of the decision-maker to ensure that the outcomes are realistic (Northcott, 1992:92; Brealey & Myers, 1991: 228).

2.3.6 Decision tree analysis

Where decisions consist of a sequence of dependent decisions such as an opportunity to expand or abandon a factory depending on sales during the first year, decision tree analysis can be utilised (Lawrence & Pasternack, 2002:349; Seitz, 1990:205).

Lawrence and Pasternack (2002:349) describe a decision tree as a chronological representation of the decision process where the root of the tree is a node, representing the present time from which a network of nodes, representing future points in time where decisions are required radiate.

Branches representing possible decisions or states of nature link these nodes. Table 2.3-1summarises the elements of a decision tree.

Table 2.3-1: Decision tree construction.

Decision Tree Construction		
Node Type	**Branches**	**Data on Branches**
Decision (Square Nodes)	Possible decisions that can be made at this time.	Cost or benefit associated with the decision.
States of Nature (Circle Nodes)	Possible states of nature that can occur at this time.	Probability the state of nature will occur given all previous decisions and states of nature

Source: Lawrence and Pasternack (2002: 349)

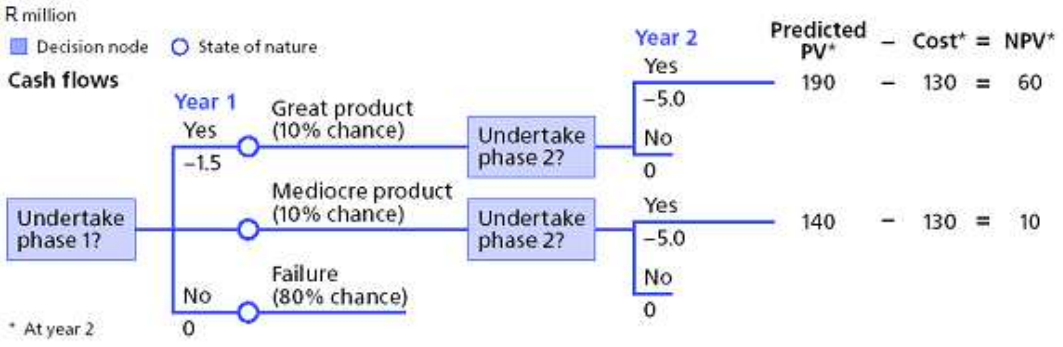
Decision tree analysis, as all risk measurement techniques, does not make the decision but allows the decision-maker to be able to gain a better understanding of the consequences of a particular decision (Seitz, 1990:207).

Cash flow forecasts depend on certain assumptions, usually based on the organisation's future investment and operating structure. These assumptions are usually not questioned by the decision-makers, decision trees allow the underlying assumptions to be brought to the attention of the decision-makers by displaying the links between the present and future decisions, allowing an organisation to find the strategy with the best result (Brealey & Myers, 1991: 236).

Decision trees can be combined with simulation models like the Monte Carlo model and the combined analysis can deliver a more specific view of risk and profitability than the other two used in isolation. The combined analysis can allow organisations to consider ways in which to reduce risk and allows for a better understanding of whether the expected profitability is worth the risk (Brealey & Myers, 1991: 236; Seitz, 1990:208).

To better demonstrate a decision tree Diagram 4 depicts an example of a research and development decision to develop a drug and then market it taken from a case study by Copeland and Keenan (1998b: 140). This example demonstrates the decision nodes, states of nature and the probabilities as described by Table 2.3-1.

Diagram 4: Decision tree for drug development.



Source: Adapted from Copeland and Keenan (1998b: 140)

Decision trees have the following problems according to Brealey and Myers (1991:236):

1. They can become very complex depending on the number of decisions and possibilities.
2. They do not consider all possible options and do not indicate how to value options and are merely a good way of summarising cash flow consequences.

2.3.7 <u>Explicit risk approaches</u>

The behavioural risk approaches that have been explored above allow organisational decision-makers to get a “feel” of the risk inherent with a particular capital investment. The explicit approaches are all linked to the economic evaluation of a capital project, where the discount factor that is used to calculate the time value of money, is either altered to reflect the risk, or if used as a decision criterion, is set to a value that reflects the anticipated risk of the investment.

To understand how risk is explicitly allowed for, it is necessary to comprehend the discount factor. The discount factor is variously referred to throughout the literature as the discount rate, required return, cost of capital, opportunity cost and hurdle rate (Gitman, 2003: 159; Brealey & Myers, 1991:13; Seitz, 1990:43). The meaning remains the same and can be summarised as the return forgone by investing in a project rather than investing in the financial markets (Gitman, 2003: 159; Brealey & Myers, 1991:13; Seitz, 1990:43). Simply put, the discount factor is the rate that a project must achieve to match the cost of generating the funding needed to implement the project.

Capital investment is rarely funded by organisations from a single source but if it were then the discount rate would be the cost of finance or interest rate. Capital investment is usually funded from multiple sources and the overall cost of capital would have to be one that reflects the different sources of funding (Gitmann, 2003: 483; Broyles, 2003:249; Northcott, 1992: 77). Two methods of calculating the overall cost of capital are:

1. Weighted average cost of capital (WACC.),
2. Capital asset pricing model (CAPM)

2.3.7.1 Weighted average cost of capital (WACC)

The weighted average cost of capital (WACC) according to Bierman and Smidt (1980: 258) represents the average cost of funds to an organisation and as such represents the sources of capital and their uses. WACC for a given capital structure reflects the characteristics of organisations assets and in particular, their average risk as well as the timing of expected cash proceeds. WACC represents an averaging of all the financial risks of an organisation.

The calculation of the weighted average cost of capital (WACC) according to Northcott (1992:77) has several steps:

1. The identification of the ranges of the sources of long-term capital.
2. The determination of the cost of the capital sources.
3. The determination of the market value of the capital sources.
4. The calculation of the WACC.

Four sources of long-term capital exist;(a) long-term debt, (b) preferred shares, (c) common shares, and (d) retained earnings (Gitman, 2003: 472; Lovemore, 1996: 87). The cost of each of the above mentioned sources of capital can be calculated, this is not being explored in this text but is extensively covered in management accounting texts.

It is sufficient to note for the purpose of this text that the cost of long-term debt is a function of the interest payable, the tax rate, any issuing expenses and the market value of the debt. The cost of equity capital sources (ordinary or preference shares) for listed organisations depends on dividend payable, the cost of issuing equity and the market price of shares. Retained earnings are usually a less expensive source of capital than issuing new shares, due to the fact that they do not incur the transaction costs associated with the public offering of shares (Gitman, 2003: 473; Bierman & Smidt, 1980:245-251).

The weightings given to each source of funds in the WACC calculation are based on the market value of the debt, ordinary shares and preference shares and are impacted on by the relative proportions employed of each capital source (Nortcott:1992:78).

The calculation of WACC once the sources of funds, their costs and their relative weightings have been determined is relatively easy as represented by Table 2.3-2 adapted from Gitman (2003:483).

Table 2.3-2: Example of the calculation of WACC.

Calculation of the weighted average cost of capital			
Sources of capital	**Weight (1)**	**Cost (2)**	**Weighted cost [(1)x(2)] (3)**
Long term debt	40%	5.60%	2.2%
Preferred shares	10%	10.60%	1.1%
Common stock shares	50%	13%	6.5%
Totals	**100%**		**9.8%**
Weighted average cost of capital (WACC)=			**9.8%**

Source: Adapted from Gitman (2003:483)

The literature identifies two problems with the use of WACC for all projects, namely (Lovemore, 1996: 87-89; Northcott, 1992:79; Bierman & Smidt, 1980: 258):

1. WACC is a reflection of the current cost of a pool of funds used for financing the current investments of the organisation. An investment outside of the normal activity of an organisation should have a different risk profile and hence the current WACC rate will not sufficiently allow for that risk profile.
2. If the investment is large enough, it might alter the WACC rate by its implementation, for example, a large loan might have to be incurred that could then alter the weighting of the long term debt and hence the WACC rate.

As WACC does not consider unique risk, it could lead to the acceptance of a high return but overly high-risk projects (Brealey & Myers, 1991: 182). A model suggested by the literature that considers a project's unique risk is the capital asset pricing model (CAPM).

2.3.7.2 Capital Asset Pricing Model (CAPM)

According to Samuels, Wilkes and Brayshaw (1990: 216), the CAPM assess risk by showing the connection between individual project returns and the market for risky assets as a whole. The CAPM evaluates the project's unique risk against its own returns and not the return that an investor could earn from the organisation's cost of capital (Samuels et al, 1990:216).

Risk, as viewed by investors, needs better definition to allow for a better understanding of the CAPM model and hence is briefly discussed. Northcott (1992: 81) defines risk as the unpredictability of returns from an investment. Gitman (2003: 234) breaks risk down into two components (a) diversifiable risk and (b) non-diversifiable risk.

Diversifiable risk or unsystematic risk is considered by Gitman (2003:234) to be the portion of an investment's risk that can be associated with random causes and that can be eliminated by the use of diversification. Examples of organisational specific diversifiable risks are: strikes, lawsuits and loss of a key account (Gitman, 2003:234).

Non- diversifiable risk or systematic risk according to Gitman (2003:234) is that portion of an investment's risk that is attributable to market forces, affects all organisations in that market place, and as such cannot be eliminated by diversification. Examples of systematic risks are war, inflation, international incidents and political events (Gitman, 2003:234).

Investors are able to establish a portfolio of investments that can eliminate diversifiable risks but are unable to eliminate non-diversifiable risks, hence non-diversifiable risk is the only important risk and as such, the measurement of non-diversifiable risks in the selection of investments with the best risk return characteristics is the most important (Gitman, 2003:234).

The CAPM model links non-diversifiable risk and the return for all assets. A measure of non-diversifiable risk is the beta coefficient (β).

Beta Coefficient (β)

The beta coefficient, β, is an expression of the "market sensitivity" of an investment, or how volatile it is compared with the "normal volatility" of the market (Nothcott, 1992:82). A beta (β) of one indicates that changes in an investment's returns agree precisely with market fluctuations (Northcott, 1992:82). A β of less than one reflects a low risk investment whose returns are more stable than the overall market, and a β of greater than one indicates an investment whose returns are more volatile than overall market movements (Northcott, 1992:82). The estimation of β for an organisation is complex and is not included in detail in this text as it is not central to the problem. It is, therefore, sufficient to note that β can be derived using three methods, namely:

1. **β based on historical returns**

The β is calculated using monthly holding period returns for security and the market portfolio for a period of 3 to 5 years with the risk-free rate for a particular month as well (Seitz, 1990:259).

2. **β for comparable organisations**

The β is estimated by referring to other companies with similar risk characteristics (Seitz, 1990:259).

3. State of nature models for β estimation.

The return for the market portfolio and holding-period return are estimated under a variety of conditions. These estimates are then used to compute a covariance and a β (Seitz, 1990:259).

CAPM equation

The CAPM uses the β coefficient to measure non-diversifiable risk and is represented by equation 5 (Gitman, 2003: 238; Northcott, 1992: 85; Brealey & Myers, 1991: 194; Seitz, 1990:263).

$$RRR_A = R_f + \left[\left(R_m - R_f\right) \times \beta_a\right] \qquad \text{----------} 5$$

RRR_A = Required Rate Of Return

R_f = The risk free rate of return

R_m = The market return

β_A = The beta of the investment

The term (R_m-R_f) reflects the "market premium, that is, the return over and above the risk free rate which the market earns.

According to Northcott (1992:86) and Seitz (1990:253) the CAPM approach to determine the risk adjusted discount rate is complex and is based on a number of underlying assumptions about the model and the market, these are:

- That the market is efficient and market β is reliable.
- That the CAPM model, which is a single time model, is appropriate for assessment of multiple time period investments.
- That the β of doubt is zero or can be found
- That capital markets are perfect and investors are economically rational and risk adverse.

Gitman (2003: 245) states that CAPM is not applicable to assets such as plant and equipment owing to indivisibility, relatively large size, limited number of transactions and absence of an efficient market for such assets. Despite the above-mentioned limitations, the CAPM is a useful conceptual framework for the evaluation and linking of risk and return and is considered theoretically better than WACC (Gitman, 2003:245; Northcott, 1992:86).

2.4 GAP BETWEEN STRATEGY AND CAPITAL BUDGETING

Brealey and Myers (1991: 918) comment that since 1964 financial authors have been questioning how strategic financial decisions are made and felt that even in 1991 this answer was still not present. Gitman (2003:445) confirms that even in 2003 the statement of Brealey and Myers (1991:918) still remains true and postulates that although traditional approaches to capital budgeting yielded good answers, more strategic approaches to capital decision-making was still emerging.

The indicated dissatisfaction with the commonly used financial evaluation methods, which are the discounted cash flow techniques of NPV and IRR (Hall, 1998; Buckley, 1996: 17; Johnson, 1994:79; Northcott, 1992:50; Brealey & Myers, 1991: 73-94) can be linked to their dependency on the perfect market paradigm (Dempsey, 1996: 9). According to Dempsey (1996:9), this paradigm states that an organisation's value reflects the present value of the organisation's expected future net cash flows capitalised fittingly, including expected cash flows from future investment chances. Put another way, this proposes that the cash flows, discount rates and other inputs into the financial evaluation equations can be calculated for each and every situation accurately and then evaluated and relied on to give the correct answer. This causes managers to be directed away from strategically necessary investments because of the strategic investment's lack of amenability to quantitative analysis (Dempsey, 1996: 9; Brealey & Myers, 1991:268).

The detractors of DCF methodology, according to Trigeorgis and Mason (2001); Hayes and Garvin (1982), hold a common concern that DCF holds a bias to analyse the analysable so that an organisation over time allows itself to sink slowly as the only proposals that allow for convincing DCF/NPV type analysis are the incremental ones. The radical long-term view or strategic view that is more difficult to quantify and which does not fit neatly into a DCF analysis is ignored.

According to Dempsey (1996:13), the view expressed above would indicate that if the future is highly uncertain then capital budgeting analysis is ineffective as it could be considered to be a waste of time to attach discount rates to projected

cash flows when neither the cash flows nor rates are known with any certainty. Ryan (2002), in review of past empirical studies and from research, found the continued use of the supposedly wrong Payback method. Dempsey (1996) postulates that this is due to the significant information that it provides, such as amount of cash that can be spent on a capital project and when its return is due.

Table 2.4-1represents the comparative results of prior studies as compiled by Ryan (2002) that indicate the prevalence of the Payback period and the increasing use of discounted Payback methods. Table 2.4-2 represents a summary of the empirical research that Ryan (2002) performed and indicates that NPV is most often used followed by IRR and then Payback. This supports Dempsey (1996) in his statement that Payback maintains its prevalence. Managers are therefore forced by the academics into choosing an economic/normative approach or a strategic/managerial approach to capital investment decision-making.

Table 2.4-1: Comparative results of prior studies.

The following abbreviations are used: Payback: PB, Internal Rate of Return: IRR, Net Present Value: NPV, Profitability Index: PI, and Accounting Rate of Return: AROR.

Authors	Journal	Year Published	Population	Most Popular Capital Budgeting Tool	Least Popular Capital Budgeting Tool
Miller	NAA Bulletin (now Management Accounting)	1960	Fortune 500 and "Manual of Excellently Managed Companies"	PB	DCF
Istvan	Bureau of Business Research	1961	Selected large companies	AROR	DCF
Mao	Journal of Finance	1970	Selected large and medium companies	IRR	NPV and PI
Williams	Managerial Planning	1970	Fortune 500 and selected small companies	IRR	PI
Klammer	Journal of Business	1972	Compustat	DCF	PB
Fremgen	Management Accounting	1973	Dun and Bradstreet's Reference Book	IRR	PI
Brigham	Financial Management	1975	Selected financial managers	IRR	PI
Petry	Business Horizons	1975	Fortune 500 and Fortune 50 retailing, transportation and utilities	IRR	NPV
Petty, Scott, Bird	Engineering Economist	1975	Fortune 500	IRR	PI
Gitman and Forrester	Financial Management	1977	Sample from Forbes	IRR	PI
Schall, Sundam, and Geijsbeek	Journal of Finance	1978	Compustat	PB	NPV
Oblak and Helm	Financial Management	1980	Fortune 500 MNC's in at least 12 countries	IRR	PI
Hendricks	Managerial Planning	1983	Some of Fortune 500	IRR	PI
Ross	Financial Management	1986	12 large manufacturers	IRR	PB
Jog and Srivastava	Financial Planning and Education	1995	582 Canadian companies	IRR	AROR
Pike	Journal of Business Finance and Accounting	1996	Large UK companies	PB	AROR

Source: Adapted from Ryan (2002:11)

Table 2.4-2: Comparison of basic capital budgeting tools.

Capital Budgeting Tool (level of technical difficulty, L=Low, M=Medium, H=High)*	Size of Capital Budget (in millions)	Always (100%)	Often (75%)	Sometimes (50%)	Rarely (25%)	Never (0%)	Always or Often (>=75%)	Always, Often, or Sometimes (>=50%)	Rarely or Never (<=25%)
Net Present Value (NPV) * (L)**	Less than $100	32.9%	52.6%	13.2%	1.3%	0.0%	85.5%	98.7%	1.3%
	$100 - $499.9	56.0%	25.3%	10.7%	5.3%	2.7%	81.3%	92.0%	8.0%
	Greater than $500	67.3%	22.5%	8.2%	2.0%	0.0%	89.8%	98.0%	2.0%
	Full Sample	**49.8%**	**35.3%**	**10.9%**	**3.0%**	**1.0%**	**85.1%**	**96.0%**	**4.0%**
Internal Rate of Return (IRR) **(L)	Less than $100	30.3%	43.4%	21.1%	3.9%	1.3%	73.7%	94.8%	5.2%
	$100 - $499.9	49.3%	25.3%	12.0%	12.0%	1.4%	74.6%	86.6%	13.4%
	Greater than $500	60.0%	24.0%	12.0%	2.0%	2.0%	84.0%	96.0%	4.0%
	Full Sample	**44.6%**	**32.2%**	**15.3%**	**6.4%**	**1.5%**	**76.7%**	**92.1%**	**7.9%**
Payback ** (L)	Less than $100	26.0%	37.7%	20.8%	13.0%	2.5%	63.7%	84.5%	15.5%
	$100 - $499.9	14.1%	33.8%	22.5%	12.7%	16.9%	47.9%	70.4%	29.6%
	Greater than $500	17.0%	25.5%	23.4%	27.7%	6.4%	42.5%	65.9%	34.1%
	Full Sample	**19.4%**	**33.2%**	**21.9%**	**16.8%**	**8.7%**	**52.6%**	**74.5%**	**25.5%**
Discounted Payback (L)	Less than $100	17.6%	28.3%	20.3%	20.3%	13.5%	45.9%	66.2%	33.8%
	$100 - $499.9	11.3%	18.3%	23.9%	22.6%	23.9%	29.6%	53.5%	46.5%
	Greater than $500	18.8%	18.8%	10.4%	20.8%	31.2%	37.6%	48.0%	52.0%
	Full Sample	**15.5%**	**22.2%**	**19.1%**	**21.1%**	**22.2%**	**37.6%**	**56.7%**	**43.3%**
Profitability Index* (L)	Less than $100	2.8%	22.2%	25.0%	20.8%	29.2%	25.0%	50.0%	50.0%
	$100 - $499.9	11.4%	14.3%	17.1%	18.6%	38.6%	25.7%	42.8%	57.2%
	Greater than $500	2.3%	6.8%	27.3%	29.5%	34.1%	9.1%	36.4%	63.6%
	Full Sample	**5.9%**	**15.5%**	**22.5%**	**21.9%**	**34.2%**	**21.4%**	**43.9%**	**56.1%**
Accounting Rate of Return * (L)	Less than $100	8.2%	5.5%	24.6%	9.6%	52.1%	13.7%	38.3%	61.7%
	$100 - $499.9	1.4%	12.7%	11.3%	23.9%	50.7%	14.1%	25.4%	74.6%
	Greater than $500	6.8%	11.4%	20.4%	15.9%	45.5%	18.2%	38.6%	61.4%
	Full Sample	**5.3%**	**9.5%**	**18.5%**	**16.4%**	**50.3%**	**14.7%**	**33.3%**	**66.7%**
Modified IRR * (M)	Less than $100	0.0%	4.2%	14.1%	25.4%	56.3%	4.2%	18.3%	81.7%
	$100 - $499.9	1.5%	13.2%	13.2%	28.0%	44.1%	14.7%	27.9%	72.1%
	Greater than $500	7.0%	2.3%	9.3%	32.6%	48.8%	9.3%	18.6%	81.4%
	Full Sample	**2.2%**	**7.1%**	**12.6%**	**27.9%**	**50.3%**	**9.3%**	**21.9%**	**78.1%**

where *** is χ^2 significant within the specific capital budgeting method at the .01 level,
** is χ^2 significant within the specific capital budgeting method at the .05 level, and
* is χ^2 significant within the specific capital budgeting method at the .10 level.

Source: Adapted from Ryan (2002:12)

2.5 ALTERNATIVE MODELS

The previous sections indicated that academics are unequivocal in the advice that they give to organisations and managers about how to appraise large scale capital investment projects. The net present value rule, based upon the discounting of decision contingent cash flows at the organisation's opportunity cost of capital is regarded as the definitive investment appraisal technique.

Although managers are faced with a variety of financial models when appraising capital projects, not all managers accept the theoretical consensus about which ones to use (Gitman, 2003: 445). Whilst there are strong theoretical justifications for the use of discounted cash flow based models, managers continue to use non-DCF appraisal techniques such as payback (Ryan: 2002).

There is a growing recognition by management that the strategic implications of current capital investment decisions are not adequately addressed by traditional approaches to capital investment appraisal (Ryan, 2002). Although attempts are made to quantify in financial terms the strategic benefits from a given investment, many perceived benefits are left out of the appraisal process because they lack precise financial quantification. This under-specification of the strategic benefits associated with given capital investment decisions has given rise to alternative models to investment appraisal that combine the economic/normative approach with the strategic/managerial approach.

Three models that address these shortcomings are (Mauboussin: 1999; Managementor: 2000; Samuels et al: 1990):

(1) The real options model;

(2) The financial appraisal profile model and

(3) The Samuels, Wilkes and Brayshaw 3 stage model.

2.5.1 Real Options model

2.5.1.1 Introduction

The real option model extends the financial call option theory to options on real, or non-financial, assets. The financial call option gives the owner the right, but not the obligation, to buy or sell an asset at a particular price (exercise price) within a predetermined period (Mauboussin, 1999: 5; Copeland & Keenan, 1998a: 40). This is like an organisation that has a real option, which is the right but not the obligation to execute a potential value adding investment. Examples of such investments are: new plants, line extensions, joint ventures and licensing agreements (Mauboussin, 1999: 5). Copeland & Keenan (1998a: 41) identify five variables that act on an option and impact on the value of the option, namely:

- The value of the option increases with the value of the underlying variable,
- The value of the option increases with its uncertainty,
- The value of the option decreases as the exercise price goes up,
- The period for which the option is valid increases its value as the longer it is valid the larger the uncertainty,
- The time value of money increases the value of the option (risk free rate) because present value of the exercise cost falls as the interest rates rise.

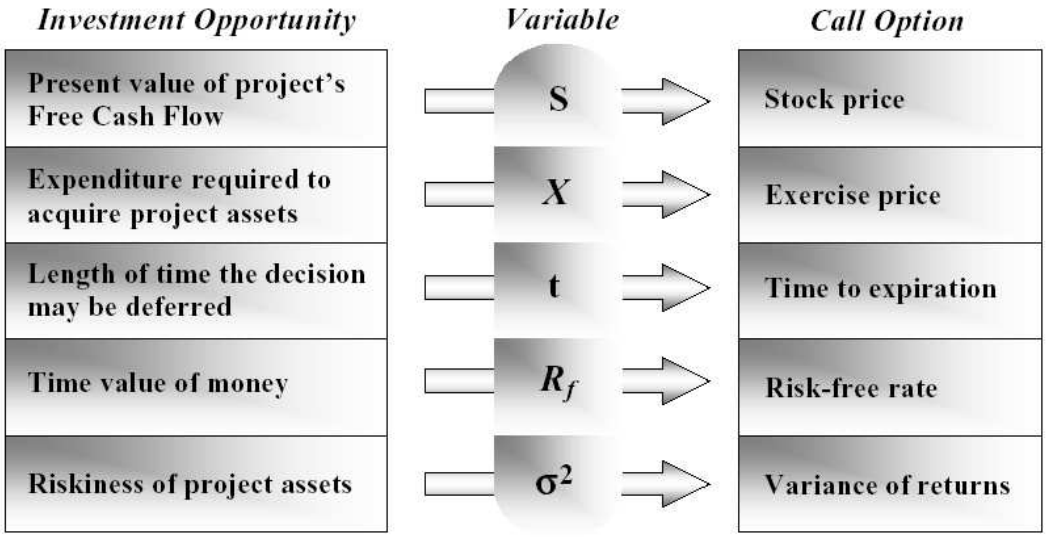
The real option model, according to Mauboussin (1999: 5) is best used as a complement to DCF analysis as it adds the important dimension of analytical flexibility, by melding strategic intuition with analytical rigour. The real option model, because it uses financial market data also has the added benefit of being aligned with the real world. The real options imbedded in a capital investment can alter the evaluation of the investment when taken into account; this is represented by equation 6.

$$NPV_{strategic} = NPV_{traditional} + Value\ of\ real\ option \qquad \text{----------} 6$$

2.5.1.2 Similarities between call options and project investments

It has been mentioned previously that a project investment is similar to a financial call option as both entitle the organisation to the right but not the obligation to acquire an asset. Luehrman (1998: 52) has mapped this similarity between a European call option and a project investment as represented by Diagram 5.

Diagram 5: Mapping an investment opportunity onto a call option



Source: Adapted from Luehrman (1998: 52)

Projects usually involve the expenditure of capital to acquire or build a productive asset; the expenditure is analogous to the exercising of an option on a share of stock (Luehrman, 1998:52). With reference to Diagram 5 the amount of capital spent corresponds to the option's exercise price (X). The present value of the asset built or bought corresponds to the option's share price (or stock price) (S). The length of time that the organisation can defer the investment decision without losing the opportunity corresponds to the option's time to expiration (t). The uncertainty about the future value of the project's cash flow or risk corresponds to the standard deviation of returns on stock (σ). The time value of money is represented for both by the risk free rate of return (r_f) (Luehrman, 1998: 52). These five variables are directly related to the variables that affect the value of an option as discussed in section 2.5.1.1 above.

2.5.1.3 Capital investment options

The option-based approach to capital investment analysis is not simply the application of a new set of valuation equations and models. It requires new methods of framing strategic questions, these questions change from what will be gained from moving from point A to point B to if the organisation starts going down the path from point A to point B, what options will become available and what value can be gained from the ownership of those options (Amram & Kulatilaka, (1999: 95)? The identification of real options according to Amram and Kulatilaka, (1999:96), Mauboussin (1999: 10) and Copeland and Keenan (1998a: 41) is not an easy task and can be easily overlooked. Amram and Kulatilaka (1999:96), Mauboussin (1999: 10) and Copeland and Keenan (1998a: 41) suggest that real options can be classified into three main groups: Invest/grow options, defer/learn options and disinvest/shrink options, each of these groups can be further expanded and defined, some of these options are interrelated. These are explored below (Mauboussin, 1999: 10):

1. **Invest/Grow Options**

- ***Scale up:*** This is where initial investments scale up to future value-creating opportunities. Scale-up options require some prerequisite investments. For example, a distribution company may have valuable scale-up options if the served market grows.
- ***Switch up:*** A switch—or flexibility—option values an opportunity to switch products, process, or plants given a shift in the underlying price or demand of inputs or outputs. One example is a utility company that has the choice between three boilers: natural gas, fuel oil, and dual-fuel. Although the dual-fuel boiler may cost the most, it may be the most valuable, as it allows the company to always use the cheapest fuel.
- ***Scope up:*** This option values the opportunity to transfer an investment made in one industry into another, related industry. A company that dominates one sector of e-commerce and transfers that success into a neighbouring sector is exercising a scope up option.

2. **Defer/Learn**

- ***Study/start:*** This is a case where management has an opportunity to invest in a particular project, but can wait some period before investing. The ability

to wait allows for a reduction in uncertainty, and can hence be valuable. For example, a real estate investor may acquire an option on a parcel of land and exercise it only if the contiguous area is developed.

3. Disinvest/Shrink Options

- ***Scale down:*** Here, a company can shrink or downsize a project in midstream as new information changes the payoff scheme. An example would be an airline's option to abandon a non-profitable route.
- ***Switch down:*** This option places value on a company's ability to switch to more cost-effective and flexible assets as it receives new information.
- ***Scope down:*** A scope-down option is valuable when operations in a related industry can be limited or abandoned based on poor market conditions and some value salvaged. A conglomerate exiting a sector is an example.

Gitman (2003: 446) presents four major types of real options as per table Table 2.5-1. These options are similar to the options presented by Amram and Kulatilaka (1999:96), Mauboussin (1999: 10) and Copeland and Keenan (1998a: 41) presented above.

Table 2.5-1: Major types of real options

Option Type	Description
Abandonment option	The option to abandon or terminate a project prior to the end of its planned life. This option allows management to avoid or minimize losses on projects that turn bad.
Flexibility option	The option to incorporate flexibility into the organisation's operations, particularly production inputs.
Growth option	The option to develop follow-on projects, expand markets, expand plants and so on, which would not be possible without implementation of the project that is being evaluated.
Timing option	The option to determine when various actions with respect to a given project are taken. This option recognizes the organisation's opportunity to delay acceptance of a project. To reflect new information.

Source: Adapted from Gitman (2003: 446)

2.5.1.4 Determining the value of a real option

Mauboussin (1999: 13) states that there are three steps in turning real options into usable results.

1. Accurately identify a real option.
2. Use the real options model itself.
3. Consider the potential differences between option-model derived value and real-world value

The literature suggests that there are two methods for calculating the value of a real option, namely:

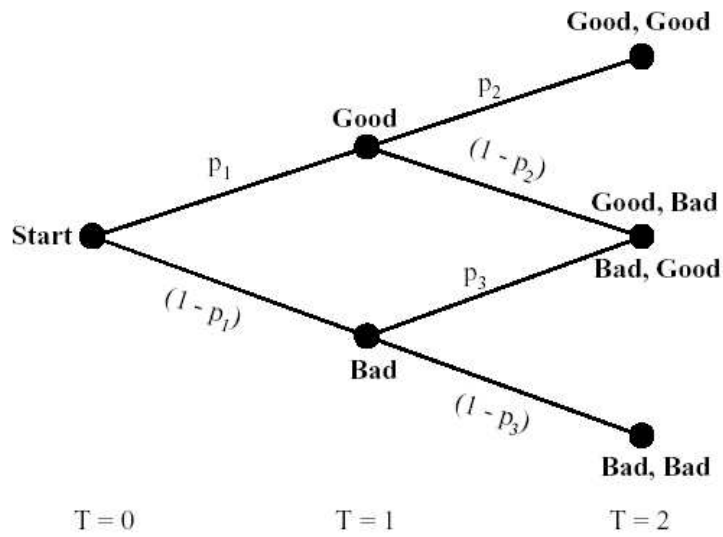
1. The binomial option pricing model
2. The Black-Scholes formula.

The mathematics behind these methods are complex, and available in detail in the option literature, the text will only give a brief understanding of these methods which are further detailed in ANNEXURE A and ANNEXURE B

2.5.1.4.1 Binomial option pricing model

Mauboussin (1999: 6) proposes that the most commonly used model for real option evaluation is the binomial option-pricing model. According to Mauboussin (1999:6) the binomial model describes price movements over time, where the asset value can move to one of two possible prices with associated probabilities. Decision trees, discussed in section 2.3.6 above, are commonly used to represent the binomial model and Diagram 6 represents the binomial process through a decision tree (Copeland & Keenan, 1998: 140b; Luerhrman, 1997:138). As an option is the right but not the obligation to make an investment, the payoff scheme to the option holder is asymmetric, with the option only being exercised if positive and unexercised if worthless. In reviewing Diagram 6 the time and range of outcomes are shown as important to the option value (Mauboussin, 1999:6).

Diagram 6: The Binomial Model



Source: Adapted from Mauboussin (1999:6)

2.5.1.4.2 Black-Scholes option pricing model

The second commonly referred to valuation method is the Black-Scholes model which is a narrow case of the binomial model (Mauboussin, 1999: 7; Luehrman, 1998: 52; Copeland & Keenan, 1998a: 40; Leslie & Michaels, 1997: 99). The drivers of the option value as discussed in section 2.5.1.1 above can be condensed into five simple inputs (Mauboussin, 1999:7):

1. Current value of the underlying asset (s)
2. Strike price of the option (x)
3. Time to expiration (t)
4. Risk free interest rate (R_f)
5. Variance in the value of the underlying asset (σ^2)

These inputs are related to Black-Scholes model as per Diagram 5 and their use in calculating the option is demonstrated in ANNEXURE A.

2.5.1.5 Comment on real option model

The real option model attempts to capture the flexibility that normal DCF calculations fail to recognise by capturing both the direct cash flows from traditional NPV and a real option value that would reflect operating and strategic adaptability. The one limiting factor to the widespread use of real option analysis can be attributed to the complexity of the mathematics involved in the base calculations.

2.5.2 Financial appraisal profile (FAP) model

The main attributes of the Financial Appraisal Model are that it adopts a "management team" approach in the evaluation of capital investments. The approach is a profile approach, rather than the reliance on only a single criterion such as net present value. This wider profile is better able to provide analysis of the financial, risk and strategic merits of an investment decision (Managementor, 2000).

There are three parts to the FAP model according to Managementor (2000) that have to be calculated, namely:

1. The NPV profile (NPVP).
2. The risk index (RI) that is based on the highest risk value.
3. The strategic index (SI). This is calculated by the multiplication of corporate ranking and project strategic score, based on a subjective viewpoint.

2.5.2.1 The NPV profile (NPVP)

The NPV profile is the NPV extended by the inclusion of the discounted Payback period (DPP), the discounted Payback index (DPI) and the marginal growth rate (MGR) into the financial profile of a capital investment proposal (Limes Consultancy, 2003; Managementor, 2000). These are explored below:

1. NPV is the net present value of the annualised cash inflows of the investment (Refer to section 2.3.3.2.1 above). The discounting factor used for the NPV calculation is the risk free rate. The risk free rate is the cost of capital that has not been modified for risk or organisational infrastructure costs (Limes Consultancy, 2003; Managementor, 2000).

2. DPP is the Payback period of the project using the discounted cash inflows (Refer to section 2.3.3.1.1 above).
3. DPI is the number of times that the initial cost of the investment will be recovered over the project's life and is calculated by dividing the accumulated discounted cash flows by the initial capital cost and is an indication of the project's profitability (Limes Consultancy, 2003; Managementor, 2000). DPI is represented by equation 7.

$$DPI = \frac{\text{Present value of net cash inflows}}{\text{Initial investment outlay}} \quad \text{----------} 7$$

4. MGR is the marginal rate of return on the project after discounting the cash flows at the cost of capital (risk free rate) (Limes Consultancy, 2003; Managementor, 2000). MGR is an indicator of a project's rate of net profitability (Limes Consultancy, 2003; Managementor, 2000). MGR is represented by equation 8.

$$MGR = \left[(DPI)^{1/n} - 1\right] \times 100 \quad \text{----------} 8$$
$$n = \text{project life}$$
$$DPI = \text{discounted payback index}$$

The FAP model uses the net present value as an initial evaluation criterion of risk and the hurdle figure used has to decided on by the organisation's senior management. If an investment does not meet the required criterion then it is rejected in the initial evaluation (Managementor, 2000).

NPVP evaluation provides several measures based on consistent data, and acts as a measure of a project's suitability based on a number of financial measures (Limes Consultancy, 2003). An example of how the NPVP is calculated is demonstrated in ANNEXURE C.

2.5.2.2 Risk index

The risk index reflects the extreme risk impact and value judgment uncertainty of an investment and consists of several risk elements dependent on the analysis of the investment's environmental situation (Managementor, 2000).

As previously mentioned in section 2.3.4 above, Visser (2004:302) proposes that a risk element has two dimensions, namely (a) the probability of a particular result occurring and (b) the impact that the result will have should it occur. These dimensions can be expressed mathematically by equation 9.

$$Risk = \Pr obability \times Consequence \qquad \text{----------} 9$$

$$or$$

$$R = P \times I$$

$$R = \text{degree of risk}$$

$$P = \text{probability of occurrance}$$

$$I = \text{degree of impact}$$

The value of risk of each element is the accumulated averages of the risk figures perceived by individual team members of the evaluation team. Each member of the evaluation team assesses the impact of risk and assigns probability of occurrence with respect to each element of risk (Managementor, 2000).

The project risk index is the highest risk value of the individual risk elements.

2.5.2.3 Strategic Index

In the conventional "black box" model, strategic benefits are usually omitted due to the inability to quantify them in financial terms as discussed in section 2.4. The FAP model allows strategic benefits to be identified and evaluated in a meaningful manner by using the Strategic Index (SI) (Managementor, 2000).

The strategic index is calculated by means of corporate ranking (CR) and project strategic score value (PSSV). Corporate ranking (CR) is the weight placed on a particular strategic benefit by senior management in order to reflect its importance with relation to other strategic benefits. Project strategic score value represents the benefit level within a given project, these factors (PSSV)

and (CR) are derived from the subjective estimates of experts in the organisation (Managementor, 2000).

The strategic index (SI) is then calculated by calculating the weighted average of (CR) and (PSSV).

2.5.2.4 Using the FAP Model

The financial appraisal model presents- after calculation of the net present value profile (NPVP), the risk index (RI) and the strategic index (SI)- a wider vision of the investment to the decision-makers. It provides a financial appraisal in the NPVP, takes risk into account via RI. It does it slightly differently to the "black box" model but is not superior at this stage to the "black box "model. The differentiating factor that closes the gap between strategy and capital budgeting is the strategic index (SI).

2.5.3 The Samuels, Wilkes and Brayshaw three stage model.

This model attempts to balance the strategic and numerical considerations of a decision that contains an element of quantitative, by separating the objective quantifiable from the judgemental elements (Samuels et al, 1990:167).

Samuels et al (1990:167) propose that three stages are used in this process, namely:

1. Strategic evaluation
2. Financial analysis
3. Justification analysis based on sensitivity analysis.

2.5.3.1 Strategic evaluation

Unlike the FAP model, stage one of the Samuels et al (1990:168) model is the strategic evaluation of the investment proposal. Management evaluates the proposal against the organisation's strategic plan and if it is not aligned then it can be definitely ruled out. At this stage it cannot, however, be definitely accepted. The rule is that the proposal must match the strategic plan of the organisation and if it does, it passes on to stage two. If not, no further evaluation is performed.

2.5.3.2 Financial evaluation

Samuels et al (1990:168) propose that conventional discounted NPV calculation be performed. If a positive NPV is shown then the proposal is accepted, if negative then it passes on to stage 3.

Samuels et al (1990:168) break the conventional NPV calculation into three stages, namely:

(a) **Model construction**, where they propose that an appropriate economic model, usually NPV , of the organisation's decision problem is constructed, the model needs to be based on the tangible or quantifiable benefits of the investment.

(b) **Data estimation**, where estimates of all quantifiable (tangible) cash flows are obtained. It is at this point that an applicable discount rate for the NPV calculation is obtained based on judgement and estimation.

(c) **Calculation of NPV,** This is performed conventionally and if positive then the investment is accepted immediately as the cash flows used are based only on tangible benefits. If negative, it moves on to stage three.

2.5.3.3 Justification analysis based on sensitivity analysis

The analysis is based on sensitivity analysis as per section 2.3.5.1 above. Samuels et al (1990:168) propose that if the tangible benefits as evaluated in the second stage have not exceeded tangible costs, then management must weigh the value of the agreed intangible benefits against the shortfall in NPV.

Two methods of causing the NPV to go positive, using intangible benefits are suggested by Samuels et al (1990:168), namely:

1. **Point system**, where all the intangible benefits are listed and a panel of experts then assign point scores to each benefit. The point scores cannot be translated directly into cash values and the points must be considered to be ordinal numbers that cannot be added. On completion of the scoring, if the points per intangible benefit are enough to turn the NPV positive then the project is accepted. The question that management is really asking is," Is the value of the intangible benefits enough to turn the NPV calculation positive"?

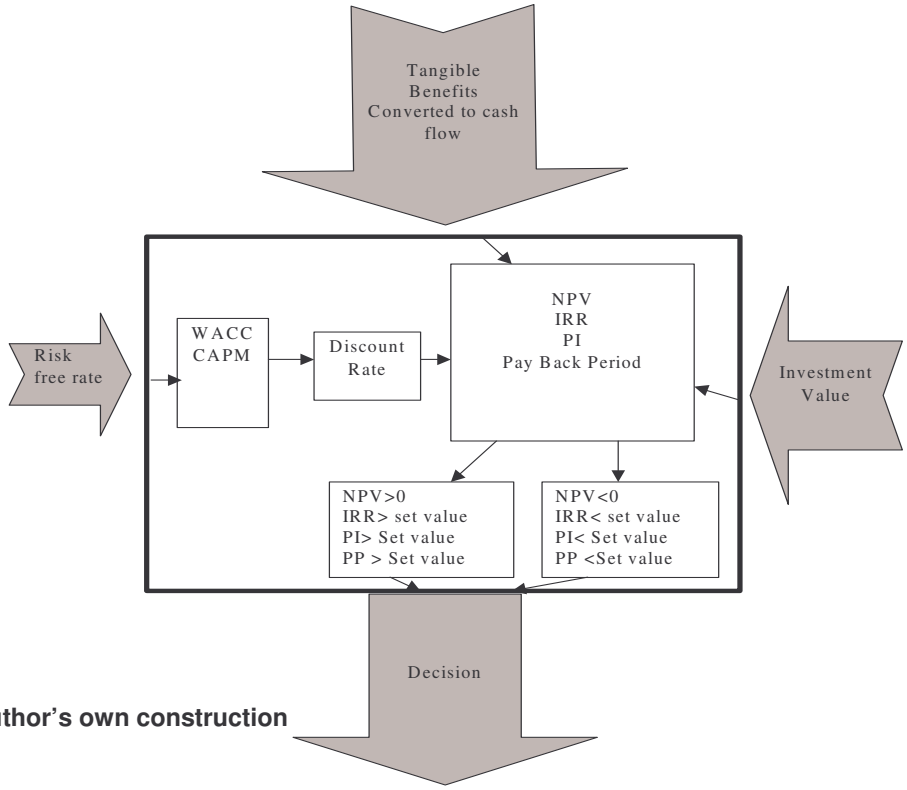
2. **Lowering the discount rate,** the rule used, is if intangible benefits can be demonstrated then the discount rate is lowered. If the lowering of the discount rate results in a positive NPV then the investment is accepted.

2.6 CONCLUSION

The literature is comprehensive and detailed with regard to the suggested method of capital investment analysis. The “black box” model presented by the literature is as follows: use the Net Present Value method and adjust the discount factor for risk using either WACC or CAPM. If the answer is greater than zero then accept the proposal as the project will create value, or if preferred convert the answer to a percentage by using IRR, which is related to NPV.

The “black box” is used as an analogy as it suggests something that is not well understood as to how it works exactly, but if fed with the correct inputs it can be relied on to deliver a predictable result consistently. The problem with “black boxes” is highlighted when the inputs that need to be fed into it do not fit the requirement of the “black box” and the operator, therefore, has either to manipulate the inputs to suit the “black box” or discard the inputs in favour of ones that match. The “black box” model is represented by Diagram 7.

Diagram 7: "Black box" model of capital investment appraisal



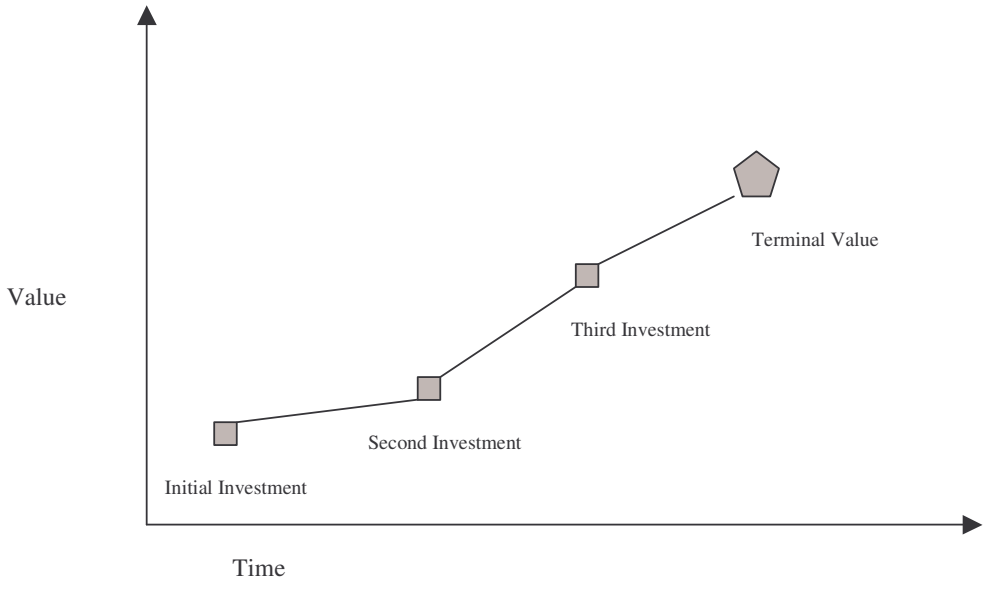
Source: Author’s own construction

The literature has raised doubt in this model in that it can only quantify the tangible and the intangible benefits that are inherent in projects are largely ignored. The consequences are that projects that have the potential to increase shareholder wealth are eliminated or projects are approved on an *ad hoc* basis, ignoring financial figures. This can result in potentially poor projects being accepted.

Alternative models to the “black box” model seek to value the intangible benefits and attempt to quantify these intangibles. The approaches do not discard the NPV calculation but rather modify it or are used in conjunction with the NPV model. There are two basic approaches, namely, value the tangibles and the intangibles separately and if the sum of the two is positive then approve. The second approach is to consider all options and not take an all or nothing approach as proposed by the “black box” model but rather see the investment as a series of potential options which can be purchased separately.

Diagram 8 represents the fixed path route that the “Black box” model imposes on an organization.

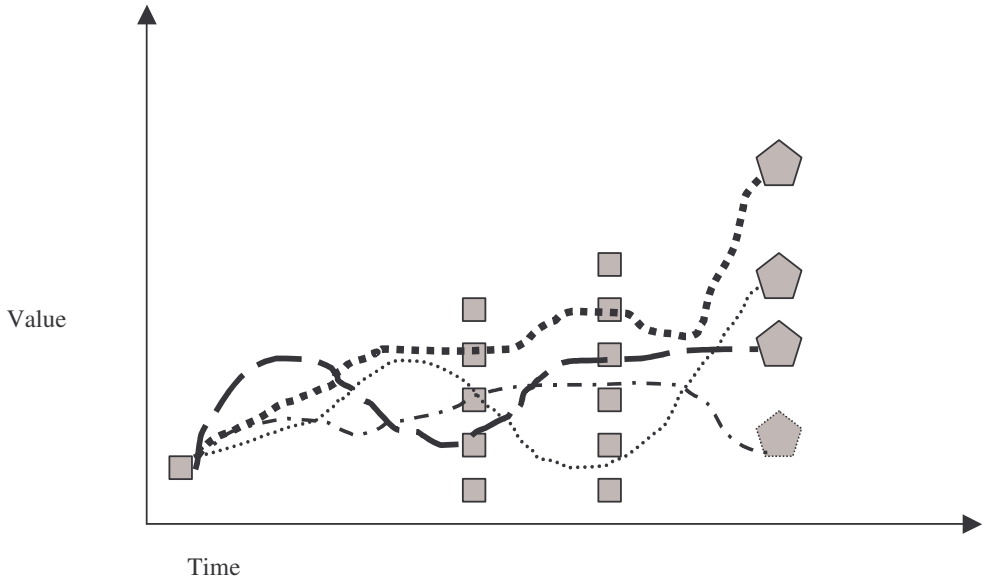
Diagram 8: Fixed path investment route



Source: Adapted from Amram and Kulatilaka (1999:101)

Diagram 9 represents the second approach of seeing options, or the fact that investments create opportunities to change operating and investment decisions later depending on the actual outcome.

Diagram 9: Investments as options to future investments



Source: Adapted from Amram and Kulatilaka (1999:101)

CHAPTER 3

3 RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

The objective of this chapter is to establish an appropriate research strategy for the main problem of which model best addresses the strategic needs of Cadbury South Africa when evaluating capital investment proposals. The research strategy must be applicable to the nature of the problem.

It will be assumed that the nature of the research problem, the objectives of the research and the methodology of the research focus the research strategy towards the primary research methodology.

3.2 WHAT IS RESEARCH DESIGN?

3.2.1 The concept of research

The literature has numerous definitions of research, but for the purpose of this text the definition of Leedy and Ormrod (2005:2), who define research as a systematic process of collecting, analysing, and interpreting information in order to increase understanding of the phenomenon being investigated contains the main aspects, namely, that research:

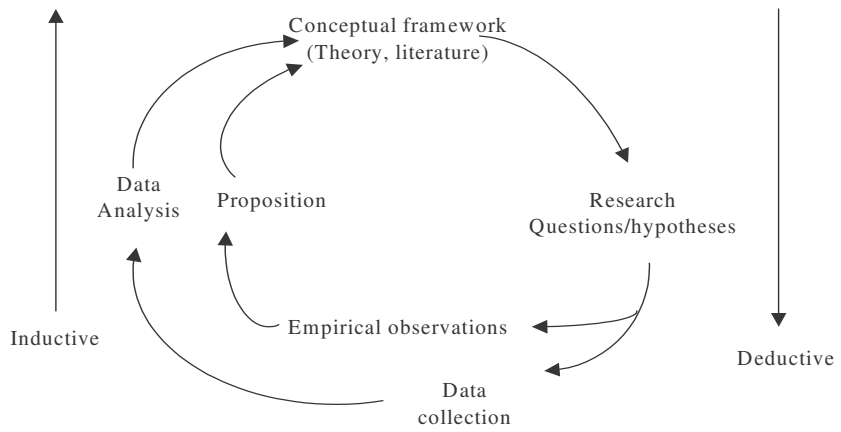
- Is ordered and planned.
- The information gathered needs analysis and interpretation.
- That understanding of the subject being researched is increased.

Research is not linear, but rather cyclic as represented by Diagram 10. The research process follows the following developmental steps according to Rudestam and Newton (2001:5):

1. The most common entry point into this cycle is some form of “empirical observation” that results in a process of inductive logic, culminating in a proposal.
2. The researcher clarifies the developed proposition, which exists within a theoretical concept, by clarifying the relationship between a particular proposition and the broader context of theory and previous research.

3. By use of deductive reasoning, the researcher moves from the larger context of theory to the generation of a specific research question. The initial loop is closed when the researcher seeks data that answers the research question.
4. Generalisations are made based on particular data that has been observed (inductive process), and the generalisations are tied to a conceptual framework, which leads to the clarification of further research questions and implications for additional study.

Diagram 10: Cyclic nature of research



Source: Adapted from Rudestam and Newton (2001: 5)

3.2.2 The concept of design

Leedy and Ormrod (2005: 85) consider research design to be a plan or strategy that provides an overall structure for procedures that a researcher follows in the collection of data and the analysis of the data. Grix (2004:174) relates design to strategy and states that the choice of research strategy impacts on the level and units of analysis used the type of study and the sources of data collected.

The above definitions lead to a simple definition of research design constituting the formulation of an action plan aimed at directing and incorporating data in an overall framework in order to solve a research problem.

Central to research design are four fundamental questions that must be resolved with respect to the data:

- What are the data required?
- Where are the data situated?
- How will the data be assured?
- How will the data be construed?

3.2.3 Validity and reliability

Two considerations important to any type of measurement are validity and reliability (Leedy & Ormrod, 2005:27; Rudestam & Newton, 2001: 98). Validity is related to the soundness or the effectiveness of the measuring instrument and asks the following questions:

- Is the measuring instrument measuring what it should?
- What is the level of accuracy of the measurement?

Common types of validity according to Leedy and Ormrod (2005:92) and Rudestam and Newton (2001:98) are:

- Internal validity –the freedom from bias in forming conclusions from the data
- External validity- refers to the ability to generalise the findings of the study.
- Content validity- the accuracy with which an instrument measures the components or situations under study
- Criterion related validity- a check that employs a second measure of validity against the accuracy of the first.
- Construct validity- any concept such as honesty that cannot be directly observed or isolated.
- Face validity- the extent to which an instrument superficially appears to be measuring a particular characteristic and relies on the subjective judgement of the researcher.

Reliability, according to Leedy and Ormrod (2005:93), is the degree to which a measuring instrument generates consistent results when the characteristic being measured does not change. Rudestam and Newton (2001: 98) state that reliability is concerned with the replication of the study under similar circumstances. Reliability asks one question -with what accuracy does the

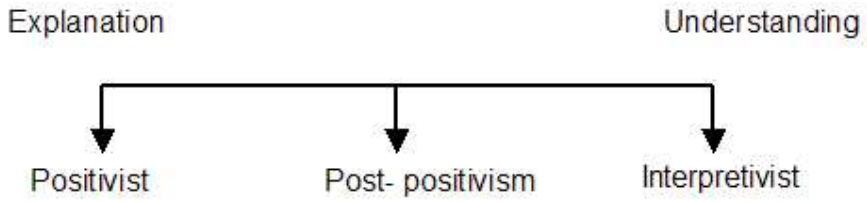
measurement, test instrument, inventory or questionnaire measure what it is intended to measure?

3.3 METHODOLOGICAL APPROACHES

The specific methods chosen to approach a research problem depend on the discipline of the researcher and the nature of the specific problem (Rudestam & Newton, 2001: 23). There are three important contemporary methodological research approaches, namely the positivist, post –positivist or critical realism and the interpretive approach. As mentioned above, researchers adopt one of these approaches and then formulate a strategy that is consistent with the discipline and nature of the research problem (Grix, 2004: 78).

If these three approaches were set on a continuum, with reference to Diagram 11, as one moved from left to right (from positivist to interpretive positions), the approach would change from attempting to explain something to seeking to interpret or understand it (Grix, 2004:78).

Diagram 11: Key methodological approaches



Source: Adapted from Grix (2004:78)

3.3.1 Positivist approach

Positivism is based on a realist, foundational ontology that views the world as existing independent of our knowledge of it (Grix, 2004:80; Rudestam & Newton, 2001: 27). In simple terms, positivism is a school of thought that maintains that all knowledge is derived from direct observation and logical inferences based on direct observation. This by default leads to the use of empirical and quantitative research (Rudestam & Newton, 2001:27).

3.3.2 Post-positivism or critical realism approach

Critical realism attempts to combine the "how" (which is linked to interpretativism) and the "why" (which is linked to positivism) by closing the gap between the two (Grix, 2004:85). A critical realist seeks not only to understand but also to explain. Critical realism does not have a specific method or technique attached to it but is compatible with a wide range of research methods and suggests that the choice of which method to employ should depend on the nature of the object of study and what is needed to be learned about it (Grix, 2004:86).

3.3.3 The interpretative approach

The interpretive approach is based on understanding as opposed to explanation as interpretativists do not believe in relying only on observation for understanding (Grix, 2004:83). Interpretativists believe that researchers cannot be divorced from the subject being researched as the researchers themselves form part of the reality being researched, and "objective" or "value" free analysis is, therefore, impossible as knowledge is theoretically and ramblingly laden and a researcher is inevitably the sum total of his or her own personal and subjective opinions, attitudes and values (Grix, 2004:84).

3.3.4 Models and modelling

Grix (2004: 20) states that a model is a representation of something, in the way that a model aeroplane is a replica of a real aeroplane. A model is both a descriptive and an exploratory device. A road map is an example of a descriptive model.

A model, according to Frankfort-Nachmias and Nachmias (1992: 44), is a representation of reality that defines certain aspects of the real world as being crucial to the problem under investigation and expresses the significant relationships among the aspects that enables the conceptualisation of empirically testable suggestions regarding the nature of these relationships.

This suggests that a model is a good method of seeing the relationships between concepts and the boxes and arrows used in modelling themselves have no meaning other than showing the relationship between variables

allowing a reader to develop an abstract picture of the relationship more easily than if it were done using text (Grix, 2004: 21).

3.4 QUANTITATIVE VERSUS QUALITATIVE RESEARCH

Qualitative research is usually associated with interpretativism and quantitative research with positivism. As previously indicated by Diagram 11 research methods can be placed on a continuum stretching from pure quantitative (Positivism) to pure qualitative (Interpretativism) (Grix, 2004: 78). It is, however, plausible to indicate whether research projects have a more quantitative or qualitative nature, which in turn would impact on the process to follow and the selection of the measuring instrument (Van Biljon 1999:37). A summary of the main differences between qualitative and quantitative research is given in Table 3.4-1.

Table 3.4-1: Differences between qualitative and quantitative research

Quantitative	Qualitative
• Test hypothesis that researcher begins with. Hypotheses are stated explicitly and are formulated beforehand.	• Capture and discover meaning once the researcher becomes immersed in data. Hypotheses are frequently undeclared or stated in the form of a research goal.
• Concepts are in the form of distinct variables. Concepts have an ambiguous meaning.	• Concepts are in the form of themes, motifs, generalisations, and taxonomies. Concepts can be interpreted in a number of ways.
• Measures are systematically created before data collection is standardized. The researcher remains largely aloof.	• Measures are created in an *ad hoc* manner and are often specific to the individual or researcher. The researcher is involved in the events/phenomena.
• Data are in the form of numbers from precise measurement.	• Data are in the form of words from documents, observations and transcripts.
• Theory is largely causal and is deductive.	• Theory can be causal or non-causal and is often inductive.
• Procedures are standard and replication is assumed.	• Research procedures are particular and replication is very rare.
• Analysis proceeds by using statistics tables or charts and discussing how and what they show related to hypotheses.	• Analysis proceeds by extracting themes or generalizations from evidence and organizing data to present a coherent, consistent picture.

Source: Adapted from Neuman (1994:317), Mouton and Marais (1992:159).

An important choice that researchers face is the research method to be used. Leedy (1993: 145) believes that the answer to this question can be found in the nature of the data, the problem of the research, the location of the data, obtaining of the data and the intention with the data. If the data is verbal, the methodology is qualitative, if it is numerical, the methodology is quantitative (Van Biljon 1999:37).

3.4.1 Quantitative research

Quantitative research according to Grix (2004:117) is characterised by three basic phases: finding variables for concepts, operationalising them in the study and measuring them. In general, quantitative research is used to answer questions about links among measured variables with the purpose of explaining, predicting and controlling (Leedy & Ormrod, 2005:94).

A quantitative study usually ends with the confirmation or disconfirmation of the hypotheses tested.

3.4.2 Qualitative research

Qualitative research involves a phenomenological perspective whereby researchers aim to understand, report and evaluate the meaning of events for people in particular situations, that is, how their social world is structured by the participants in it. The focus of qualitative methodologies is on the way in which participants (rather than the researcher) interpret their experiences and construct reality (Leedy & Ormrod, 2005:95; Grix, 2004: 119; Rudestam & Newton, 2001:91).

3.5 CHOOSING THE MOST APPROPRIATE RESEARCH METHOD

As referred to previously, the research method is related to the nature of the data, the problem of the research, the location of the data, the collection of the data and the intention with the data (Leedy, 1993: 145). The characteristics of quantitative and qualitative approaches are detailed in Table 3.5-1.

Table 3.5-1: Distinguishing characteristics of quantitative and qualitative approaches

Question	*Quantitative*	*Qualitative*
What is the purpose of the research?	• To explain and predict • To confirm and validate • To test theory	• To describe and explain • To explore and interpret • To build theory
What is the nature of the research process?	• Focused • Known variables • Established guidelines • Predetermined methods • Somewhat context-free • Detached view	• Holistic • Unknown variables • Flexible guidelines • Emergent methods • Context –bound • Personal view
What are the data like, and how are they collected?	• Numeric data • Representative, large sample • Standardised instruments	• Textual and/or image-based data • Informative, small sample • Loosely structured or non-standardized observations and interviews
How are data analysed to determine their meaning?	• Statistical analysis • Stress on objectivity • Deductive reasoning	• Search for themes and categories • Acknowledgment that analysis is subjective and potentially biased • Inductive reasoning
How are the findings communicated?	• Numbers • Statistics, aggregated data • Formal voice, scientific style.	• Words • Narratives, individual quotes • Personal voice, literary style

Source: Adapted from Leedy and Ormrod (2005:96).

This study is an investigation into a decision-making model that best closes the gap between strategy and the capital investment procedure for Cadbury South Africa. From the setting of the problem and with reference to Table 3.5-1 and Table 3.4-1 it can be concluded that the research project is suited to a quantitative research method as it supports deductive reasoning and analysis.

A deductive design begins with an explicit conceptual framework developed from existing theory and models. The project requires the formulation of specific research hypotheses leading to a theory building exercise. A questionnaire is used to collect data; the hypotheses are accepted or rejected and casual relationships between variables are established.

3.6 RESEARCH GOALS AND STRATEGIES

3.6.1 Research goals

The research goal provides a broad denotation of what a researcher wishes to achieve with research. The researcher needs to determine whether the aim of the research project is to describe, explain or to explore (Neuman 1994:18; Jackson 1995:18).

3.6.1.1 Descriptive projects

The primary intent of descriptive projects is to depict accurately the characteristics of a particular individual, group, situation, or organisation, tribe, subculture, interaction or social objective. The outcome of a descriptive project is a detailed picture of the subject. According to Neuman (1994:19), the goals of descriptive projects may be to:

- Clarify a sequence, set of stages or steps.
- Document information that contributes prior beliefs about a subject.
- Provide an accurate profile of a group.
- Give a verbal or numerical picture.
- Describe a process, mechanism or relationship.
- Find information to stimulate new explanations.
- Present basic background information or a context.
- Create a sequence, set of stages or steps.

The description of some phenomena may range from a narrative type of description as in historical analysis to a highly structured statistical analysis (Van Biljon 1999:54; Neuman 1994: 19; Mouton & Marais 1992: 43).

3.6.1.2 Explanatory projects

Explanatory projects are built on exploratory and descriptive projects and go on to discover the reason something occurs. The primary aim of explanatory projects is to test a hypothesis of a cause and effect relationship between variables. A given phenomenon is explained in terms of specific causes (Van Biljon, 1999:55; Neuman, 1994:20; Mouton & Marais, 1992: 46). The goals of explanatory projects may be to:

- Build and elaborate a theory so it becomes more complete.
- Provide evidence to support or refute an explanation.
- Extend a theory or principle into new areas or issues.
- Link different issues or topics under a common general statement.
- Determine the accuracy of a principle or theory.
- Find out which competing explanation is better.
- Advance knowledge about an underlying process.

3.6.1.3 Exploratory projects

The goal pursued in exploratory projects is the exploration of a relatively unknown topic, situation or phenomenon. The goal of such a project may be to

- Develop new hypotheses about an existing phenomenon.
- Gain new insights into the phenomenon by becoming familiar with facts, people and concerns involved.
- Undertake a pilot investigation and determine feasibility before a more structured study of the phenomenon.
- Generate many ideas and develop tentative theories and conjectures.
- Determine priorities and develop techniques for future research.

Exploratory projects usually lead to insight and comprehension rather than a collection of accurate and replicable data. The methods frequently used in exploratory projects include in-depth interviews, the analysis of case studies and the use of informants (Van Biljon, 1999:55; Neuman, 1994:20; Mouton & Marais, 1992: 46).

3.6.1.4 The research goals of this project

The primary aim of this research project is to portray accurately the characteristics of a particular group, situation, or object (Mouton & Marais, 1992:43) -in this case the decision-makers of Cadbury who are involved with the capital budgeting process. This research project as a result follows the descriptive path. A further goal is the matching of a capital evaluation technique that enhances the strategy to the current capital expenditure procedure.

3.6.2 Research strategy

Mouton and Marais (1992:49) believe it is possible to distinguish between types of research strategies, namely:

- Contextual research strategy that deals with projects such as historical sciences, languages, arts, jurisprudence and theology
- General research strategy that deals with experimental studies, comparative research and various types of surveys.

For the purpose of this research project, the focus was on a general research strategy utilising a survey in a form of a questionnaire.

3.6.3 Survey research

Leedy and Ormrod (2005: 183) defines survey research as the acquiring of information about one or more groups of people, regarding their characteristics, opinions, attitudes, or previous experience, by asking them questions and tabulating their answers. Survey research typically employs a face-to-face interview, a telephone interview or a written questionnaire (Leedy & Ormrod, 2005:184). As previously indicated a questionnaire survey will be utilised for this project.

3.6.3.1 Questionnaire design

Hussey and Hussey (1997:61) define questionnaires as lists of structured questions with a view to eliciting reliable responses from a chosen sample with the aim of finding out what a selected group of participants do, think or feel.

According to Leedy and Ormrod (2005:185) questionnaires have two main advantages, firstly they are relatively cheap as they reduce the researcher's travel costs and telephone expenses. Secondly, questionnaires offer respondent anonymity assuring, therefore, greater confidence in the accuracy of the results.

Leedy and Ormrod (2005:185), however, point to two disadvantages of questionnaires, the main one being the low return rate owing to the general apathy of respondents to take the time to answer a questionnaire. The second disadvantage is that the respondents' answers might be flawed because of a misinterpretation of the questions.

To minimise the extent of the disadvantages Leedy and Ormrod (2005: 190) propose twelve guidelines for the development of a questionnaire.

1. Keep it short - the questionnaire should be brief as to extract only that information pertaining to the particular research project.
2. Use simple clear unambiguous language. The questions should be designed in such a way that they communicate exactly what the researcher wants to know.
3. Check for unwarranted assumptions in the questions. Assumptions must be carefully considered when designing a question.
4. Questions should be worded in such a manner that clues are not disclosed about preferred or desirable responses.
5. Check for consistency. When a question being asked is such that some respondents may give answers that are socially acceptable rather than true, a "countercheck" question should be incorporated further down the list.
6. Determine in advance how responses will be coded.
7. Keep the respondent's task simple - the questionnaire must be simple to read and answer.

8. Provide clear instructions. The researcher must communicate exactly how he/she wants people to respond.
9. Give a rationale for any items whose purpose may be unclear. The purpose of each question should be made clear to the respondent.
10. The questionnaire should look attractive and professional.
11. Conduct a pilot test - the questionnaire should be given to friends or colleagues to see whether they have difficulty in understanding any items.
12. Scrutinise the almost final product carefully to make sure that it addresses the needs of the researcher, item by item. A questionnaire should be quality tested several times for precision of expression, objectivity, relevance and probability of favourable reception and return. It is important that each question addresses the research problem as well as the sub-problems.

The questionnaire for this study was developed from the literature study in Chapter 2 to facilitate the collection of information. The questions identified from the literature and by the hypothesis were first linked to the main research question and the hypothesis and are listed in ANNEXURE D. Multiple choice, yes/no and open-ended questions were selected and assigned to each question and countercheck questions were included.

The multiple-choice questions had two formats- selection of options presented by the researcher and which could have more than one answer and a rating scale based on the Likert scale, ranging from “strongly disagree”, “disagree”, “agree” and “strongly agree” or when checking understanding from “not at all”, “vaguely”, “working knowledge” and “thoroughly” (Leedy & Ormrod, 2005: 185). The scale was particularly chosen to exclude a neutral response. A limitation of this approach according to Leedy and Ormrod (2005:187) is the potential loss of valuable information and as a means to overcome this, certain questions required an open-ended response as well.

Before the questionnaire was finalised (ANNEXURE E) the questions presented in ANNEXURE D were checked by a member of the Department of Mathematical Sciences at the Nelson Mandela Metropole University against suitability for statistical analysis.

3.6.4 The population

As mentioned in Chapter 1, the population selected are directors, senior managers and middle managers involved with the capital expenditure decision-making process in the Cadbury organisation with particular focus on Cadbury South Africa. The population contains definite strata that appear in different proportions within the population, hence proportional random stratified sampling was utilised (Leedy & Ormrod, 2005: 205). The exception to this was the Cadbury South Africa directors, who, because their busy schedules frequently prevent meaningful interaction, were all, included in an effort to increase the response rate.

The sample was determined by using the Cadbury organisational list and managers who have access to the HOLT evaluator program. All managers not directly involved with the capital expenditure process because of their lack of access to the HOLT evaluator program were eliminated and 50 per cent of the remainder were taken as a sample with the exception of the directors who were included at 100 per cent. The population sample is presented in Table 3.6-1

Table 3.6-1: Population Sample

Level	Location	Proposed Number	%	Actual number	%
Directors	Local	7	16.2%	2	4.6%
Senior	Local	6	14%	4	9.3%
Senior	Group	10	23.3%	10	23.2%
Middle	Local	15	34.8%	13	30.3%
Middle	Group	5	12.6%	0	0%
	Total	**43**	**100%**	**29**	**67.4 %**

3.7 GENERAL PROCEDURES

The methodology adopted in this research project was discussed earlier in this chapter. The empirical data collection was done by means of questionnaires. The secondary data used in this research project were obtained from various local and international sources in various forms, such as articles, books, the most predominant being international books originating in America and Europe. The primary data used in this research project was acquired from observation by way of questionnaires (see ANNEXURE E).

The questionnaire design has been discussed in section 3.6.3.1 above and a pilot survey to test the questionnaire was conducted with three respondents, one senior and two middle managers, to test the user-friendliness of the questionnaire.

The actual survey in the form of an e-mail survey questionnaire (see ANNEXURE E) was forwarded under a covering letter dated 27 October 2005 (ANNEXURE F) to respondents within the Cadbury South Africa area, excluding directors. For directors and respondents from group an additional introduction letter from the promoter (ANNEXURE G) was included.

The return date as requested in the covering letter (ANNEXURE F) was 10 November 2005. A total of 29 questionnaires were accepted for the study representing a 67.4 per cent response rate, which for a questionnaire survey that usually has a low response rate according to Leedy and Ormrod (2005:185) can be taken as acceptable.

The worst respondents, the group middle managers at 0 per cent, (Table 3.6-1) elicited follow-up phone calls and further e-mails with an extension to 14 November 2005 after which no further responses were received.

During the follow-up on outstanding questionnaires the following reasons and excuses were given as to why questionnaires had not been completed and returned:

- The email had been deleted by mistake.
- The respondent was too busy to reply.
- The respondent was away on business and had many other emails to reply to.
- The respondent stated that he/she was too busy to open the email.

The questionnaires that originated from the actual survey were recorded on computer disk and the data was processed and presented in tabular form by a member of the Department of Mathematical Sciences at the Nelson Mandela Metropolitan University. These results are presented in Chapter 5.

3.8 CONCLUSION

A formal systematic approach to research design is crucial to ensure that a research project conforms to the principles of validity and reliability. The research design decisions guide the researcher in effectively addressing the research problem. A quantitative, descriptive approach strategy was the most appropriate approach for this research project. Questionnaires were the main method of data collection.

CHAPTER 4

4 EMPIRICAL RESULTS

4.1 INTRODUCTION

Empirical results are a core part of this research project, and the response to the questionnaire will make a major contribution to the identification of those topics or issues that form part of the hypotheses of the project.

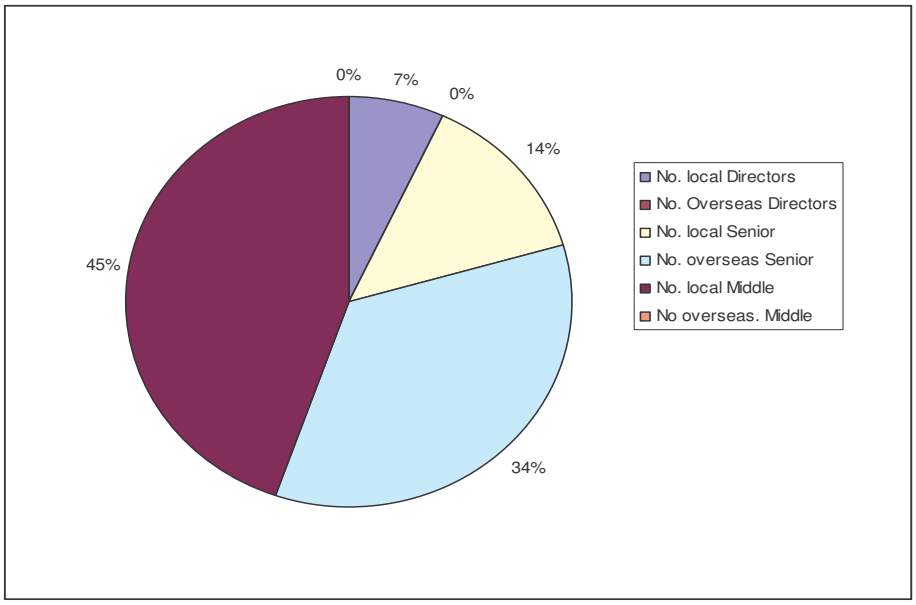
4.2 GENERAL OBSERVATIONS ON THE DATA

The total response from the sample of 43 amounted to 29 questionnaires (67.4%), of which all were usable. The largest group of respondents were from Cadbury South Africa (66%) and the rest (34%) were from Cadbury Group based in Birmingham in the United Kingdom. The UK respondents, however, have a group function that requires them to assist with projects across the Cadbury organisation. The data for this section is based on the responses to questions 1 to 7 of the questionnaire (ANNEXURE E).

When the data were analysed, it was found that the questionnaire had been completed almost equally by senior managers (48%) and middle managers (45%). The smallest group of respondents were directors at 7 per cent of the total and 28 per cent of the available population. The majority of the senior management respondents were from Cadbury group (34%) and only 14 per cent of local senior management completed the questionnaire. Only local middle managers (45%) responded to the questionnaire. This data is presented in Figure 4-1.

The respondents generally have a high level of experience with the Cadbury Schweppes group, as 41 per cent have been with the organisation for more than 13 years. Of the remaining 59 per cent, only 41 per cent have less than 5 years experience in the organisation. The average length of service for the population is 13 years with a minimum service length of 2 years and a maximum of 34 years. The respondents are generally highly skilled people, 72 per cent have a tertiary qualification and 21 per cent have a postgraduate qualification (Honours or Masters).

Figure 4-1: Management level of respondents



The average age of the group is 43. The youngest respondent is 31 and the oldest is 56 years old. The majority of respondents were male as there were only three female respondents.

On average, each respondent examines 23 RAM forms a year with the maximum being 200 (the capital expenditure compiler) and the minimum 1. If the median is taken due to the skewing of the capex compiler's excessively high number of 200 then the middle managers' median is 10.

Table 4.2-1 further defines the data.

Table 4.2-1: General observations of demographics of population

		SPLIT BETWEEN LOCAL AND GROUP				
Item	Percentage of total n=29	Local	Group	Average Age	Average service length	Average No. RAM's evaluated per annum
Director	7%	7%	0%	42	15	30
Senior	48%	34%	14%	46	14	13
Middle	45%	45%	0%	41	11	8

The capex compiler who reviewed 200 RAMs was removed to determine the average for middle managers.

4.3 STRATEGY INCORPORATION

As Table 4.3-1below illustrates, the majority of respondents claim to be aware of the organisation's strategy with all senior management and directors being aware of the organisation's strategy and 69 per cent of middle managers claiming awareness. This implies that these decision-makers have a thorough understanding of what projects fit into the organisation's strategy when they review a RAM.

From the general observations, the majority of respondents appear to be steeped in the Cadbury culture and way of doing things as indicated by the average length of service of 13 years. It is, therefore, no surprise that 61 per cent of the respondents were of the opinion that the current capex procedure adequately addresses strategy. The distribution amongst the management levels indicated by Table 4.3-1.

When the respondents were asked if the current program (HOLT evaluator) used to generate the answers for evaluation was easy to use only 33 per cent of them agreed with the statement.

Table 4.3-1: Incorporation of strategy and understanding of strategy

		Split among management levels that agree.		
Item	Total Agree	Directors	Senior	Middle
Knowledge of current strategy	86%	100%	100%	69%
Incorporation of current strategy	61%	50%	64%	58%
Ease of use of existing system.	33%	0%	38%	33%

The respondents were asked what their opinion was of a time period of strategy and what the average time was that a project took from conception to approval only. Table 4.3-2 below presents these findings.

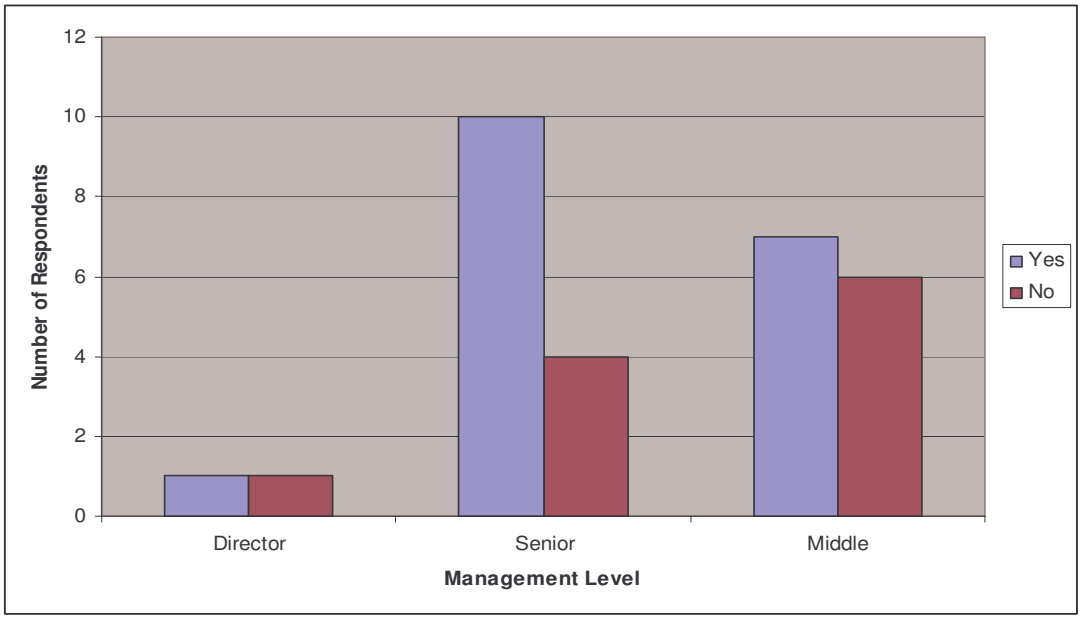
Table 4.3-2: Average periods of strategy and approval

		Split among management levels		
Item	Total average	Directors	Senior	Middle
Time period of strategy	24 Months	12 Months	25 Months	30 Months
Time taken from concept to approval	9 Months	8 Months	10 Months	9 Months

4.4 IMPORTANCE OF FINANCIAL EVALUATION

The respondents were asked if projects could be approved based on strategy only and 64 per cent replied 'yes'. The split between management levels is presented in Figure 4-2.

Figure 4-2: Management split of whether projects can be approved on strategy

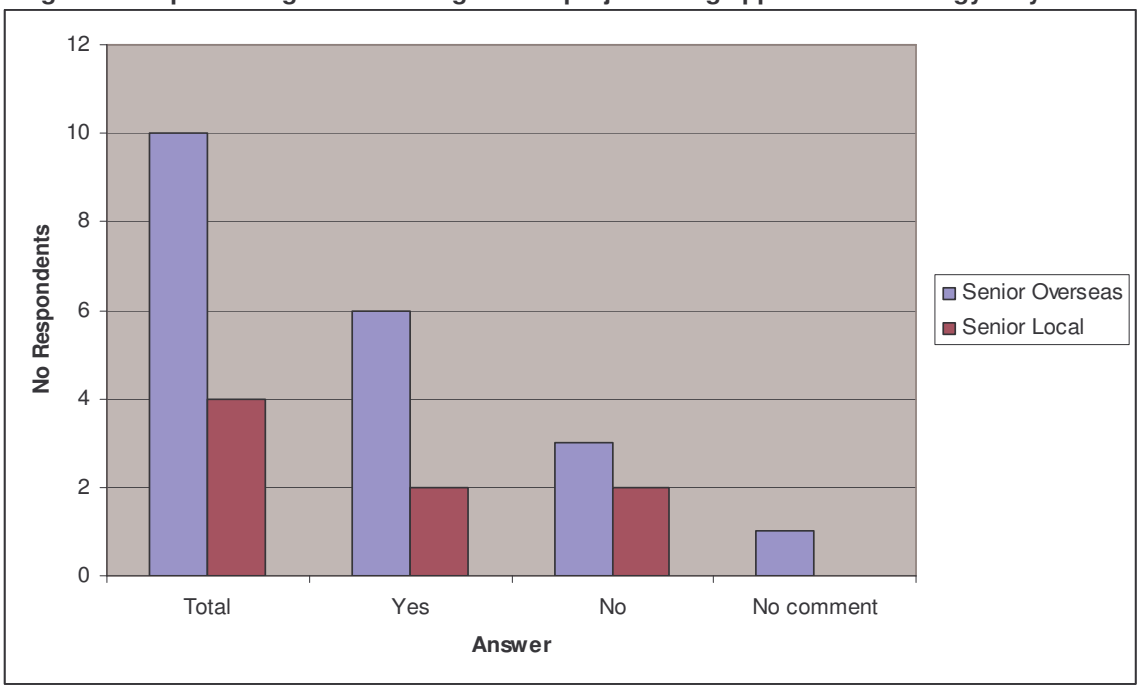


The two directors appear to be equally divided as to whether projects can be approved on strategy or not. It is interesting to note, however, that the younger and better educated of the two is the 'yes' respondent. The middle managers are almost equally divided in their opinion.

The senior managers appear to have a larger discrepancy and further analysis of the local and overseas split reflected by Figure 4-3 reveals that more overseas senior managers are of the opinion that projects can be approved on

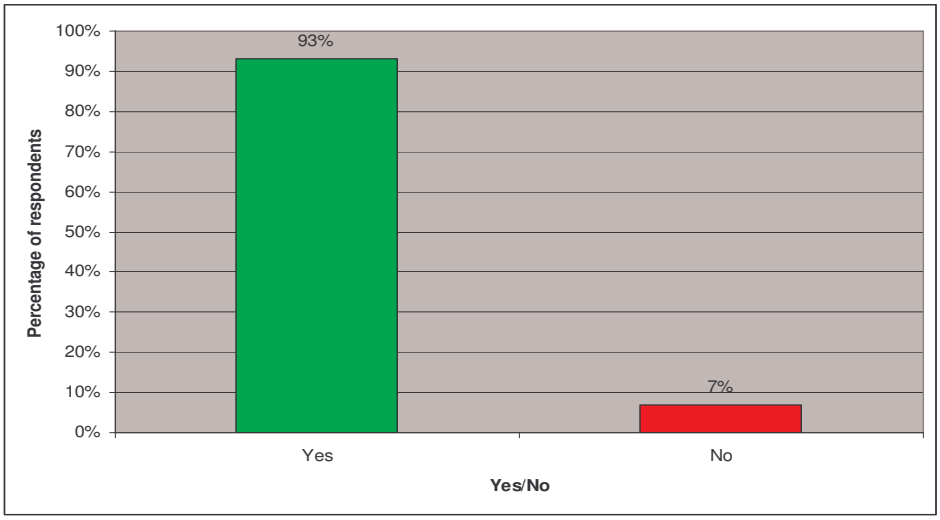
strategy only, while local senior managers are equally divided. This could be due to the fact that the overseas senior managers perform a group function and are not attached to any particular manufacturing facility and hence might not always have to live with the end results of their decisions.

Figure 4-3: Split among senior managers of a project being approved on strategy only.



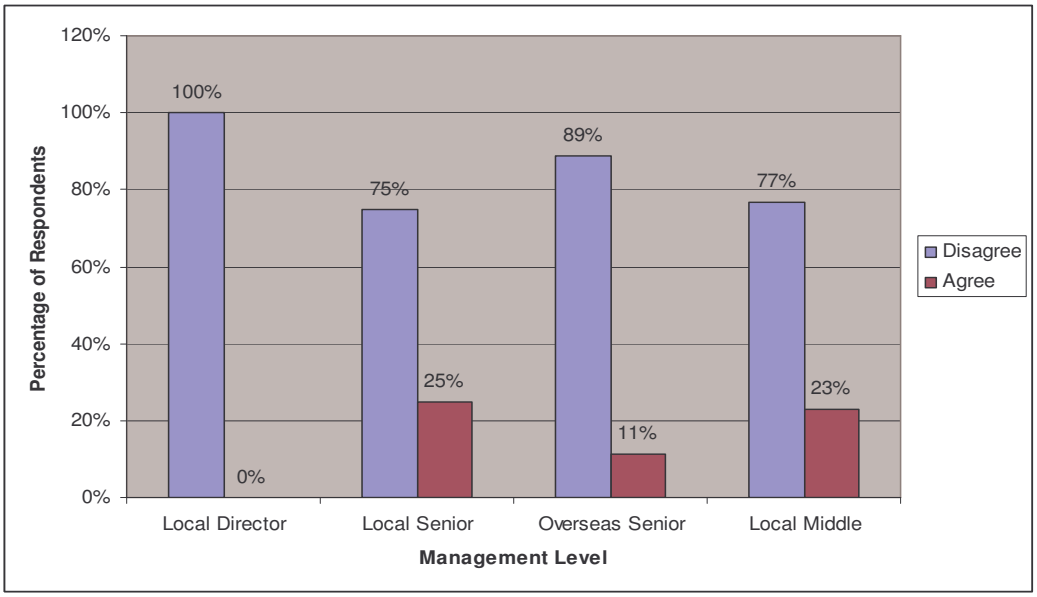
The result above could also be influenced by the fact that lobbying of projects is very high as demonstrated by the 93 per cent ‘yes’ answer to the question on whether lobbying of projects occurred (Figure 4-4). This could indicate that by the time a project is presented for approval the project leader has already won support for a particular project and the decision is taken less on financial evaluation and more on verbal justification, which could lead to the belief/perception that projects are approved on strategy.

Figure 4-4: Does lobbying of projects occur?



With regard to strategy approval, in chapter two, section 2.4, it was noted that not all benefits of a project could be linked to tangible cash benefits and that this prevented strategy from being approved as strategic driven projects often do not have tangible benefits in terms of cash inflows. When the respondents were asked if a project was only acceptable if it showed a cash inflow, the majority (82 %) of them disagreed with the statement, indicating that the respondents were of the opinion that projects are acceptable if they had no cash inflows. The analysis of how the different management levels responded to this question is represented by Figure 4-5.

Figure 4-5: How different management levels agree or disagree about cash inflows.



4.5 TECHNIQUES USED IN THE CAPITAL BUDGETING PROCESS

When the respondents were asked to indicate which technique they used first in evaluating a proposal, 79 per cent indicated Payback and 10 per cent indicated that IRR are considered first. The remaining respondents regarded NPV (7%) as what they examine first with only 3 per cent examining PI. The understanding of the techniques indicates that all of the respondents understood the Payback calculation in some form or another ranging from thoroughly to vaguely.

According to the results, profitability index (PI) after cash Payback was the next most thoroughly understood technique although it had the lowest working knowledge understanding. This difference between importance and understanding could be due to an error in the questionnaire, in that PI was not defined and the respondents could have misinterpreted it to mean profit improvement (PI). Table 4.5-1 below illustrates these preferences regarding the capital budgeting method used and the understanding that the respondents have regarding the method.

Table 4.5-1: Preferences regarding the capital budgeting technique used and understanding of technique

ITEM	IMPORTANCE	UNDERSTANDING			
		THOROUGHLY	WORKING KNOWLEDGE	VAGUELY	NOT AT ALL
Cash Payback (PP)	79%	34%	62%	3%	0%
Internal Rate of return (IRR)	10%	17%	62%	14%	7%
Net Present Value (NPV)	7%	16%	61%	16%	7%
Profitability index (PI)	3%	31%	41%	24%	3%
	100%				

4.6 ACCURACY OF CASH INFLOWS

With regard to the expected benefits that a project can generate the respondents were asked if the cash inflows were accurate and if these cash flows were ever manipulated to meet financial measures. For the first question, 46 per cent of the respondents were of the opinion that the cash flows are accurate while 54 per cent were not. This split was not as large as what was expected. For the second question 72 per cent of the respondents felt that cash flows are manipulated while 32 per cent were not. This split was what was expected.

There is an illogical discrepancy in the response to these two questions in that, if the cash flows are manipulated then, they cannot also be accurate. The answers were further split between different management levels, as can be seen in Figure 4-6 and Figure 4-7 respectively. If these Figures are considered, then the most evident difference between the two is that it is senior management, and in particular the overseas senior management, who differ the most between the two questions. This could be attributed to:

- The fact that this particular section of the population is not attached to any specific manufacturing facility, or
- That to admit to inaccurate cash benefits might have some negative impact, or
- Could be an error in the questionnaire process. (If the respondents answered 'no' to the first question or 'yes' to the second, they were required to expand their answer and the respondents might have been pressed for time and hence chosen the easiest answer with the least work.)

Figure 4-6: Management split on whether cash flows are accurate.

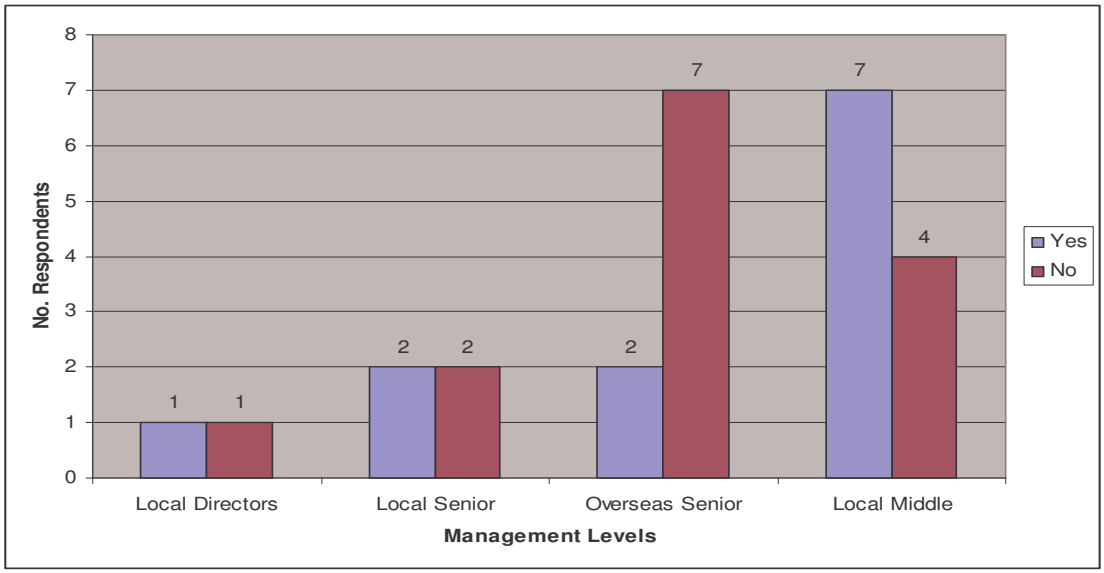
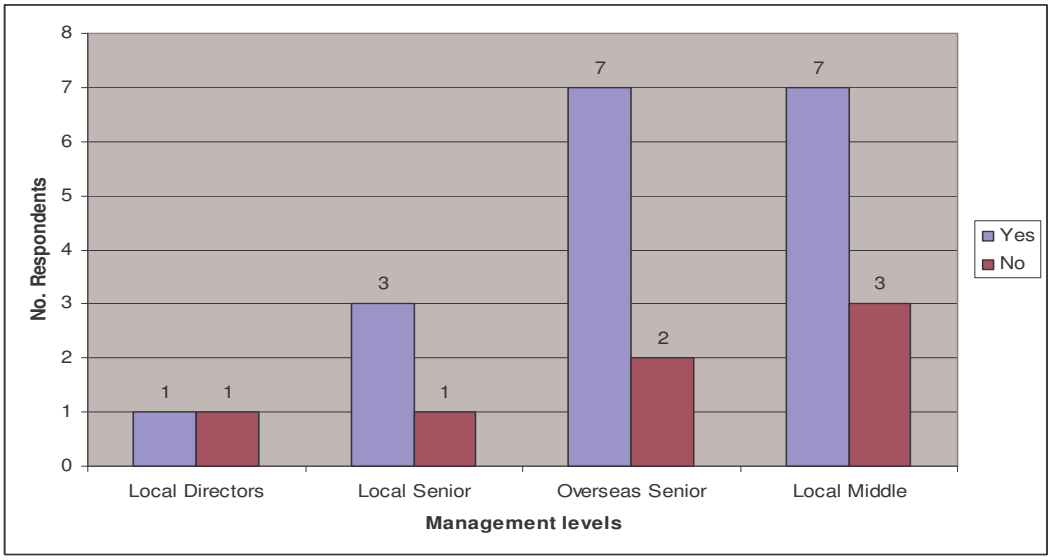


Figure 4-7: Management split on whether cash flows are manipulated to meet financial measures.



As mentioned above the respondents were asked to comment on either a 'no' or a 'yes' answer. For the question regarding the accuracy of cash flows for a project, the most common reason given is that the forecasts are not accurate and that they are only guidelines. The results are presented below.

- The cash flows are traditionally ambitious.
- Forecast accuracy is variable.
- Cash flow forecasting not a great strength of the organisation.
- They are only guidelines.
- Project selling volumes are rarely accurate.
- Sometimes the cash flows are manipulated to get an acceptable Payback.
- Accuracy is dependent on the competency of the individual preparing the input information.
- Sales volumes are manipulated to meet pre-set expectations.
- There are no economic, market analysis, prior review or historical trending as part of evaluation.
- There is a tendency to slant figures at the desired outcome.
- Forecasting is inaccurate.
- They are only guidelines.
- Depending on the variables, predicted cash flows are based on assumptions and could vary.

For the question regarding if cash flows are manipulated, the ‘yes’ answer required clarification. The most common answer is ‘to meet Payback period’ and ‘by manipulating sales volumes’. The results are presented below.

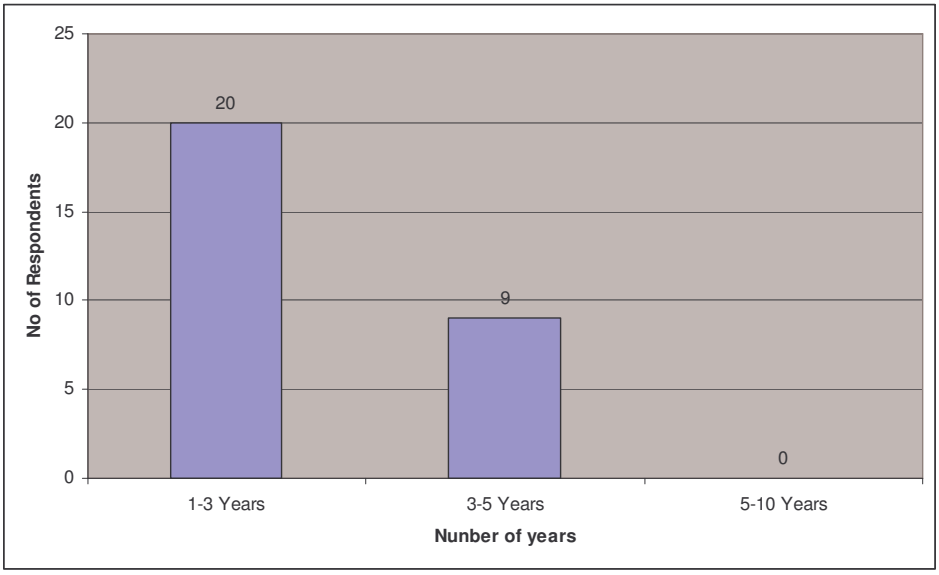
- Assumption tolerances are being played with.
- To get the project approved.
- To get an acceptable return.
- To achieve an acceptable Payback.
- Number of years over which an asset is depreciated.
- Mainly by manipulating volumes.
- To get an acceptable Payback.
- Dependent on the competency of the individual preparing the input information.
- Sales volumes are manipulated to meet pre-set expectations.
- Manipulate measurable costs to guarantee approval.
- To affect the Payback period and get a particular percentage gain in a given year.
- Capital altered, subjective benefits are included.
- Sale volumes are manipulated.
- Depending on the variables, predicted cash flows are based on assumptions and could vary.

4.7 PRESENTATION OF REMAINDER OF QUESTIONNAIRE'S RESULTS

This section covers the remainder of the questionnaire's answers not included in the previous sections.

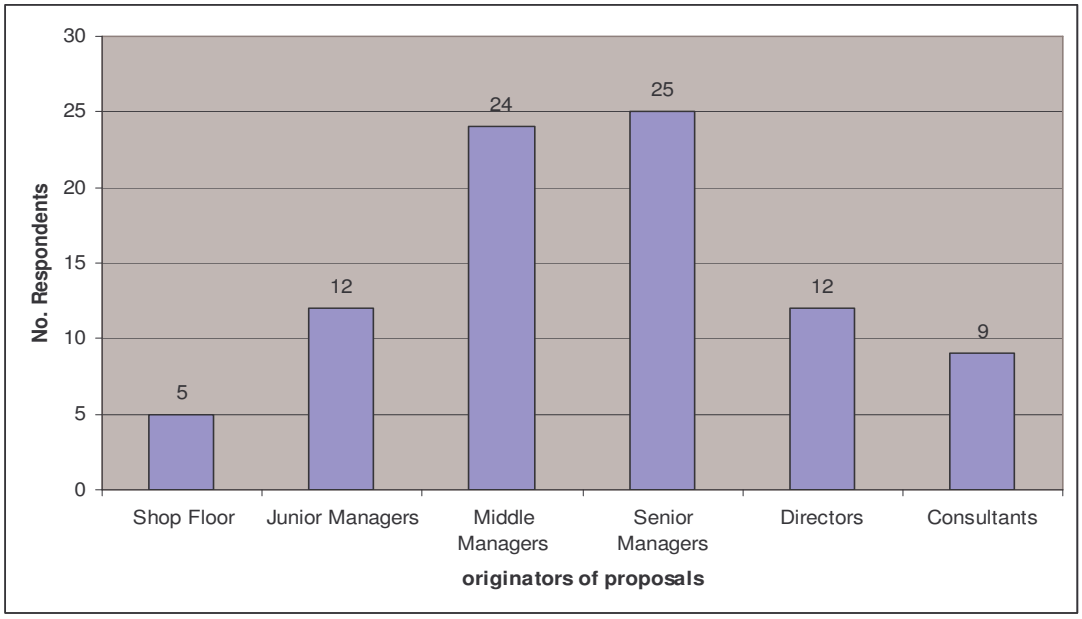
Question 3: How soon should a project pay for itself?

Figure 4-8: Response to question 3



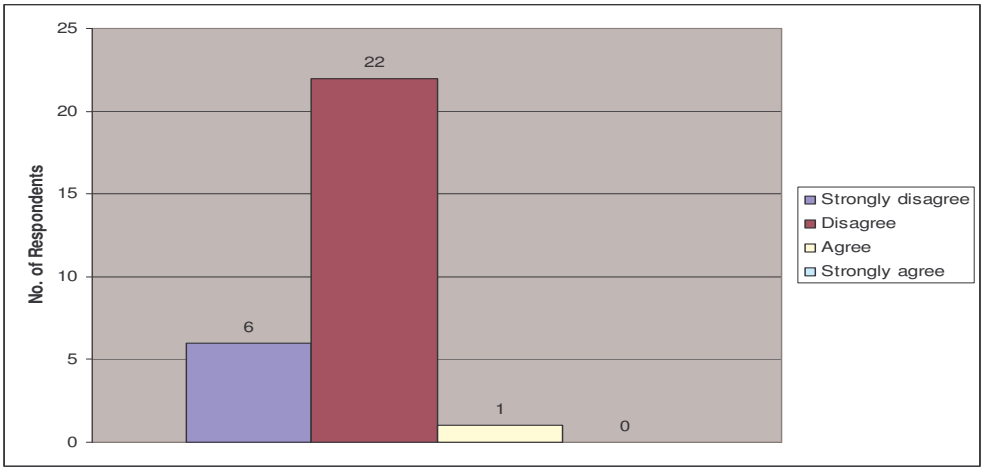
Question 9: Project Proposals originate from?

Figure 4-9: Response to question 9



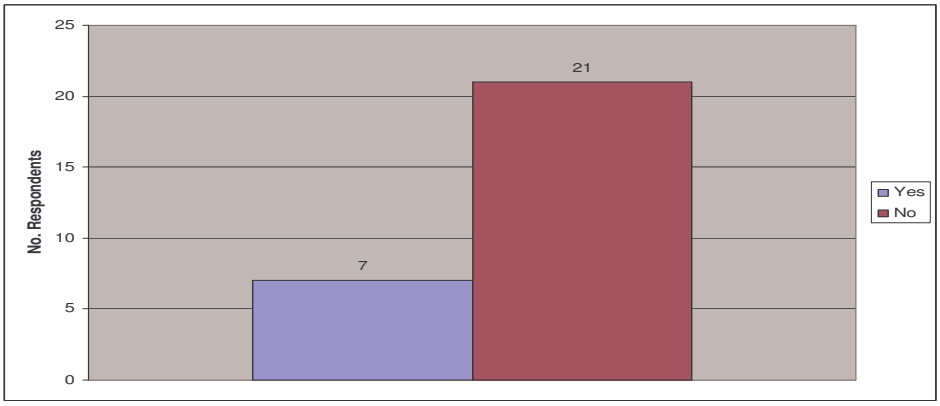
Question 10: Only financial indicators should be used for project evaluation.

Figure 4-10: Response to question 10



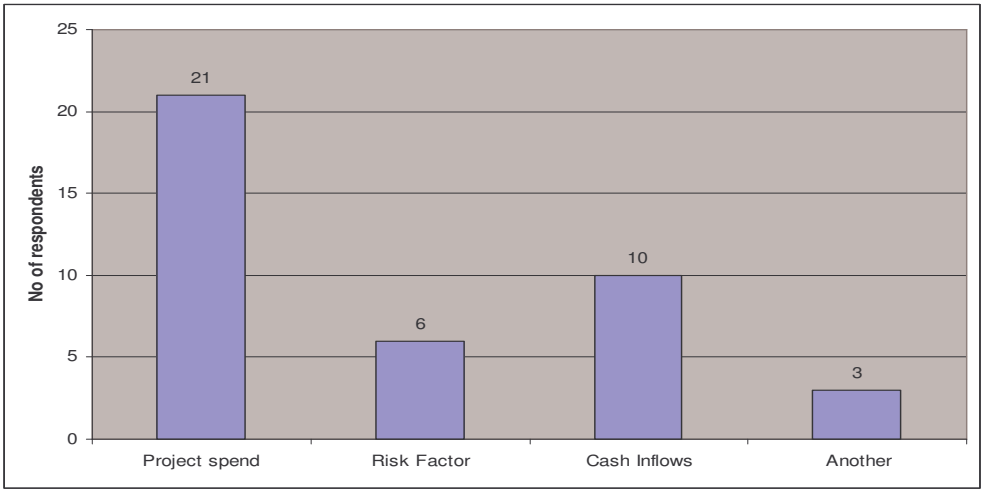
Question 11: Can all benefits from a project be related to financial benefits?

Figure 4-11: Response to question 11



Question 14: To get a project approved the following must be altered.

Figure 4-12: Response to question 14

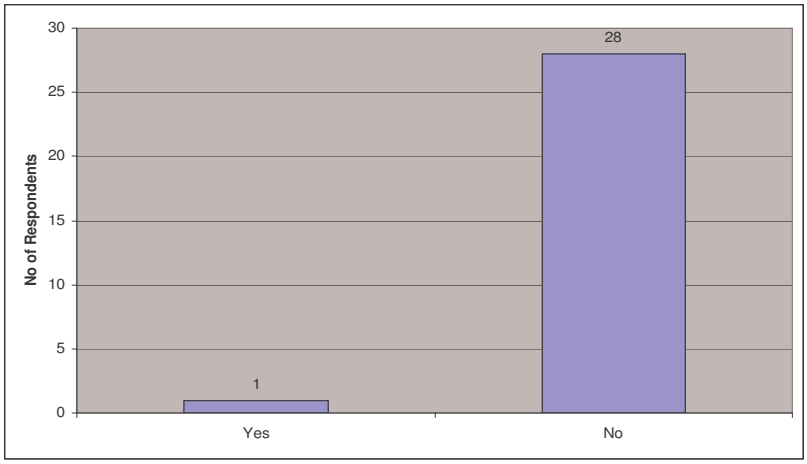


The “other” referred to in Figure 4-12 were:

1. Write-Offs and restructuring
2. Quality
3. Political importance of a negative outcome.

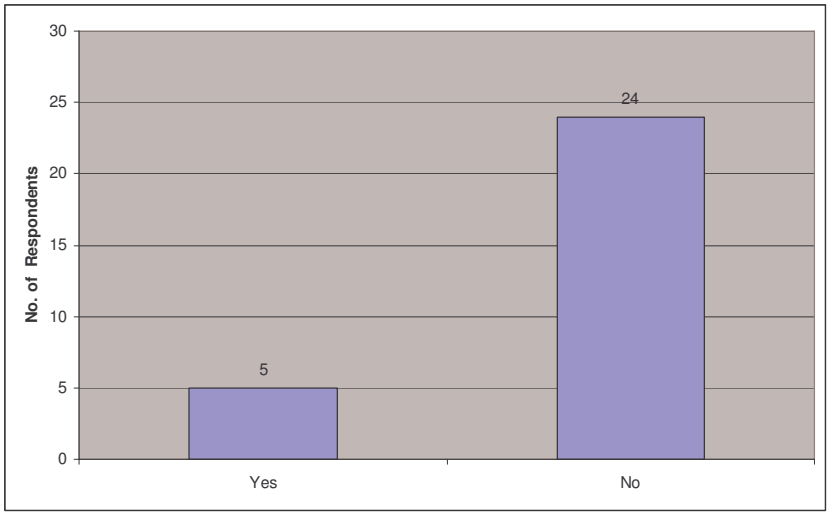
Question 15: Is capital investment making an exact science?

Figure 4-13: Response to question 15



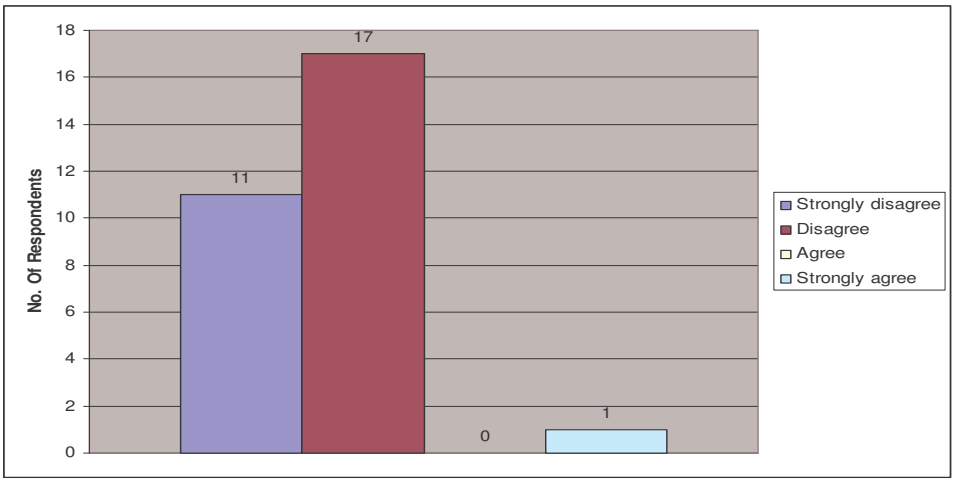
Question 16: Have you heard of the real option with regard to capital investment?

Figure 4-14: Response to question 16.



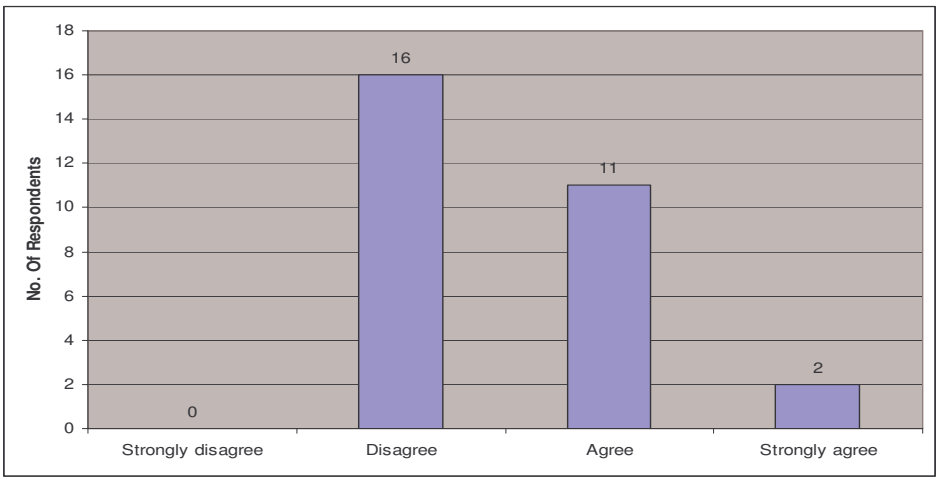
Question 20: To replace equipment with the same technology is better than introducing new technology.

Figure 4-15: Response to question 20



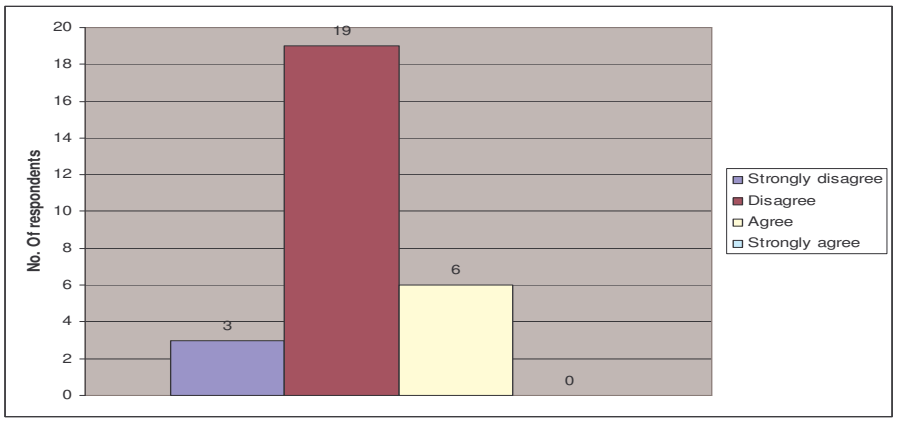
Question 21: Intangible benefits are not quantifiable.

Figure 4-16: Response to question 21



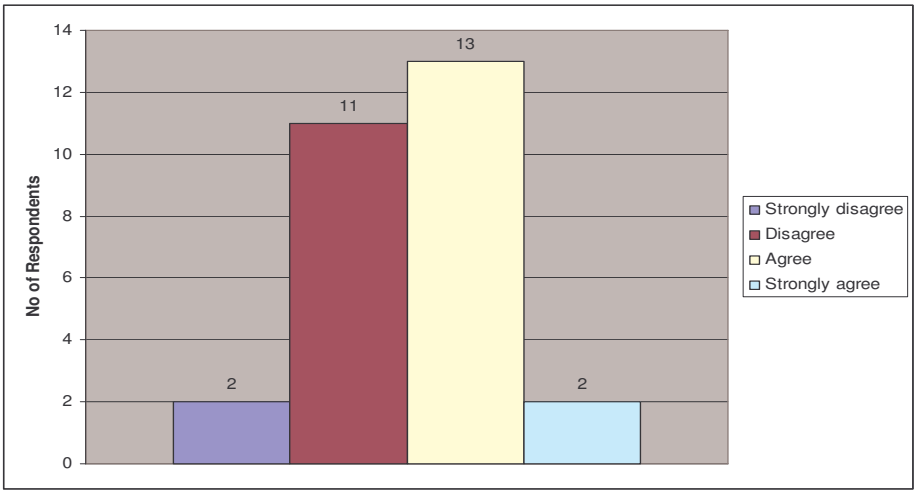
Question 25: Project cash inflows are precisely calculated and reliable.

Figure 4-17: Response to question 25



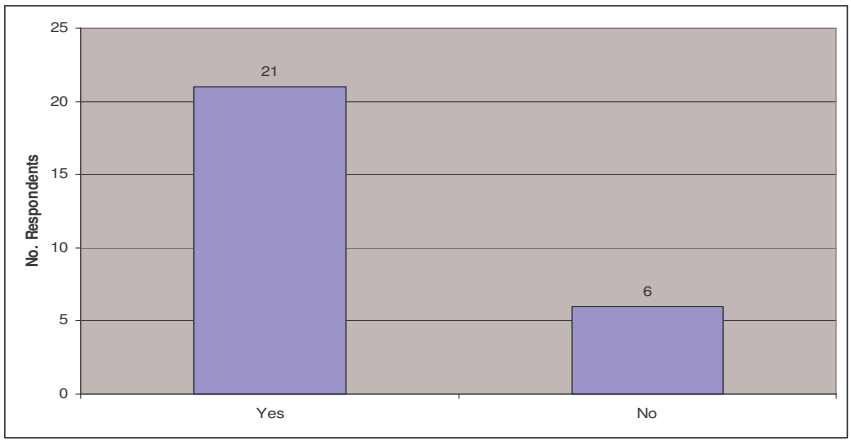
Question 26: More time should be spent on getting accurate investment costs than on establishing cash inflows.

Figure 4-18: Response to question 26



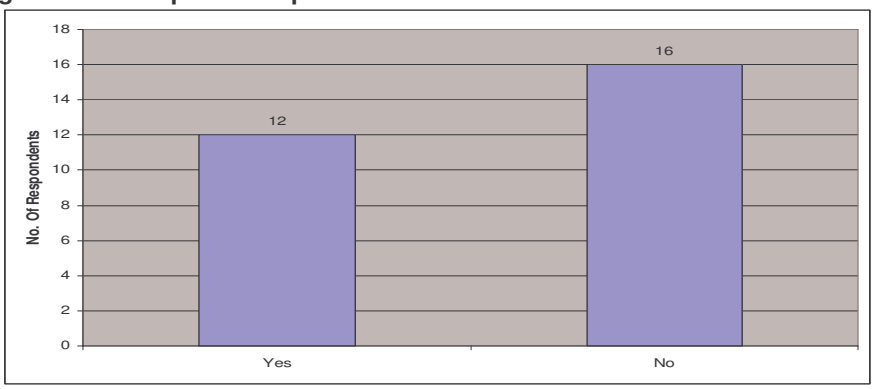
Question 27: Should different project types have different discount factors?

Figure 4-19: Response to question 27



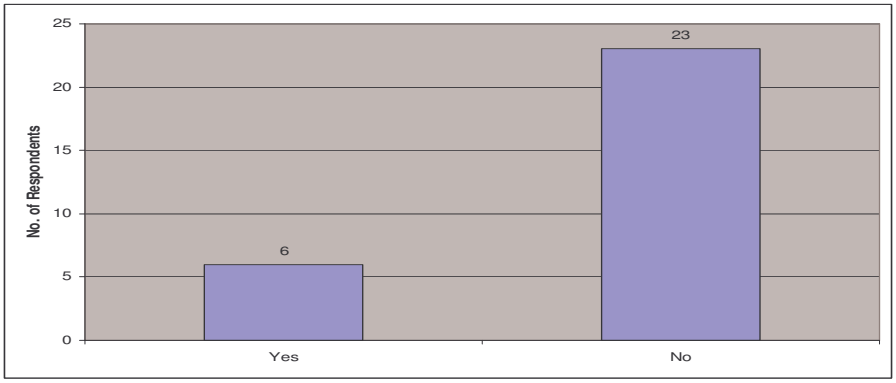
Question 30: Have you ever manipulated cash flows to get a project to fit the financial indicators?

Figure 4-20: Response to question 30.



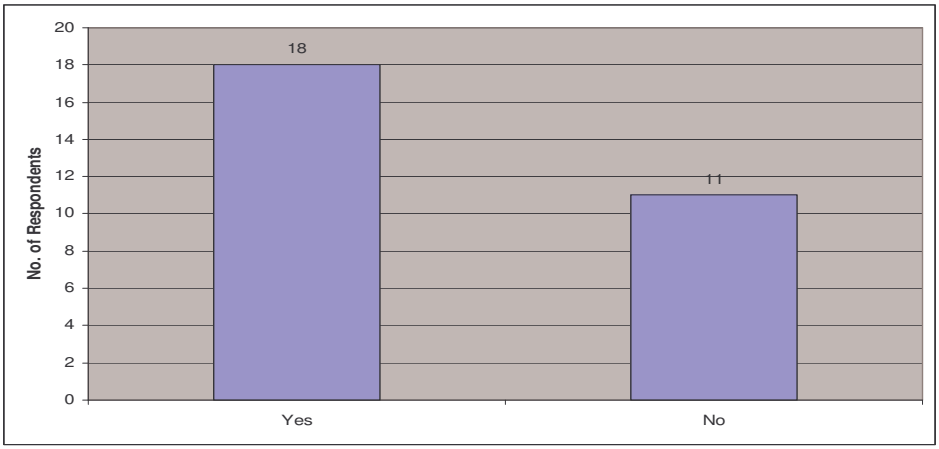
Question 31: Have you heard of the financial appraisal model with regard to capital investment?

Figure 4-21: Response to question 31



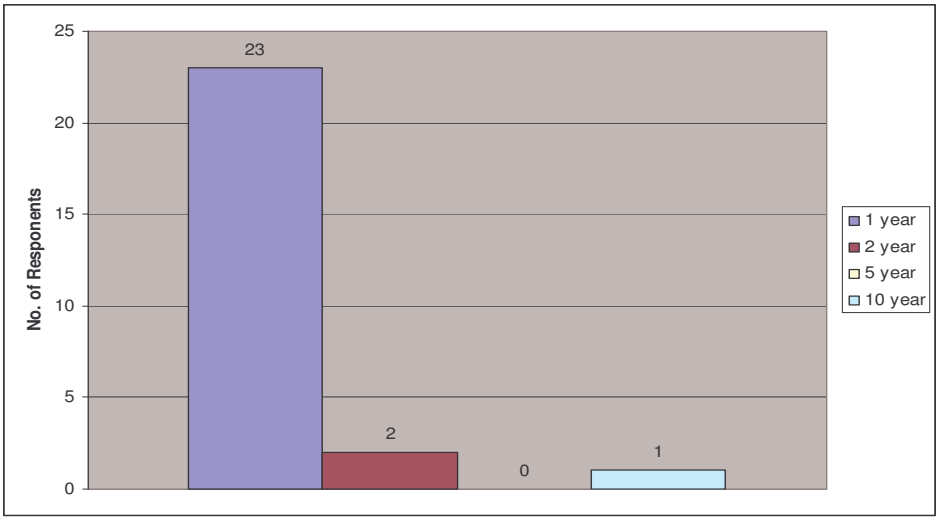
Question 32: Are post implementation evaluations done on completed projects with regard to expected financial benefits?

Figure 4-22: Response to question 32



Question 33: How soon after the project is the post evaluation done?

Figure 4-23: Response to question 33



Question 34 asked what corrective actions are taken if predicted financial benefits for a project are not realized. In the responses below a √ is used to indicate the number of similar responses:

- Nothing √ √ √ √ √ √ √ √ √ √
- Fortunately we still have to find out
- I don't know √ √ √ √ √ √ √ √ √
- No tangible accountability, except loss of credibility with final decision-makers, which increases time period of approval.
- Findings are converted into learning for future projects
- Not much. Generally the marketing people who estimated the benefits will have moved on.
- Shooting of the innocent! Loss of credibility and sometimes some corrective action.
- Not sure. Find some innocent people and fire them?

4.8 TESTING OF THE HYPOTHESES

The hypotheses testing has been approached on the basis of the following principles:

1. The written survey respondents are likely to constitute the more committed Cadbury managers because they answered the questionnaire.
2. No control can be exercised with regard to the percentage committed versus percentage uncommitted from a sample population.
3. It should be appreciated that the findings are likely to be representative of the activities of the more committed managers and one can only contemplate the activities of the uncommitted managers.
4. A positive result is one that agrees with the hypotheses.

To represent each hypothesis in a radar diagram, where the positive results are superimposed over the negative results, the collected data from the questionnaires have been computed using the following process:

1. Compute data for each questionnaire to represent positions on each radar diagram depending on the number of questions.
2. The questions are based on a Likert- type 4-point scale without a neutral response, where the range is from “strongly disagree” to “strongly agree” or other such combinations representing 1 to 4 and yes / no questions.
3. To establish the negative radar diagram the values from the questionnaires are then computed as follows:
    a. For Likert type questions: (1+2) x 100=%
    b. No = Negative
4. To establish the positive radar diagram the values from the questionnaires are then computed as follows:
    a. For Likert type questions: (3+4) x 100=%
    b. Yes = Positive
5. Draw both diagrams, superimpose the positive over the negative and interpret the results.

Finally, when interpreting the written surveys with the aid of the radar charts the following indicators are used:

- Minority: 30% and less
- Half: 50%
- Majority: 60% but less than 80%
- Most: 80% and more
- All: 100%

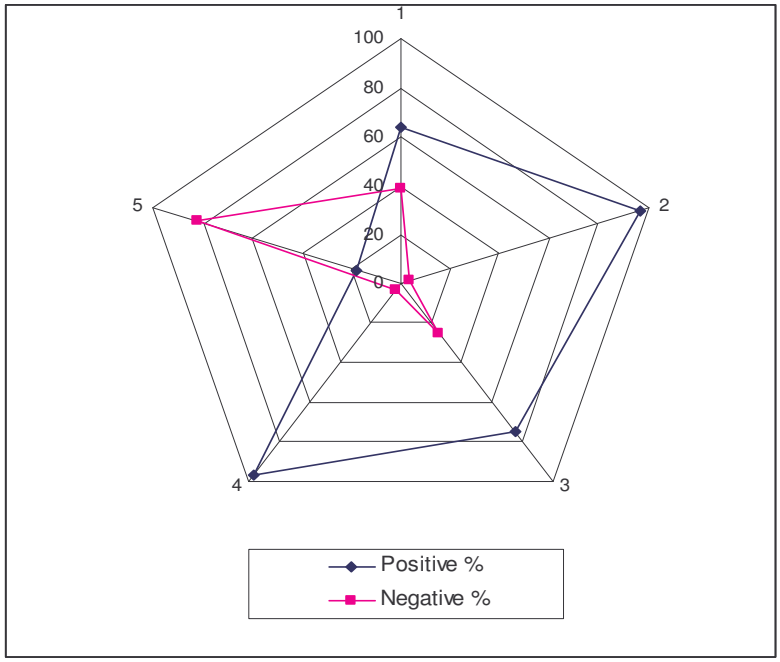
4.8.1 Hypothesis 1

Capital investment decisions are only accepted on financial criteria.

The salient findings of the survey can be summarised as follows:

Figure 4-24: Summary of responses to questions for hypothesis 1

Question	Positive %	Negative %
4 (1)	64	39
10 (2)	97	3
11 (3)	75	25
15 (4)	97	3
18 (5)	18	82



Written survey

From the written survey, **most** of the respondents felt that:

- Projects should not only be approved on financial benefits.
- Capital investment-making decisions were not an exact science.

Also from the written survey the **majority** of the managers were of the opinion that:

- The current capital investment procedure adequately addresses strategy.
- Not all benefits can be converted to financial benefits.

Test

The findings of the written survey as depicted in Figure 4-24 support hypothesis 1: "Capital investment decisions are only accepted on financial criteria."

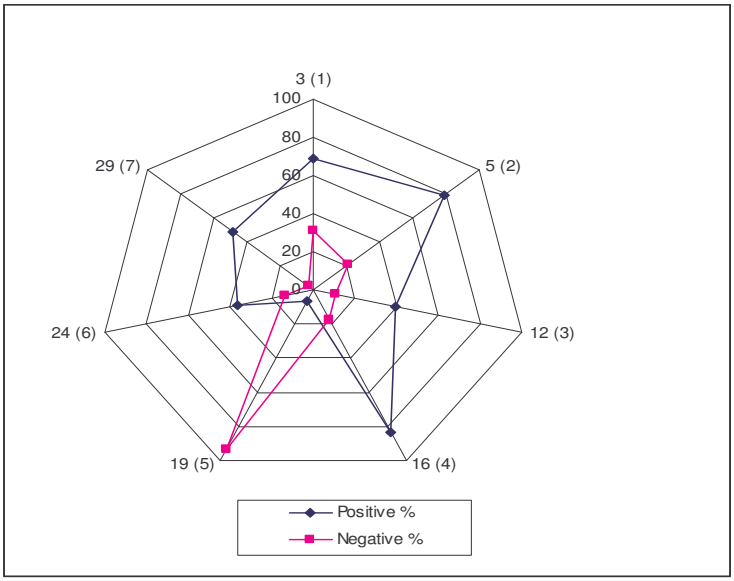
4.8.2 Hypothesis 2

Although three financial measures are calculated and presented, Payback is the only measure used as acceptance by most decision-makers.

The salient findings of the survey can be summarised as follows:

Figure 4-25: Summary of responses to questions for hypothesis 2

Question	Positive %	Negative %
3 (1)	69	31
5 (2)	79	21
12 (3)	39.5	10.5
16 (4)	83	17
19 (5)	7	93
24 (6)	36	13.5
29 (7)	48	3



Written survey

From the written survey **most** of the managers:

- Had not heard of alternative evaluation models.

From the written survey, the **majority** of the respondents felt that:

- That they looked at Payback before any other indicator.

Test

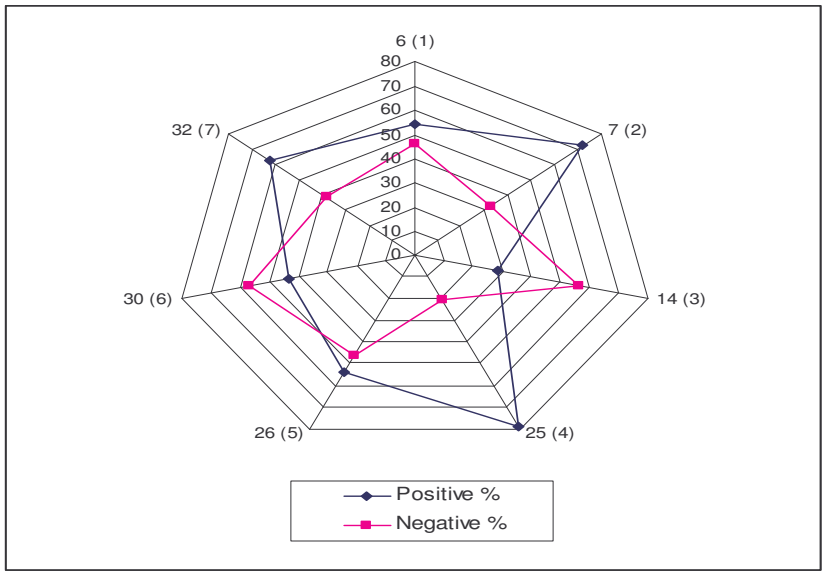
The findings of the written survey as depicted in Figure 4-25 support hypothesis 2: "Although three financial measures are calculated and presented, Payback is the only measure used as acceptance by most decision-makers."

4.8.3 Hypothesis 3

That management manipulates cash flows, to ensure a positive result, when a project is strategic of nature or if the majority of benefits are intangible in order to gain acceptance within the purely financial based evaluation criteria.

Figure 4-26: Summary of responses to questions for hypothesis 3

Question	Positive %	Negative %
6 (1)	54	46
7 (2)	72	32
14 (3)	28	56
25 (4)	79	21
26 (5)	54	46
30 (6)	43	57
32 (7)	62	38



Written survey

From the written survey, **half** of the respondents felt that:

- The cash flows for a project are inaccurate.
- The establishment of cash inflows was important.

From the written survey, the **majority** of the respondents felt that:

- Cash inflows are manipulated
- Cash inflows are not precisely calculated or reliable.
- Projects are evaluated at the end of the project, but no corrective action is taken

Test

The findings of the written survey as depicted in Figure 4-26 and from the international literature support hypothesis 3: "That management manipulates cash flows, to ensure a positive result, when a project is strategic of nature or if the majority of benefits are intangible in order to gain acceptance within the purely financial based evaluation criteria."

4.9 CONCLUSION

The results of the empirical study were presented in tabular and graphical form and the hypotheses were tested.

The results of the data can be summarised as follows

- Strategy does not appear to fit easily into the current capital budgeting process.
- Cadbury management (senior, middle and director) are likely to be steeped in Cadbury culture owing to long periods of service.
- Cadbury management seems to prefer using Payback when evaluating projects.
- Payback times are relatively short - 3 years or less.
- Project cash inflows are unreliable and no action is taken if proved so.
- The HOLT Evaluator is not easy to use.
- The three hypotheses all tested positive.

Chapter 5 will present the conclusions and recommendations of the research study.

CHAPTER 5

5 FINAL SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 SUMMARY OF THE MOST IMPORTANT FINDINGS FROM THE EMPIRICAL STUDIES.

The summary of the salient findings of this study is based on the facts established from the theoretical and empirical analyses. Firstly, it was established that investment decisions are amongst the most important that organisations make and that the investment analysis process has been refined to the point of being a “black box” which functions well most of the times, but when faced with certain decisions, in particular strategic decisions, the “black box” has limitations.

Firstly, from the theory, these limitations have been identified as:

- Inability to quantify the intangible.
- Use of discounted cash flow analysis (DCF) only promotes incremental type projects because of the need to analyse the analysable.
- If the future is highly uncertain then the use of discount rates and projected cash flows could be considered as highly unreliable and hence of little value.
- When a decision does not fit the “black box”, it enters the realm of executive decision-making, which is inconsistent and not well understood, with a high potential of delivery of poor decisions.
- Although DCF is academically preferred, the use of Payback is still extensive.

Secondly, alternative models to the black box do exist and follow two approaches namely:

- A management team approach, where tangible and intangible benefits are evaluated and a decision is based on this more holistic information. This approach however remains an all-or- nothing approach. Examples of this approach are the financial appraisal profile model and the Samuel, Wilkes and Brayshaw three-stage model.

- The second approach treats investment decisions as financial call options and melds analytical rigour with strategic intuition, moving away from the all-or- nothing approach to the ability to exercise options when best needed. An example of this approach is the real option evaluation model. Both of these approaches retain the use of DCF calculations.

Thirdly, Cadbury South Africa in utilising a model for investment decision-making based on the "black box" model, suffers from the identified limitations of the "black box" model and risk is poorly addressed.

The limitations of the Cadbury "black box" model specifically are:

- The manipulation of inputs into the model to incorporate strategic projects.
- Almost exclusive use of Payback by decision-makers.
- Strategic decisions are made by the poor and highly subjective executive decision-making process.
- Inability to accurately capture intangible benefits.

5.1.1 Strategy

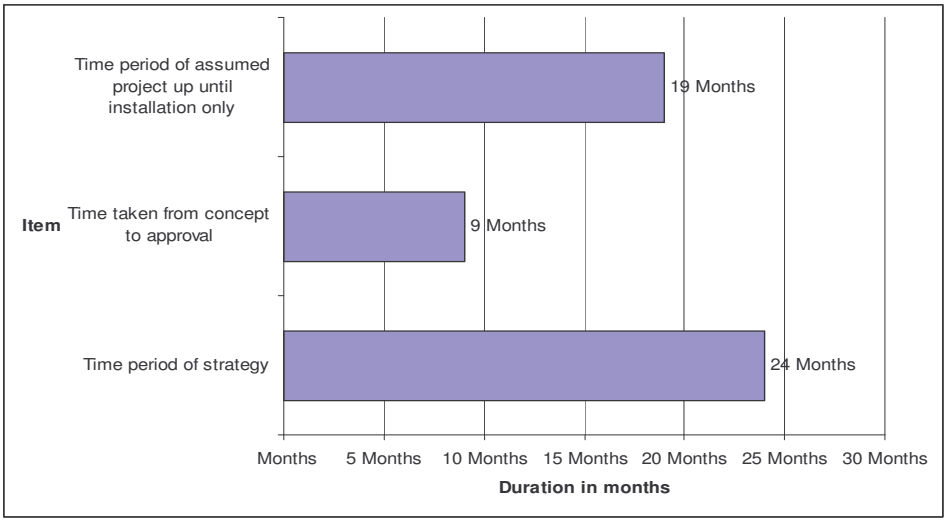
Strategic factors of an investment are invariably those factors that cannot be valued in financial terms and are usually left out of the financial appraisal calculation. These strategic factors, however, influence the long-term performance of an organisation and include, manufacturing flexibility, creating a competitive advantage, the ability to respond positively to customer needs and environmental issues. The main problem of this research was around the incorporation of these strategic factors into the capital investment procedure.

The secondary data, in particular Johnson and Scholes (2002: 10), define strategy as: " The direction and scope of an organisation over the **long term,** which achieves advantage for the organisation through its configuration of resources within a changing environment and to fulfil stakeholder expectation."

It is interesting to note that the term **long term** that is referred to by Johnson and Scholes (2002: 10) seems to be two years within the Cadbury organisation. This appears at odds with the time of 9 months that it takes from conception to approval, which is 38 per cent of the total time of a strategy as perceived by the decision-makers.

If it were assumed that most manufacturers of confectionery machinery require 6 months to manufacture and, if sea- freighted, a further month is allowed for delivery, then before the machine is installed and commissioned, 67% of the available strategic time would have already elapsed. The assumed project is compared to strategy time and approval time in Figure 5-1. The time of two years may be considered strategic due to the influence of another factor. This factor could be due to the almost exclusive use of Payback (79%) by Cadbury decision-makers (directors, senior and middle managers) and that the Payback acceptance criterion is set at two to three years, making two years a figure that will guarantee project acceptance.

Figure 5-1: Comparison of strategy to assumed project



Source: Author's own construction

5.1.2 Payback

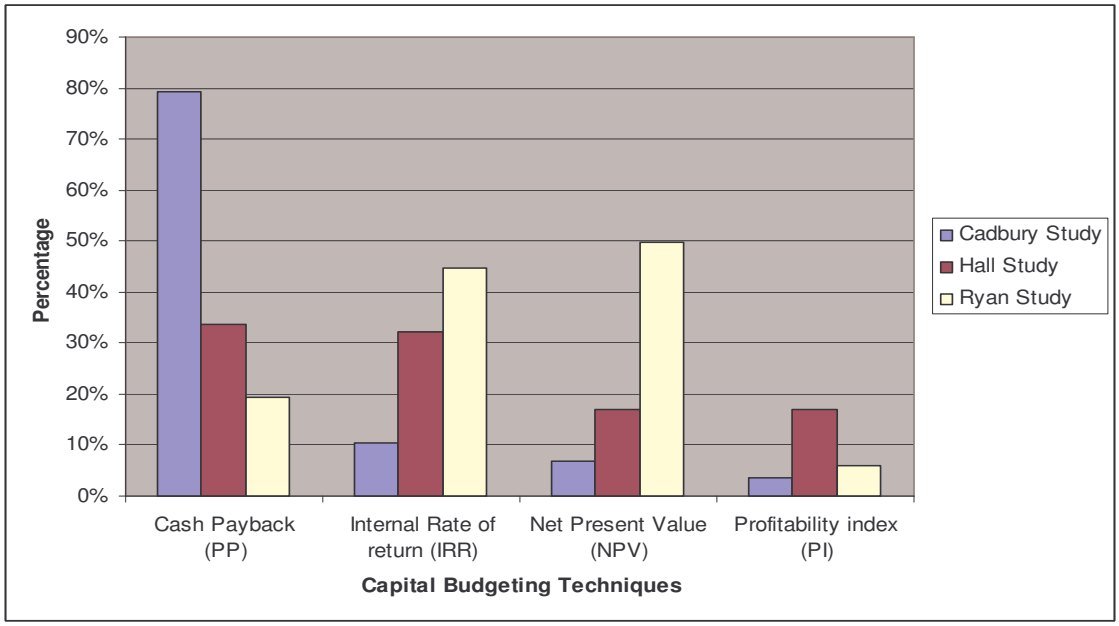
Payback, although slated by academia as being unsophisticated, naïve, or inferior, does provide information regarding the liquidity of a project and how long it will take to recover a project's initial cost. It also gives an indication of time risk (The uncertainty of estimating future cash flows increases with time, the longer a project's life the greater the difficulty in estimating cash flows in the later years. This uncertainty in itself creates a risk that the ultimate benefits expected from a project may not materialise in that the longer the Payback period, the greater the time risk involved. Payback is not necessarily wrong - just one-dimensional in the information it provides.

In South Africa another study, Hall (1998:13) also found that Payback (33.8%) was the most popular tool followed by IRR (32.3%). As previously referred to in chapter 2, table 2.3.6.2-2, Ryan (2002:12) found in her comparative results of prior studies that Pike (1996), in his review of large UK companies, found the most popular capital budgeting tool to be Payback.

A USA study by Scapens, Sale & Tikkas (Lumby, 1991: 492) found that discounted cash flow (DCF) techniques generally were more generally used in the USA than in the UK. They found that in their sample 84 per cent of USA companies used DCF techniques, as opposed to only 54 per cent in the UK. This indicates that there is a difference between UK and USA organisations in the use of evaluation techniques. The UK organisations favour Payback and the USA organisations favour DCF.

The results above have been combined with the Cadbury results in Figure 5-2. It appears that Cadbury decision-makers place greater importance on Payback than the other studies indicate. The difference between European organisations and American organisations in this use of discounted cash flow techniques and Payback is captured by the Cadbury/ Hall study and the Ryan study.

Figure 5-2: Comparison of Capital budgeting technique use from different studies.



Source: Author's own construction

Cadbury, as a UK company, where 79 per cent of its managers prefer to use Payback appears to be within expectation. This is, however, higher than what previous studies have found where the difference between IRR and Payback was close.

Graham and Harvey (2001: 193) found in their research of capital budgeting practice that Payback was more likely to be used by older managers and managers with long tenure as well as managers without Masters in Business administration (MBA) qualifications. This prior research supports the author's findings that the Cadbury managers with the greatest preference for Payback are those with an average service of 13 years and who probably do not have MBA's (only three respondents out of the 29 possessed an MBA). Payback according to academics is used by organisations that are capital constrained. The findings of Graham and Harvey (2001:193) and this study suggest, however, that lack of sophistication is the real reason.

5.1.3 Current Cadbury schemes for incorporating strategy

In order to facilitate strategic factors within the confines of the "black box model" and the purely financial approval process, Cadbury managers appear to be manipulating the inputs into the model.

This manipulation is taking the form of adjusting derived benefits and altering the spending of the project. The practice, of altering spending could create a possibility of delivering projects of poor quality.

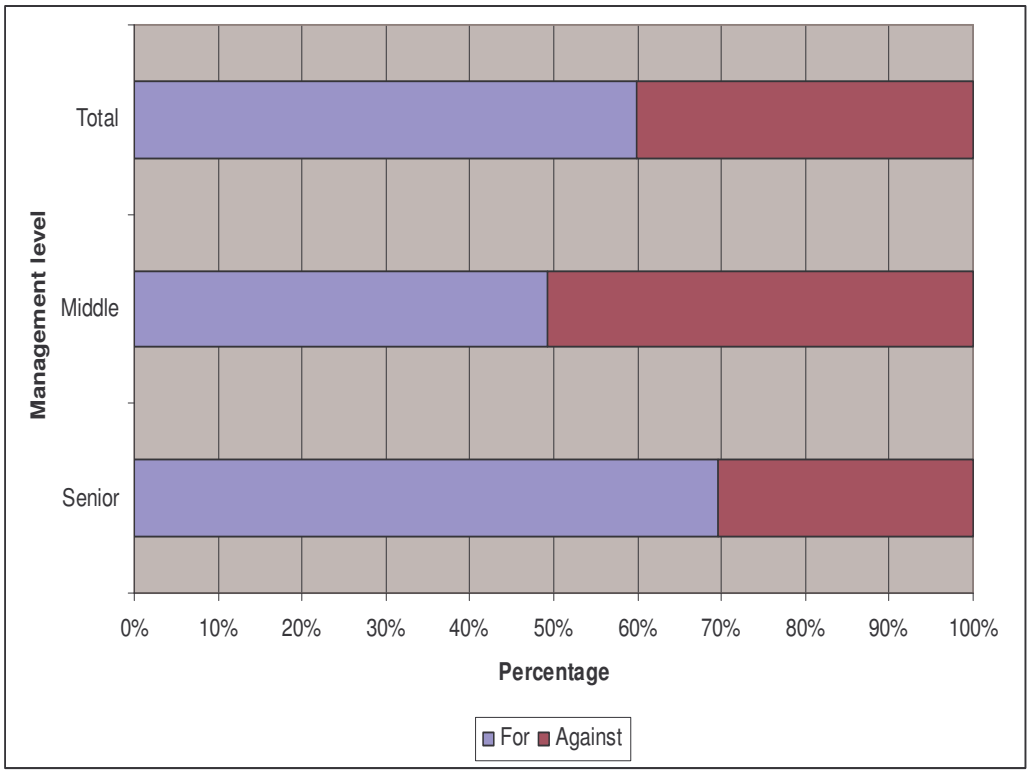
It would appear though, that the decision-makers are aware of this manipulation and are doubtful of cash inflows. Because no corrective action is taken, this manipulation is excused and used as a mechanism to get strategic projects approved.

This practice appears to be feeding itself, as strategy that is incorporated in this manner leads to the belief that the process is effective. Although evaluation is done, there are no consequences and poorly performing strategic projects are in a sense "hidden". A further compounding factor is the extensive use of lobbying of projects that creates the opening for "politically strong" managers to

spotlight their preferred investments to the detriment of better projects. The use of a "supply chain meeting" where capexes are approved in a nominal group technique (see section 5.2.2 below) adds to the possibility that "politically strong" managers can sway the meeting in favour of a particular investment.

The largest supporters of this practice are the senior managers. Middle managers appear to be equally divided and directors were excluded because of the small sample size. Figure 5-3 represents the basis on which this conclusion was based and was derived from the responses to the questions dealing with hypothesis three " That management manipulates cash flows to ensure a positive result when a project is strategic of nature or if the benefits are intangible in order to gain acceptance within the purely financial based evaluation criteria". Figure 5-3 clearly indicates that senior managers are the largest propagators of the current manipulation process.

Figure 5-3: Management support of manipulation



Source: Author's own construction

5.1.4 Risk

From the secondary data, current risk models may be conveniently divided into those that aim at identifying the level of risk and those that, in some way, consider risk. Identification of project risk is usually achieved by analysing the financial data through the measurement of its sensitivity to variations and by determining a project's Payback period. Sensitivity analysis, simulation and decision tree analysis are all models that show the identification of risk as an influence on the financial data of a project. Risk is then taken into account through an adjustment within the financial appraisal model used by either reducing the required Payback period in line with the perceived increase in risk or with respect to the DCF models, arbitrarily increasing the hurdle rate. This subjective approach to risk is contrary to financial theory, which argues that systematic and possibly unsystematic risk should be taken into account through the cost of capital (from which the discount rate is determined). In directly addressing risk, the secondary data refers to the capital asset pricing model (CAPM) and the weighted average cost of capital (WACC).

Cadbury utilises WACC (weighted average cost of capital) as its method of risk inclusion into its financial appraisal process and the setting of a hurdle rate.

These are fixed irrespective of the project size and risk profiles -the building of a bicycle shed or a completely new facility all have to meet and use the same discount factor and hurdle rate. The decision-makers are, however, aware of the fact that risk profiles are different and can be varied, hence it can be assumed that this is included in the calculation of the benefits as the RAM does not allow for different risk profiles, once again hiding the true effects.

5.2 RECOMMENDATIONS

In this section, the characteristics of an ideal financial appraisal model, as well as decision-making process are discussed and recommendations on the choice of a model and implementation at Cadbury are made.

5.2.1 Required Characteristics of a financial decision-making model

From the literature and empirical research it can be concluded that strategic benefits, although important, are one aspect of a three-dimensional investment profile and deserve equal consideration with the financial and risk aspects.

To incorporate strategy successfully a model that treats strategic benefits as a separate issue to financial appraisal and attempts to evaluate them in some other way is needed. This model should show the following aspects:

- The incorporation of an orderly process to the finding of key strategic benefits in each capital investment.
- The analysis and putting of value to the benefits, in order to highlight their respective importance.

The key to unlocking of the most value of an organisation will only occur if the model used can treat strategy as mentioned above as well as have the ability to take the other dimensions of finance and risk into account. The model should, however, be practical to use and adaptive to changing environments.

It would be naïve to assume that such a model will deliver faultless results, unless the users effectively utilise it. If the old saying, ‘the tool is only as good as the person who uses it’, is used as an analogy then attention should also be placed on the decision-makers who should have the same dimensional ability as the model.

5.2.2 Required decision-making

If the model described above is to be utilised effectively then the decision-makers, need to alter their approach. The approach, like the model, needs to be multi-disciplinary. The model described above has both subjective and judgemental aspects that will require the views of managers to be expressed. The model by nature of its multi-dimensions will require a group or management team approach. Three generally accepted models of determining consensus or near consensus opinion are: (Schultz, 2003: 175).

1. **Nominal group technique** where managers meet, exchange their views and come up with a group judgemental value. The idea is that discussion will take place until all managers are convinced to accept a single consensus value through argument and persuasion. The danger of this approach is that individual managers may be influenced by dominant group members and an individual's view will not be recorded (Schultz, 2003:175).
2. **Pooling of individual values model** where managers are asked individually to supply their judgemental values. These values are then combined in some way to arrive at a single value. Under this approach, which is not reiterative, large variances in the judgemental values are produced (Schultz, 2003:175).
3. **The Delphi model** where individual managers (experts), who form the Delphi panel, are asked to supply their own judgmental values, opinions and assumptions on certain issues. The responses obtained from the initial request are then reviewed by a group facilitator and feedback is given to managers for their further consideration and evaluation until a near consensus value is reached- usually using some kind of weighted average approach. Unlike the nominal group technique, methods other than face-to-face group discussions are used. The Delphi model is especially suited to intuitive judgements. In this approach, model managers never meet to discuss their individual views but interact through a group facilitator using the media of telephone, written statements or questionnaires. Responses are thus anonymous. This addresses the danger of the nominal group technique as dominant or "political" factors are removed (Schultz, 2003:175).

Cadbury currently utilises the nominal group technique for its decision-making process and the high incidence (93%) of lobbying, indicates that the group is manipulated by managers to achieve approval of their preferred projects.

The Delphi model would be better able to deliver investments more aligned with strategy by removing the "political" influence of managers.

5.2.3 Current Cadbury decision model

The model currently in use by Cadbury is based on the "black box" model described in chapter 2. This model consists of the following aspects.

5.2.3.1 Characteristics of current model

1. It is based on purely financial evaluation with only the following measures displayed on the forms:
    a. Cash Payback must be under three years.
    b. IRR must be greater than 25 per cent.
    c. Profitability Index must be greater than 100 per cent.
    d. The above hurdles remain fixed irrespective of the size, value, and duration of the project.
2. WACC is used to calculate the discount rate and remains fixed, irrespective of project size or risk profile.
3. A dedicated computer program HOLT Evaluator is used to calculate the three financial criteria.
4. Project duration is fixed at 10 years.
5. Project benefits are assumed correct and entered into the HOLT Evaluator.
6. Should a project not meet the requirements, a detailed report is needed to justify why it should be accepted

5.2.3.2 Current Decision process

All capexes completed are first evaluated by a capex compiler who checks if basic format meets the requirement of the Cadbury manual and then by the financial department who check the calculations of the benefits. These capexes are then submitted to a supply chain meeting where they have to be signed by various sections of the supply chain. If accepted, they are submitted to the board for final approval, depending on value they are either submitted to regional, group, and finally main board, where a similar process as described

above occurs for each approval level. The supply chain meeting members are mainly senior management.

5.2.4 Recommended implementation strategy

From the empirical evidence, it is apparent that Cadbury decision-makers are locked into a particular way of performing capex evaluations and that this not an ideal situation. The group responsible for the *status quo* are the senior managers within the business. The recommendation is based on the following assumptions and limitations:

- It is unlikely that there will be a large influx of new senior managers.
- A very different approach to capex evaluation will not easily find favour, due to an old and established culture.
- Any implementation of a new model will take time.
- The current decision-making process will have to be adapted to suit the situation.
- The HOLT Evaluator will have to remain a key component.
- Large disruption of the current process is not recommended as it could affect the organisation's profitability because of potential non-acceptance of capital proposals.

If these limitations and assumptions are taken into account, then of the available alternative models the Real Option model can be eliminated immediately as its whole approach is too divergent from the current process (highlighted in Table 5.2-1) and it is unlikely to gain immediate acceptance and use. The model should, however, be introduced to the decision-makers, to allow acceptance to grow slowly.

Table 5.2-1: Difference between Real Option and current process

Current	Real options
Uses standard DCF calculations	Uses complex option maths
All-or-nothing acceptance	Staged, option approach.
Preference for use of Payback	Payback not calculated or used
Relatively unsophisticated decision-makers required	Sophisticated decision-makers required who understand option mathematics and identifying options.

Source: Author's own construction

The financial appraisal profile model meets the characteristics described above, and incorporates the three-dimensions of strategy, finance and risk well. It does have certain characteristics in common with the current model. The differences are again too large, (highlighted in Table 5.2-2) requiring too large an alteration to the existing process to gain widespread acceptance and utilisation.

Table 5.2-2: Difference between Financial Appraisal Profile and current process

Current	**Financial Appraisal Profile**
Uses standard DCF calculations	Uses modified DCF calculations, in particular NPVP
All –or- nothing acceptance	All- or- nothing acceptance
Preference to use of Payback	Variation of Payback calculated
Relatively unsophisticated decision-makers required	Relatively unsophisticated decision-makers required.
Risk fixed	Unique risk calculated for each project.
Strategy not directly addressed	Strategic index calculated.

Source: Author's own construction

5.2.4.1 Recommended model

The recommended model is the Samuels, Wilkes and Brayshaw three-stage model as it has the most similarities with the current process, as well as with the ideal and can easily be added onto the existing process but will enhance strategic decision-making. Table 5.2-3 indicates the similarities.

To refresh, the Samuels, Wilkes and Brayshaw 3 stage model (now referred to as the 3 stage model) first evaluates whether an investment is aligned with strategy, if not, it is rejected. Stage 2 consists of financial evaluation, which can use NPV or the other DCF calculations. A difference is that only tangible benefits need to be included and the discount rate can be obtained from judgement and estimation. If the outcome is positive then the project is accepted. Should the outcome be negative then the value of agreed intangible benefits are weighed against the shortfall in NPV.

Two methods can be used; a point system where intangible benefits are listed and a panel of experts (Delphi model) assign point scores to each benefit; or the discount factor is lowered if the intangible benefits value can be demonstrated (Refer to section 2.5.3.3).

Table 5.2-3: Similarities between Samuels, Wilkes and Brayshaw 3 stage model, current, and ideal.

Current	Samuels, Wilkes and Brayshaw three stage model	Ideal
Uses standard DCF calculations	Uses standard DCF calculations	Addresses financial, DCF preferred.
All- or- nothing acceptance	All- or- nothing acceptance	No preference
Preference to use of Payback	Standard Payback can be calculated	Payback not overriding factor, but another indicator.
Relatively unsophisticated decision-makers required.	Relatively unsophisticated decision-makers required.	Process needs to generate answers that can be effectively evaluated by all types of decision-makers.
Risk fixed	Risk fixed or varied with permission	Risk needs to match investment
Strategy not directly addressed	Strategy directly addressed.	Strategy needs to be included

Source: Author's own construction

The major benefits of the 3-stage model are that it can be included into the existing process and removes the "hidden" aspects of the old process.

5.2.5 Proposed process

The proposed process is that all projects are listed with a short description. The list is submitted to the supply chain meeting where the projects are accepted or rejected on strategic basis only. On completion of this stage, the remaining projects undergo stage two where the projects can be evaluated using the HOLT evaluator and the financially acceptable are forwarded to the directors for final acceptance.

The financially unacceptable then undergo stage 3 where the intangible benefits are listed and evaluated, using the Delphi model and are finally submitted to the supply chain meeting for acceptance.

The process described above, utilising the three-stage model, should address the following limitations of the old process and “black box” model:

- Inability to quantify the intangible. (Intangible included in stage 3)
- Use of discounted cash flow analysis (DCF) only promotes incremental type projects due to the need to analyse the analysable. (Strategic projects can be included by all projects first being accepted on strategy, as well as the inclusion of intangible benefits)
- If the future is highly uncertain then the use of discount rates and projected cash flows could be considered as highly unreliable and hence of little value. (Discount rate can be adapted)
- When a decision does not fit the “black box”, it enters the realm of executive decision-making, which is inconsistent and not well understood, with a high potential of delivery of poor decisions. (The use of the Delphi model and removal of the need to manipulate cash flows to fit into purely financial evaluation.)
- Although DCF is academically preferred, the use of Payback is still extensive. (Reliance on Payback removed)

The specific Cadbury limitations are addressed as follows.

- The manipulation of inputs into the model to incorporate strategic projects. (The need to do so is removed as the suggested process incorporates strategy)
- Almost exclusive use of Payback by decision-makers. (Process indifferent)
- Strategic decisions are made by the poor and highly subjective executive decision-making process. (The use of the Delphi model and removal of the need to manipulate cash flows to fit into purely financial evaluation.)
- Inability to capture intangible benefits accurately. (Intangible included in stage 3)

The recommended process meets the imposed assumptions and limitations as indicated below:

- It is unlikely that there will be a large influx of new senior managers. (The process is not reliant on a completely new approach and will not effect existing managers negatively)
- A very different approach to capex evaluation will not easily find favour, due to an old and established culture. (The proposed model is very similar to the existing process - it enhances rather than replaces)
- Any implementation of a new model will take time. (The process is not time dependent and lends itself to slow implementation)
- The current decision-making process will have to be adapted to suit the situation. (The proposed model enhances rather than replaces).
- The HOLT evaluator will have to remain a key component. (This component remains)
- Large disruption of the current process is not recommended as it could affect the organisation's profitability, owing to potential non-acceptance of capital proposals. (The proposed model does not disrupt)

Based on the above, the 3-stage model and suggested process are recommended as an alternative to the existing Cadbury model and process.

5.3 RECOMMENDATIONS FOR FURTHER RESEARCH

During the theoretical and empirical analysis the following where identified by the researcher as possible areas requiring further research:

- Investigate what effect affirmative action is having on promotion levels within the Cadbury organisation. This is based on the relative small age gap between the management levels. The UK respondents were removed and the average age for middle managers is 40, for senior managers, 48 and for directors, 42. This could indicate that there is little movement through the ranks as natural promotion is curtailed.
- Investigate how many of the approved projects actually deliver the expected benefits.
- Investigate what should be done if projects do not deliver expected benefits.
- Investigate the nature of Cadbury culture.
- Investigate the nature and source of managers' "political power".

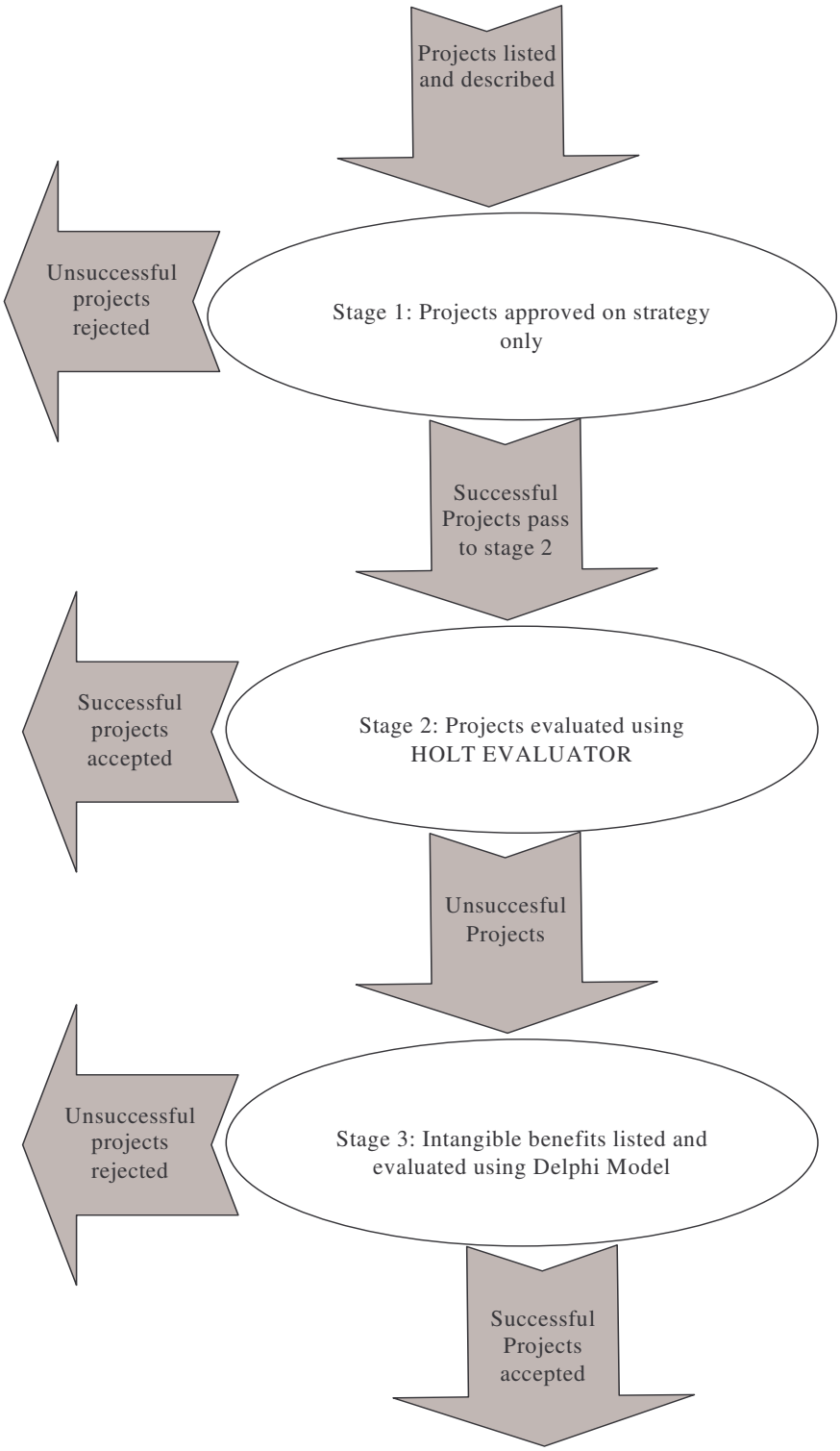
5.4 CONCLUSION

It is clear from the study that capital investment decision-making is a complex and multi-dimensional topic and that it assists an organisation in creating value. Furthermore, strategy is difficult to incorporate into capital investment decision-making and the study identified models that can be used to achieve this incorporation.

The study found that Cadbury does not effectively include strategy in its capital investment process and that its decision-makers, manipulate the process to include strategy.

An alternative model and process were identified and developed for Cadbury to use to further ensure its success. This model and process, is represented by Diagram 12 below.

Diagram 12: Proposed model for Cadbury



Source: Author's own construction

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ANNEXURE A: HOW TO USE THE BLACK-SCHOLES OPTION PRICING MODEL

Source: Adapted from Mauboussin (1999:27)

Before Fisher Black and Myron Scholes developed their model in 1973, economists had tried for years to develop satisfactory models to price options. In part, these would-be Nobel Prize winners were obstructed by the lack of advanced mathematics in classical economics training. Fortunately, one does not need to know how to derive the Black-Scholes model to use it. To understand what value drivers make options valuable is not linked to knowledge of the Black-Scholes formula.

In this Annexure, the generalized Black-Scholes formula is presented, leaving the derivation of the equation to option textbooks. Following this presentation, the formula is applied to a sample option.

The Black-Scholes Formula

The Black-Scholes formula values a European call or put option as follows:

$$\text{Value of Call} = S\,e^{(b-r)T}N(d_1) - X\,e^{-rT}\,N(d_2)$$

$$\text{Value of Put} = -S\,e^{(b-r)T}N(-d_1) + X\,e^{-rT}\,N(-d_2)$$

where:

- S is the stock price of the underlying stock. If we expect the stock to pay specific dividends before the option expires, we should subtract the present value of those dividends from the stock price and use this "adjusted stock price" as the relevant input for this equation.
- X is the exercise, or strike, price of the option.
- r is the risk-free rate.
- b is the "cost of carry," defined as risk-free rate minus the dividend yield (q).
- T is the expected life of the option in years.
- σ^2 is the variance of the underlying security.
- $d_1 = \dfrac{\ln\left(\frac{S}{X}\right) + \left(b + \frac{\sigma^2}{2}\right)T}{\sqrt{T}}$
- $d_2 = d_1 - \sqrt{T}$

To use the Black-Scholes method, the properties of an option are entered into the appropriate formula. For example, if a call option has the following properties:

Note that while the option can be immediately exercised for a gain of R 10 – by

- The underlying security is worth R50 (S = R50).
- The exercise price is R40 (X = R40).
- The risk-free rate is 5% (r = 0.05).
- The dividend yield is 3% (q = 0.03).
- The "cost of carry" is 2% (b = r – q = 0.05 - 0.03 = 0.02).
- The option has a maturity of five years (T = 5).
- The volatility (σ) of the underlying stock is 30% (σ = 0.3).
- e is a constant equal to 2.7183.

We can then calculate the Black-Scholes value of this option:

$$d_1 = \frac{\ln(\frac{50}{40}) + (0.02 + \frac{0.3^2}{2})5}{0.3\sqrt{5}} = \frac{\ln(1.25) + 0.3250}{0.6708} = \frac{0.2231 + 0.3250}{0.6708} = 0.8171$$

$$d_2 = d_1 - \sqrt{T} = 0.8171 - 0.3\sqrt{5} = 0.8171 - 0.6708 = 0.1463$$

$$N(d_1) = N(0.8171) = 0.7931$$

$$N(d_2) = N(0.1463) = 0.5582$$

$$\text{Value of Call} = 50\,e^{(0.02-0.05)5}\,0.7931 - 40\,e^{-0.05\,5}\,0.5582 = 34.13 - 17.39 = R16.74$$

paying R 40 to exercise an option and receiving a share worth R 50 – the option will trade in the market place at R 16.74 this higher value comes from the "time value" of the option, that is, from the possibility that the stock may be worth even more than R 50 before the option expires in five years (Mauboussin, 1999:27).

ANNEXURE B: THE MATHEMATICS BEHIND THE BINOMIAL MODEL

Source: Adapted from Mauboussin (1999:29)

In its simplest form, the binomial model describes the process of price movements where the asset value, in any period, can move to one of two possible prices with associated probabilities. The model is based on a replicating portfolio that combines risk-free borrowing (lending) with the underlying asset to create the same cash flows as the option. As there is rarely a market-priced underlying asset in real options valuation, it is important to be careful to maintain as much of a financial market link as possible.

Here is a simple example. We value a European call option with a strike price of R50, expected to expire in two periods, on an underlying asset of R50, which is expected to follow a binomial process. We assume a 5 per cent risk-free rate.

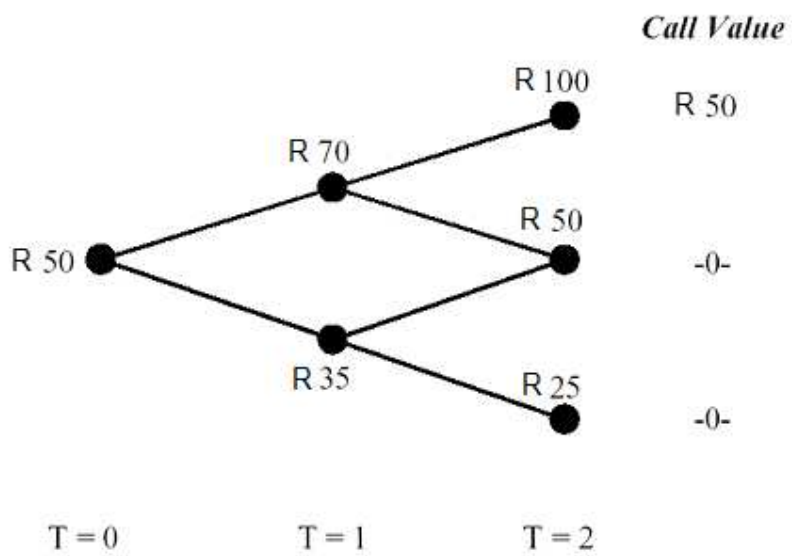
Value of call option = (current value of asset) **x** (option Δ) – (borrowing needed to replicate the option call value)

Where:

Δ = number of shares in replicating portfolio
B = amount of borrowing in replicating portfolio

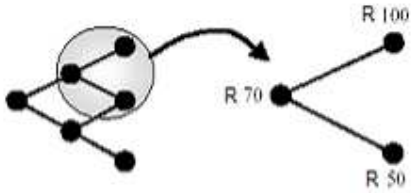
The problem can be diagrammed as follows. (See Diagram 13) The actual valuation can be done in three steps.

Diagram 13: Valuing a call option with a Binomial Model



Step 1: Start by valuing the end nodes

A.



Call Value

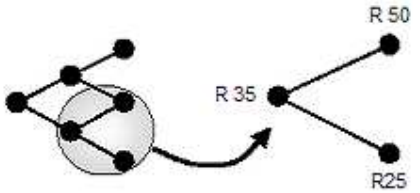
R 50 (R 100 x Δ) – (1.05 x B) = R 50

-0- (R50 x Δ) – (1.05 x B) = R 0

B =
Δ = 1

Call option = (R70 x 1) – R 47.60 = **R 22.40**

B.



Call Value

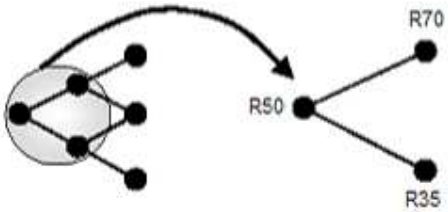
R0 (R50 x Δ) – (1.05 x B) = R0

R0 (R25 x Δ) – (1.05 x B) = R0

B = R0
Δ = 0

Call option = (R35 x 0) – R0 = **R0**

Step 2: Move backward to the previous node and recalculate



Call Value

R25 (R70 x Δ) – (1.05 x B) = R22.40

R0 (R35 x Δ) – (1.05 x B) = R0

B = R21.33
Δ = .64

Step 3: Value the call

Value of the call = (R50 x 0.64) – R21.33 = <u>R10.67</u>

ANNEXURE C: USING THE FINANCIAL APPRAISAL MODEL

Source: Adapted from Limes Consultancy (2003:4)

Better Bet Inc. is considering the purchase of new manufacturing equipment costing R 628,500. This equipment is expected to change the working practices of its manufacturing department. This will help the company to render better customer satisfaction. The company will gain a competitive advantage over its rivals through this equipment (Flexibility) by being able to offer a continuous supply of customised products. The installation of this equipment and revised working practices will help the company to decrease its overall noise and dust extraction levels and reduce its weekend operations. The cash flows that are associated with this machine are in the range R 250,00 and the cost of capital is 9 per cent p.a. The machine has a useful life of 10 years.

NPVP calculation				
Capital cost R 628,500.00				
	Net cash Inflows from project			
Year	**Net cash Inflows**	**Discount factor 9 %**	**PV of Net Cash inflows**	**Cum PV of net cash Inflows**
1	250000	0.9174	229350	229350
2	250000	0.8417	210425	439775
3	250000	0.7722	193050	632825
4	250000	0.7084	177100	809925
5	250000	0.6499	162475	972400
6	250000	0.5963	149075	1121475
7	250000	0.547	136750	1258225
8	250000	0.5019	125475	1383700
9	250000	0.4604	115100	1498800
10	250000	0.4224	105600	1604400
Totals	2500000		1604400	

Calculations:

NPV= (PV of net cash inflows - capital cost of project)

.= R 1604400- R 628500 = **R 975,900.00**

DPP=[2 + (R188725/R193050)] = **2.98** years

DPPI = (PV of net cash inflows/ capital cost of project)

.=R 1604400/ R 628500= **2.55**

MGR = [(DPPI)^1/n - 1] x 100 = [(2.55)^1/10-1]x 100= **9.82%**

ANNEXURE D: QUESTIONNAIRE DEVELOPMENT

ANNEXURE E: QUESTIONNAIRE

Instructions

Please take the time to answer these questions truthfully. Where there are boxes tick the answer that best applies and **type** your answers in the spaces provided. On completion, please save the document and email to brendan.wilson@csplc.com. Your answers will be treated as confidential.

Demographics

1) Position/ job title: _____

2) Length of service with Cadbury: _____

3) Age: _____

4) Gender: _____

5) Highest level of education obtained: _____

6) No. Of projects evaluated on average per annum: _____

7) Level in the organisation: _____

Questions

1) The current RAM policy and process adequately addresses strategic driven CAPEX.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

2) Do you know what the organisation's strategy is?

Yes ☐	No ☐

3) How soon should a project pay for itself?

1-3 Years☐	3-5 years☐	5-10 years☐

4) Can projects be approved on strategy only?

Yes ☐	No ☐

5) Which key financial performance indicator do you examine first?

PI ☐	IRR ☐	NPV ☐	Cash Payback ☐	Other☐

If other please comment on which and why

_____

6) Are the predicted cash flows for a project accurate?

Yes ☐	No ☐

If no please comment on why not!

_____

7) Are the cash flows sometimes manipulated to meet acceptable financial measures/ratios?

Yes ☐	No ☐

If yes, what do you think is done?

_____

8) How long should a financial decision take?

1 - 2 weeks ☐	1 month ☐	More than a month ☐

9) Project proposals originate from?

Shop Floor ☐	Junior managers ☐	Middle managers ☐	Senior managers ☐	Directors ☐	Consultants ☐

10) Only financial indicators should be used for project evaluation.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

11) Can all benefits from a project be translated to financial benefits?

Yes ☐	No ☐

If yes please comment on how

_____

12) How well do you understand IRR.

Not at all ☐	Vaguely ☐	Working knowledge ☐	Thoroughly ☐

13) Does lobbying of projects occur?

Yes ☐	No ☐

14) To get a project approved the following may be altered.

Project spend ☐	Risk factor ☐	Cash inflows ☐	Other ☐

If other please comment on what

_____

15) Is capital investment decision-making an exact science?

Yes ☐	No ☐

If yes why?

_____

16) Have you heard of the real option model with regards to capital investment?

Yes ☐	No ☐

17) In your experience what is the average time that a project takes from conception to approval?

_____

18) Projects are only acceptable if they show cash inflow.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

19) Payback is the easiest of financial indicators to understand and use.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

20) To replace equipment with the same technology is better than introducing new technology.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

21) Intangible benefits are not quantifiable.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

22) Is the HOLT Evaluator easy to use?

Yes ☐	No ☐

23) How long do you spend analysing the RAM before signing? _____

24) How well do you understand PI?

Not at all ☐	Vaguely ☐	Working knowledge ☐	Thoroughly ☐

25) Project cash inflows are precisely calculated and are reliable.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

26) More time should be spent on getting accurate investment costs than, establishing cash inflows.

Strongly disagree ☐	Disagree ☐	Agree ☐	Strongly Agree ☐

27) Should different project types have different discount factors?

Yes ☐	No ☐

28) What is the time period of strategic driven decisions? _____

29) How well do you understand Payback?

Not at all ☐	Vaguely ☐	Working knowledge ☐	Thoroughly ☐

30) Have you ever-manipulated cash flows to get a project to fit the financial indicators.

Yes ☐	No ☐

If yes what were your reasons

_____

31) Have you heard of the Financial Appraisal Model with regard to capital investment?

Yes ☐	No ☐

32) Are post implementation evaluations done on completed projects with regard to expected financial benefits?

Yes ☐	No ☐

33) How soon after the project is the post evaluation done?

1 Year ☐	2 years ☐	5 years ☐	10 years☐

34) What corrective actions are taken if predicted financial benefits for a project are not realized.

_____

35) How well do you understand NPV?

Not at all ☐	Vaguely ☐	Working knowledge ☐	Thoroughly☐

Thank you for your time!

ANNEXURE F: COVERING LETTER

27 October 2005

Survey on the capital budgeting process

Dear Colleague,

I am currently engaged in post-graduate studies, the topic of my study being "Developing a decision-making model that best closes the gap between strategy and the capital investment procedure for Cadbury South Africa"

The main purpose of the survey is to evaluate how the current capital budgeting process addresses strategy. For this purpose, a number of respondents, including you have been selected to participate in the survey.

As a result of your involvement in and experience with the current capital budgeting process, your views and opinions concerning existing practices will be of major importance, not only in respect of this study but also as a further contribution to the improvement of the capital budgeting process.

Enclosed, please find the questionnaire. It would be greatly appreciated if you could spare a few moments of your valuable time to contribute to the study by completing the questionnaire and returning it to me by e-mail, not later than **10 November 2005.**

All data obtained will be treated in the strictest confidence and the findings of the study will be made available on request to participants after completion of the study.

Should you require any further information concerning the study as a whole or this survey in particular, please do not hesitate to contact me at:

Telephone: **041 392 2256 (Work)**
041 3609735 (Home)
072 2008482 (Cell)
e-mail: brendan.wilson@csplc.com

Thank you for your time and willingness to participate.

Yours sincerely

Brendan Wilson

(MBA student)

6 ANNEXURE G: LETTER FROM PROMOTER

Nelson Mandela Metropolitan University

for tomorrow

NMMU Business School

Second Avenue Campus

P O Box 77000.

Port Elizabeth. 6031

Tel. +27 (0)41 5043736

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27 October 2005

TO WHOM IT MAY CONCERN

I have pleasure in introducing Mr Brendan Wilson to you. He is currently a master's student in this department and is far advanced in his research towards a master's degree in business administration. His research topic is in the realm of Project Management and the title of his thesis is "Developing a decision-making model that best closes the gap between strategy and the capital investment procedure for Cadbury South Africa"

He has virtually completed the literature survey for the thesis and now needs to collect data from samples of respondents within the Cadbury Organisation. This data is of cardinal importance for the success of the project and he has constructed a questionnaire as a collection instrument.

It is hoped that, once the study has been completed, the findings will be able to contribute significantly to the theory and practice of evaluating projects in an increasingly turbulent environment.

As Mr Wilson's promoter for his master's research, I would like to appeal to you to please assist him in his data collection by completing and returning his questionnaire. By devoting a little of your valuable time to this research, you will be making an important contribution to an expansion of knowledge in an increasingly important field of management.

I thank you in anticipation.

Yours sincerely

Dr Shaun Krause