Capital Budgeting Practices: A South African Perspective

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by

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EXECUTIVE SUMMARY
Capital budgeting is an important decision company managers have to make in order to maximize shareholder value. This is also of paramount importance especially to South Africa mines due to their involvement in large projects which are capital intensive in nature. The main aim of this research was to find out the kind of methods commonly used in practice by mining companies in South Africa in making capital budgeting decisions taking into consideration the firm and decision maker’s characteristics and their influence on the method selected, and to find the best capital budgeting methods for South African mining companies to be used in different situations. The study only focused on mines which are listed on the Johannesburg Securities Exchange (JSE).

The research was structured in two different stages: literature research and a survey. In the first case, the information gathered provides detailed information about the literature on capital budgeting which enhances the understanding of the topic at hand. The literature looked at the importance of capital budgeting to organisations, the capital budgeting process and the techniques available which managers can make use of when evaluating their projects. The advantages and disadvantages of these techniques were highlighted. The second stage of the research includes a survey where data was collected by use of questionnaires and face to face interviews. This was done so as to get the information about the capital budgeting techniques commonly used in practice by South African mines in evaluating their major projects and the reasons behind the use of these methods.

The results of the literature study has shown that companies can make use of the Net Present Value (NPV), Internal Rate of Return (IRR) Payback Period (PB), Profitability Index (PI), Discounted Payback Period (DPB), Accounting Rate of Return (ARR) and the Real Option when evaluating their projects. In the appraisal of capital investment projects, South African mines seem to prefer the NPV, IRR and PB as methods to decide the viability of a project. NPV was seen to be the most popular technique among this industry. Previous South African research on this topic indicated a
preference for IRR as a capital budgeting method used over the NPV. The main reasons for the use of these methods in this study were as follows: NPV is used because it accurately takes into account the time value of money and adjust for risk factors. The method is in line with the company policy. IRR is used because it takes into consideration the time value of money and the method indicates the actual return of each project and it is a good device for ranking projects. PB is used due to the fact that it is easy to calculate and understand.

It has been recommended that (FOs) should make use of the PI, DPB and NPV frequently when evaluating their projects which have been proved to be the best techniques according to literature. Also, modern techniques such as the Real Option should be used when making decisions on whether to continue with the project or abandon the project.

**Key words:** Capital budgeting; Investment appraisal; Capital budgeting practices; Profitability Index; Discounted Payback Period; Net Present Value; Internal Rate of Return; Accounting Rate of Return; Payback Period; Real Option; South Africa; Financial Officers.
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LIST OF ACRONYMS

ARR - Accounting Rate of Return
CA - Chartered Accountant
CFO - Chief Financial Officer
DCF - Discounted Cash flow
DPB - Discounted Payback Period
ERR - Economic Rate of Return
FO - Finance Officer
GDP - Gross Domestic Product
IFAC - International Federation of Accountants
IRR - Internal Rate of Return
IT - Information technology
JSE - Johannesburg Securities Exchange
MBA - Masters in Business Administration
NDCF - Non Discounted Cash Flow
NPV - Net Present Value
PB - Payback Period
PI - Profitability Index
SID - Strategic Investment Decision
SME - Small and Medium Enterprises
SPSS - Statistical Package for the Social Sciences
UK - United Kingdom
USA - United States of America
1.1 Background:

**Capital budgeting in general**

Capital budgeting practice has become one of the fundamental criteria for a company planning to undertake an investment. It is one of the most important decisions that face the financial managers today; these decisions shape the future of the company. The process of capital budgeting should be done taking into consideration the firm’s strategic plan. Typical projects include the acquisition of plant and equipment, a marketing campaign, developing a new business or product (Correia *et al.*, 2007; Emery & Finnerty, 1997). These projects are expected to produce future benefits to the organization. Capital budgeting, sometimes called capital investment analysis refers to the process of determining which investment projects result in maximization of shareholder value (Hermes *et al.*, 2007). According to Dayananda *et al.*, (2002), the risk involved in capital budgeting calls for the involvement of all the functional areas of the business to take part in the decision making such as production, marketing, data processing and human resources department. Although managers from different departments have to be involved in the process, the overall control rests with the Chief Financial Officer (CFO) or any other person responsible for capital budgeting since they have got the technical knowhow.

The selection of potential investment is done using several techniques which have been designed by many researchers. The methods aid in the calculation of the expected return from a promising investment project. Some of these techniques are theoretically superior to others, but each has its own advantages and disadvantages. The following techniques can be used: the Net Present Value (NPV), the Payback Period (PB), Accounting Rate of Return (ARR), Internal Rate of Return (IRR), Profitability Index (PI), Discounted Payback Period (DPB) and Real Option. Companies might use different techniques for different projects. For example a company might use the
payback method for small projects whilst for large projects they might use NPV which can show the profitability of the project (Ross, 1986).

**Importance of capital budgeting to companies**

In Drury (2004), it has been shown that capital budgeting is of importance to firms because; it enables firms to determine which projects they should accept and companies are also able to determine the total amount of capital expenditure which the firm should undertake. Capital budgeting decisions impact the firm for several years, it is important that they should be carefully planned. A wrong decision can have a major effect on the firm’s future operations. According to du Toit and Pienaar (2005) and Morgan *et al.*, (2001), capital budgeting is a crucial aspect for the firm's success for several reasons. First, capital investments typically account for a large amount of the funds of the organisation. Second, capital investments normally have a fundamental effect on the future cash flows of the organisation once an investment decision has been taken. Third, it is often not possible to reverse it, or it is very costly to do so, once the funds have been committed and funds are normally tied up for a considerable period of time. Finally, investments affect the profitability and long-term strategy of the organisation. These reasons calls for management to use proper techniques to evaluate their projects since failure to make valuable decisions can result in the company suffering financially in the long run.

**South African mines.**

Capital budgeting is of paramount importance to the South African mining sector because most of their activities involve large sums of money. Mines are involved in long term projects which require huge amounts of money therefore it is important that proper techniques are used to evaluate the projects. In a Green Paper for public discussion written in 1998, it has been shown that South African mining projects tend to be ordinarily huge and long term in nature requiring vast amounts of capital which brings about a high degree of risk. On average, some companies need about R3 billion towards their annual capital budgets (www.goldfields.co.za). In emphasizing the importance of capital budgeting on mines, Smith *et al.*, (2007) state that the success of
any mining company depends on its ability to manage capital investments effectively so as to ensure acceptable stakeholder returns within an overall strategic context. This shows that great care needs to be taken when evaluating projects and mining companies should pump out their monies on those projects which will maximize shareholder value. In a report by Construction Equipment (2007) as cited in Du Plessis (2008), South African mines are on average replacing 10% of their surface equipment annually. Therefore, this shows the importance of capital budgeting since the replacement has to be based on the benefit the asset will provide to the company.

The current study focuses on capital budgeting practices adopted by South African mining companies. The mining sector has been selected because of its contribution to the country’s Gross Domestic Product (GDP). The study by Mabena (2009), shows that in 2008 the contribution of the mining sector to the GDP was estimated at 8.6% and 6% of the workers were employed in the formal sector of the economy. Also, the involvement of this sector in large projects which are capital intensive has enabled it to qualify as the study population in this research. Therefore, it is of paramount importance to investigate how the CFOs or decision makers in this sector evaluate their projects.

**Capital budgeting studies done so far.**

Several studies have dealt with capital budgeting practices as an essential tool for evaluating the feasibility of possible investments in the corporate world (see Graham & Harvey 2001; Lefley 1996; Maccarrone 1996; Mao 1970; Pandey 1989). There has also been some focus on capital budgeting practices in South Africa (e.g., Andrews & Butler 1986; Correia & Cramer 2008; du Toit & Pienaar 2005; Hall 2000; Hall & Millard 2010; Gilbert 2005; Lambrechts 1976; Olawale 2010), but their coverage was limited. No detailed information exists on capital budgeting practices of South African mines. These studies analyzed practices of large companies or all sectors. Andrews and Butler’s survey in 1986 was limited to largest industrial and mining companies in South Africa. Their results has shown that, despite the capital intensive nature of the mining industry, some companies are not utilizing capital budgeting
techniques in making capital budgeting decisions. Although this research included mining companies, the study was not all that exhaustive; the reason behind the use of the selected method and the situation under which the method can be used were not highlighted. Also, the research by du Toit and Pienaar (2005) was limited to a review of the capital budgeting behavior of large South African firms. The findings of this research are going to be compared with the results of these two studies.

This Study
The purpose of this study is to present evidence on capital budgeting methods used by South African mines based on a survey of a number of mining companies listed on the Johannesburg Securities Exchange (JSE). The research has targeted listed companies only because these companies have got proper policies which are in place and getting information about these companies will be much easier. The existence of these policies calls for projects to be thoroughly scrutinized before being started. Investments cannot be embarked on before being thoroughly scrutinized therefore; the researcher assumes that capital budgeting procedures are being followed within these companies. Also, getting information about these companies is easy since some of the information about these companies can be found on their websites. This study is going to provide a first in – depth analysis of the South African mining companies’ capital budgeting practices. The research will focus on the organizational and decision maker’s characteristics which according to existing literature may influence capital budgeting practices (see Brounen et al., 2004; Graham & Harvey, 2001; Hermes et al., 2007).

1.2 Research Questions:

In this research, we will answer the following questions:

Central Question:

*What are the best capital budgeting methods for South African mining companies and in what circumstances?*

Sub-questions:
In order to answer our central research question we first need to get a clear focus of the capital budgeting techniques that are currently available. We therefore will start with a thorough literature review to find all the available techniques. Literature will be reviewed from both books and articles written by academics in the field of financial management. This enables us to get different views about this subject. According to Drury (2004) and Garrison and Noreen (2000), there are several techniques available in literature which can be used to evaluate the feasibility of projects. Our first sub-question will therefore be:

- **What important information can be obtained from scientific literature on capital budgeting and the different techniques available?**

After we have identified all the available techniques, in order to value them for our research purpose we will map their pro’s and con’s. In a study by Sony (2006), it has been shown that different techniques have got their own advantages and disadvantages. Therefore, companies might prefer to use a certain technique based on its advantages. Our second sub-question will therefore be:

- **What are the pros and cons of the methods that are out there?**

For us to be able to fulfill our main objective, we need to find out the kind of capital budgeting techniques commonly used by South African mining companies. A current study by Hall and Millard (2010) which was conducted using a selected list of companies has shown that NPV was more popular compared to IRR. Also, a review which was done by du Toit and Pienaar (2005) composed of large listed South African firms show that IRR was the most popular technique followed by NPV. A survey will be done to gather information about the techniques used in practice. Our third sub-question will be as follows:

- **What kinds of capital budgeting methods are commonly used in practice by South African mining companies?**
Once we have identified all the techniques commonly used in practice by South African mines, for us to be able to add value to our results we will find out the rationale behind the selection of those techniques. Decision makers can use certain techniques within their organizations for several reasons. In a UK study by Pike (1983), firms were also asked for their reasons for choosing the methods they use. Different answers were noted for example; the method was thought to be a good device for ranking projects, it was easy to understand as it gave a percentage rate of return and the technique did not require a discount rate to operate. Also, in a study by Hall (2000), it has been shown that the use of a certain technique could be as a result of managerial judgment. Our fourth question will therefore be:

➢ *What are reasons behind the use of the selected method?*

After finding out the reasons behind the use of techniques. For us to get more insight on whether there are no other factors which might contribute to the use of one technique compared to another, it is good for us to find out whether firm and decision maker’s characteristics contribute much towards the use of a certain technique. A number of studies have shown that firm and decision maker’s characteristics have an influence on the capital budgeting technique to be used within the company. According to Kannadhasan and Nandagopa (2010), demographics such as education, experience, tenure, are noticeable features that have an influence on decision making. The research by Graham and Harvey (2001) has shown that organizational and CFO’s characteristics have got an influence on the capital budgeting method to be used. Their results shows that large firms (with at least $1 billion sales) prefer to use NPV than small firms when making capital budgeting decisions (rating of 3.42 versus 2.83). Small firms (with less than $100 million sales) use the payback period (rating of 2.72). Their study was also supported by (Brounen *et al.*, 2004; Hermes *et al.*, 2007)’s findings who stated that there is some evidence that larger firms are more inclined to use more sophisticated capital budgeting techniques. Graham and Harvey (2001) also found that CFOs with Masters in Business Administration (MBA) use NPV than non-MBA CFOs but the difference was only significant at the 10% level whilst CFOs...
without MBAs use the payback criterion. Also, their results shows that mature CFOs (those with 59 years and above) prefer to use the payback period compared to young CFOs who prefer to use the NPV technique. While in the information above several factors have been mentioned as determinants of the choice of capital budgeting practices. In this study, I will concentrate on only five variables due to limited time plus as a means of limiting the number of questions on my questionnaire. In this research, we will take decision makers who are over 57 years as old people, highly qualified decision makers will be those having the following qualifications: Chartered Accountant (CA), Masters in Business Administration (MBA), Non MBA Masters and PhD and firms with total assets which are less than R11 billion will be said to be small. Our fifth sub-question will be as follows:

- Are the methods used related to the organisational and decision maker’s characteristics?

After getting information about the techniques available in literature, their pro’s and con’s, the techniques used in practice by South African mines and whether there is any relationship between firm and decision maker’s characteristics with the method used in a firm. It is good to identify the methods not being used by financial officers which according to literature are more useful for them to be able to make meaningful decisions. The results of the survey and literature study will be analysed to see the methods not being used. Our sixth sub-question will therefore be:

- What are the different methods available in literature which managers are not making use of despite the usefulness of these methods?

Once all the above mentioned sub-questions have been looked at, the results have been analysed and useful methods not being used by the financial officers have been identified. It is important to give companies some recommendations based on the outcome of our literature findings. It is possible that companies might be using a certain technique which according to literature is said to be inferior especially when
evaluating large projects or can use a sophisticated technique to evaluate a small project. Different methods can be used to evaluate projects which involve different levels of capital. For example for small projects, companies might be advised to use the PB method which is easy to use and understand so as to reduce costs in terms of time consumed in doing some computations whilst for large projects they might use the NPV which can show the profitability of the project (Elumilade et al., 2006). We therefore end our research with giving advices to companies on suitable techniques to be used depending on the situation which they are under. Therefore, our last sub-question will be:

- Can we, based on our research, advice the companies to use a specific method, and in what situation?

1.3 Research Objectives

The main aim of this research is to find out the kind of methods commonly used in practice by mining companies in South Africa in making capital budgeting decisions taking into consideration the firm and decision maker’s characteristics and their influence on the method selected, and to find the best capital budgeting methods for South African mining companies to be used in different situations. More information about the variables is found in the theoretical framework chapter of this study. A survey will disclose the techniques used by mining companies in practice. Furthermore, reasons will be determined which influence the use of those methods. South African mines use a lot of capital in their projects. Due to its capital intensive nature, this research is of importance to enhance the understanding of the investment processes in mines. The results of this study will be valuable to this sector in improving the way they do their capital projects.

Current literature provides data on capital budgeting in South African companies in general but the insight on the capital budgeting techniques used by mining companies is generally limited. This research is relatively concerned with the question what are the best capital budgeting methods for South African mining companies and in what circumstances.
The most important aspect in capital budgeting is to use the best method which will ensure that the company will survive in the long run. The specific objectives of this research are as follows:

➢ To evaluate the theory available on capital budgeting and to investigate the different capital budgeting methods which are available in literature.
➢ To get an insight on the reasons behind the use of the selected capital budgeting methods.
➢ To give recommendations based on the literature findings.

1.4 Research model

This research has conceptualised the research model with help of the literature review. Based on our earlier discussion we come to the following conceptual research model. The research model helps to understand whether the capital budgeting method that is used by a company is influenced by the firm and the financial officer’s characteristics. The dependent variable in this case is the capital budgeting method to be used by a company. The proposed model includes five independent variables such as size of the company, age of the company, age of the finance officer, academic qualifications of the finance officer and tenure of the finance officer. The arrows in the model explain the hypothesised relationships which will be examined using SPSS. Figure 1 shows the model which indicates the relationships between the variables.

Figure 1: Research model
1.5 Research framework

The research framework defines the categories of outputs that this research can produce. It also defines a set of different research activities or the steps to be taken in order to realize the research objectives.

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Figure 2: Research Framework

The research is grounded on a literature review and empirical study. Literature about the background information of capital budgeting and the different techniques available was looked at. The literature review was a basis for designing a questionnaire used in this research. Data was gathered by use of questionnaires and interviews were held. The analysis of the data results in some recommendations being formulated and conclusions reached.
1.6 Structure of the research
This thesis consists of six chapters. Chapter 1 provides an introduction and background to the study, presents the problem statement, research objectives, research model and questions to be answered by the research. Chapter 2 reviews literature on capital budgeting. Chapter 3 will look at the theoretical framework. Chapter 4 describes the research methodology used to gather data on capital budgeting. In Chapter 5, the findings of the data gathered through some questionnaires and interviews will be analyzed and summarized. Chapter 6, based on the results of the research, concludes on the capital budgeting techniques used by South African mining companies.
Chapter 2
Capital Budgeting

2.1 Introduction
This chapter aims to introduce the topic of capital budgeting, the capital budgeting process and capital budgeting techniques. This is one of the aspects of decision making which is important for the firm’s success because many firms have experienced financial suffering as a result of wrong capital investment decisions made by their managers at one point. The success of a company depends on its ability to make changes in several areas of its functioning in order to meet the challenges which exist within the business environment (Soni, 2006). Therefore, it is important that whilst the company is trying to adjust to the new environment by either introducing a new line of business, a proper technique is used to evaluate the new project. Most of these changes involve capital expenditure decisions which require large sums of money. Large investments are usually pursued after being exposed to a thorough evaluation by management using different capital appraisal methods. Several techniques are commonly used to evaluate capital budgeting projects. We are going to start by giving some background information about capital budgeting. Before looking at the techniques available in literature, we are going to look at previous studies done in South Africa on this topic. This will enable us to make a comparison with the results of this current study. The last part of this chapter is going to give a detailed analysis of the capital budgeting methods available to managers. This will enable us to distinguish the different methods with their pro’s and con’s.
2.2 Background Information

2.2.1 Capital Budgeting

Capital budgeting can also be referred to as the investment appraisal. The term is also used to describe the process of creating and controlling expenditures on prolonged assets (Ross et al., 2009). It is a decision to make a cash outlay in order to get a benefit in the future through cash inflows (Dayanada et al., 2002). The concept of capital budgeting brings in several ideas about the financial manager’s roles such as the selection and rejection of projects the firm could invest (Blum, 2005). The decisions made on the allocation of resources in organizations require one to have a proper system to follow, be analytical and using a thorough approach whilst at the same time making a valuable decision (IFAC, 2008).

Shareholder's value is created if the present value of the cash inflows exceeds that of the past cash outlay taking into consideration the interest lost if funds could have been invested into financial institutions rather than embarking in a fixed asset. The aim of capital budgeting decisions is to maximize the market value of the firm to its shareholders (Dayanada et al., 2002). The relationship between the firm's overall goal, financial management and capital budgeting is shown in Figure 3. Before embarking on any project, managers should study the project before investing in it to see if it is worth pursuing. In general, companies should put more effort in all projects and opportunities that have the capability of increasing shareholder value. The process of capital budgeting involves a number of stages, calculations and evaluation of the methods; this includes calculation of the cash inflows and the assessment of the different capital budgeting methods (Hall & Millard, 2010).

According to Dayanada et al., (2002), investments decisions also deal with the way cash flows raised in financial markets are deployed in different productive activities of the firm so as to meet the set goals. The main point of capital budgeting is to allocate available resources between alternatives with the aim of getting a return in the near future of current investments (Kalu, 1999). The decision to be made will be in line with other decisions managers must take and will also depend on the company’s core
business, its competitive environment and the legal constraints (Blum, 2005). A study by Blum (2005) also shows that financial decisions are characterized by having revenues and expenditures which are spread over time and are uncertain. Capital budgeting is an important management tool and one of the duties of the financial manager is to choose suitable investments for the organization with satisfactory cash flows and rates of return. In essence a financial manager should be able to decide if an investment is worth undertaking and should also have the ability to choose wisely given other alternatives (Awomewe & Ogundele, 2008).

Figure 3: Corporate goal, financial management and capital budgeting (Dayananda et al., 2002).

2.2.2 Objectives of Capital budgeting
Drury (2004) stated that capital budgeting has got the following objectives: to determine which specific projects a firm should accept, to establish the total amount of capital expenditure which the firm should undertake and lastly, to decide how the
total amount of capital expenditure should be financed. Also, the research done by Leon (2008), has shown that the aims of capital budgeting are to increase the firm’s future cash flows, to boost the company’s current earnings and to enhance growth in market share and stock prices.

2.2.3 Classification of investment projects

The study by Dayananda et al., (2002), has shown that investment projects can be classified into three categories based on their influence on the investment decision process. The first is the independent project: the acceptance or rejection of this project does not have an influence on the selection of other projects. For instance, management might want to introduce a new product whilst at the same time thinking of replacing a machine which is currently producing a different product. The two projects are being considered as independent projects provided there are enough funds to implement all of them. The projects can be evaluated separately and a decision to accept or reject them will depend on whether they add value to the firm (Dayananda et al., 2002).

The second is the mutually exclusive project: these are two or more projects which cannot be carried out at once. The acceptance of one project will result in the rejection of another project. For example a firm might own a piece of land which is enough to establish either a bakery shop or a supermarket. If a bakery shop is chosen, therefore, the construction of a supermarket will be eliminated. Mutually exclusive projects can be evaluated separately so as to be able to select the one which adds more value to the firm compared to the other. Early identification of mutually exclusive projects is vital to avoid wasting resources if two divisions independently investigate and implement projects which are later own recognized as mutually exclusive (Dayananda et al., 2002; Drury 2004).

The third is the contingent project: the acceptance or rejection rests on the decision to accept or reject one or more other projects. These projects may be substitutes to other projects. For instance, the choice of having a pharmacy may be subject to the establishment of a surgery next to the pharmacy. Therefore, the cash flows of the pharmacy are enriched by the presence of surgery and the opposite is true. Substitute
projects are ones where the achievement of one project depends on the decision to reject the other project. Contingent projects should be evaluated taking into account the cash flow connections of all the projects (Dayananda et al., 2002).

2.2.4 The capital budgeting process

The capital budgeting process is composed of many aspects. There are several stages in the process succeeding each other. This process is well known in large organizations (Dayananda et al., 2002).
Figure 4: Flow chart of the Capital budgeting process (Dayananda et al., 2002).

Figure 4 above shows the stages involved in the capital budgeting process. These stages enable managers to thoroughly evaluate their projects before pursuing them as
each stage calls for a different action to be undertaken and this result in them focusing on projects which are more lucrative. The stages will each be described below in detail so as to enable us to know what each stage encompass.

### a) Strategic Planning

A strategic plan could be referred to as the actual plan of the company which stipulates the kind of business the company is involved in and where it intends to position itself in the future (Awomewo & Ogundele, 2008; Pandey, 1989). In a well-managed organization, the capital budgeting process starts at the strategic level with senior managers developing a vision of the firm and communicating it to lower level managers (Shapiro & Balbirea, 2000). Strategic planning translates the organization’s corporate goal into specific policies and directions, sets priorities, specifies the structural, strategic and tactical areas of business development and guides the planning process in the pursuit of solid objectives (Shapiro & Balbirea, 2000). A company’s vision and mission is incorporated in its strategic planning framework (Dayananda et al., 2002). It should be noted that feedback to strategic planning during project evaluation and decision making stages is very important to the future of the organization. Different feedbacks may point out to some changes which are more likely to have an impact on the future direction of the company which may cause changes to the organization’s strategic plan (Awomewo & Ogundele, 2008).

### b) Identification of investment opportunities

The identification of investment prospects and creation of investment project proposals are vital stages in capital budgeting process (Dayananda et al., 2002). Possible projects are not merely born, someone has to put it forward (Drury, 2004). The generation of ideas for investment should start by looking for market opportunities that build on the firm’s core competences or addressing competitive weaknesses (Shapiro & Balbirea, 2000). A firm’s success rest on its capability to generate investments rather than on its capacity to appraise them (Drury, 2004). Project proposals have to fit the organization’s corporate objective, vision and long-term strategic plan. In the case that there is an investment which has shown the
potential of being successful, the corporate vision and strategy may be changed so as to let it fit in within the organization (Awomewe & Ogundele, 2008). Some investments are mandatory meaning that each and every company within a certain type of industry has to put a certain amount of money aside for them, for example investments required to satisfy a particular regulation, health and safety requirements that are important for the firm to remain in business (Dayananda et al., 2002). Other investments are as per individual judgment and are usually as a result of the growth of a company, competition, cost reduction opportunities, etc. These investments usually exhibit the strategic plan of the business and, in turn, these investments can change the direction of the firm’s strategic plan. The organization should attempt to search and identify possible profitable investment opportunities and proposals because the remaining part of the capital budgeting process can only ensure that the best of the proposed investments are appraised, selected and executed (Awomewe & Ogundele, 2008). Mechanisms should be put in place within the organization such that suggestions which come from inside the company for example from employees or outside such as the advisors of the company about possible investments are taken into consideration by the management (Dayananda et al., 2002). It is also fascinating to know that brilliant investment propositions can come through informal meetings such as employee conversations in a staff room or during break periods (Awomewe & Ogundele, 2008).

c) Preliminary screening of projects

In general, many potential investment proposals arise from within the organization but obviously all of them are not selected during the thorough project analysis process (Elumilade et. al., 2006). Therefore, the identified investment opportunities have to be exposed to an initial screening process by the company management to isolate the marginal and illogical proposals, because it is not wise wasting resources to thoroughly evaluate such proposals (Dayananda et al., 2002; Drury, 2004). Also, in his study, Dayananda et al., (2002), states that the preliminary screening may include some preliminary quantitative analysis and judgments based on natural feelings and
experience. In a book written by Drury (2004), it is shown that projects that fulfill the initial test requirements are incorporated in the annual capital budget.

d) Financial appraisal of projects
Projects which have succeeded during the preliminary screening phase are then subjected to a rigorous financial appraisal so as to confirm their possibility of adding value to the organization (Awomewe & Ogundele, 2008). This stage is also referred to as the quantitative analysis, economic and financial appraisal, project evaluation or project analysis (Awomewe & Ogundele, 2008). The quantitative analysis may predict the expected future cash flows of the project, analyze the risk associated with those cash flows, develop alternative cash flow forecasts, examine the sensitivity of the results to possible changes in the predicted cash flows, subject the cash flows to simulation and prepare alternative estimates of the project’s net present value (Dayananda et al., 2002). The project analysis could also involve use of forecasting techniques, project evaluation techniques, risk analysis and mathematical programming techniques such as linear programming (Dayananda et al., 2002). The discounted cash flow method is the best-recommended approach since it is consistent with the objective of maximizing shareholders’ wealth (Elumilade et al., 2006). Although the basic concepts, principles and techniques of project evaluation are the same for different projects, their application to a certain type of project requires special knowledge and expertise (Awomewe & Ogundele, 2008). For instance, property investment, forestry investment asset expansion projects, asset replacement projects and international investments have their own special features and uniqueness.

Financial appraisal will provide the estimated addition to the firm’s value in terms of the projects’ net present value. Where a project identified within the current strategic framework of the firm continue to give a negative net present value in the analysis stage, this gives an indication to management to revise their strategic plan (Dayananda et al., 2002). The feedback from project analysis to strategic planning plays an important role in the whole process of capital budgeting (Awomewe & Ogundele, 2008). The outcome of the quantitative analysis has an influence on the selection of
the project or investment decisions and the decisions made have a long term effect on the success or failure of the organization. Therefore, project analysis is important for the survival of the firm (Dayananda et al., 2002).

e) Qualitative factors in project evaluation

After the project has passed the quantitative analysis test, it has to undergo another evaluation stage in which the qualitative factors will be taken into consideration. Qualitative factors are defined by Dayananda et al., (2002), as factors which will have an impact on the project but cannot be expressed in monetary terms. The factors have been mentioned in a study by Dayananda et al., (2002), as follows: the societal impact of an increase or decrease in employee numbers, the environmental impact of the project, possible positive or negative governmental political attitudes towards the project, the strategic consequences of consumption of scarce raw materials, positive or negative relationships with labor unions about the project, possible legal difficulties with respect to use of patents, copyrights and trade or brand names, and impact on the organization’s image if the project is socially questionable. Some of the factors mentioned above can have an effect on the value of the firm and some do not have an effect therefore, management can address factors which have got an impact on the firm’s value during the project analysis phase by means of having some discussions and making consultations with various relevant parties (Awomewe & Ogundele, 2008). The process requires management experience and judgmental skill to incorporate the outcome of these processes into the project analysis (Dayananda et al., 2002). At times, management may be able to predict the impact of some of these issues through the estimation of monetary cost or benefits of the project and incorporating those values into the appropriate cash flows (Awomewe & Ogundele, 2008). At times, those qualitative factors which influence the project advantages may have such a negative effect on the project such that feasible project will have to be deserted (Dayananda et al., 2002).
f) The accept/reject decision
After making some cash flow estimates, the project can be evaluated in financial terms and assessing whether the decision to go ahead with the project is in line with the strategic goal of maximizing shareholder value (Shapiro & Balbirea, 2000). The information is given to the management with some recommendations from the analyst, management will then look at the information and based on their previous knowledge gained through their routine information sources, their experience, expertise and judgment then they can make a valuable decision (Awomewe & Ogundele, 2008).

g) Project implementation and monitoring
When a project has passed through the decision making stage, then management has to implement it (Elumilade et. al., 2006). During the implantation phase, various divisions of the firm are most likely to be involved in order to share some ideas on how the project is going (Dayananda et al., 2002). The implementation phase involves close monitoring of the project’s progress with the aim of identifying bottlenecks thereby allowing immediate intervention. Differences noted from the estimated cash flows need to be monitored frequently with a view to taking corrective actions where necessary (Dayananda et al., 2002).

h) Post-implementation audit
The evaluation of the performance of ongoing projects is an important mechanism to be put in place by management so as to be able to assess the effectiveness of the process (Shapiro & Balbirea, 2000). The post- implementation audit involves comparing the project’s cash flows with the projected figures (Drury, 2004; Elumilade et al., 2006). An assessment of the performance of previous resolutions, however, can contribute greatly to the perfection of present investment decision-making by scrutinizing the past ‘rights’ or ‘wrongs (Awomewe & Ogundele, 2008). The post-implementation audit therefore provides useful feedback to project appraisal or strategy formulation. For example, projects undertaken in the past within the underlying structure of the organization’s current strategic plan do not prove to be
profitable as forecasted, such information can prompt management to consider a thorough review of the organization’s current strategic plan (Dayananda et al., 2002).

The discussion above clearly indicates that capital budgeting is one of the decisions made by the managers which needs great care. To sum up, the capital budgeting process entails that managers should do the planning, evaluation implementation and monitoring. Following all these stages will reduce the risk of making uninformed decisions. This part is of importance to this study in the sense that it helps the readers to be well informed about what is involved in the capital budgeting process. The next part is going to give an overview of the previous studies done in South about capital budgeting practices.

2.3 Desk research in the context of South Africa.

Earlier research on capital budgeting practices based on South African companies by Lambrechts (1976) shows that the Net Present Value (NPV) was not widely used by many companies. The following techniques were commonly used by the companies; priority rating (82%), Internal Rate of Return (IRR) (76%), Accounting Rate of Return (ARR) (74%) and Payback Period (PB) (63%). His study involves 100 top listed companies and from these, 48 responded to his study. Andrews and Butler (1986) also did a research on this subject. His study population involves 500 large industrial and mining firms, from these 132 responses were received and they found that larger firms tend to use more sophisticated capital budgeting techniques. The subject of capital budgeting practices in South Africa was also studied by Hall (2000). From the total population of 300 companies, useable responses were 65 respondents and the results of this study shows that Return on Investment was the most preferred method. The study by du Toit and Pienaar (2005), found that South African firms favor IRR and NPV to evaluate capital investments. Also, their results show that there seem to be a relationship among the techniques that companies use and the size of their annual capital budget. The study by Gilbert (2005) brought to light the idea that companies do not only consider the expected return of potential investment opportunities when making capital budgeting decisions but they follow a multi stage filtering process and decrease the list of projects by establishing the association with the firm’s strategic
goals on a qualitative basis. A study by Correia and Cramer (2008) to determine and examine the practices of South African listed companies in relation to cost of capital, capital structure and capital budgeting decisions show that companies always employ DCF methods such as IRR and NPV to evaluate projects. Also, companies use the capital asset pricing model to determine the cost of equity. A recent study by Hall and Millard 2010 found that industrial firms prefer NPV method, and that risk is incorporated into evaluating capital budgeting projects more often. Another study was done by Olawale et al., (2010) on the impact of investment appraisal techniques on the profitability of small manufacturing firms. The results show that the use of non-sophisticated investment appraisal techniques has a negative effect on the viability of small firms.

The literature survey on capital budgeting techniques used by firms in South Africa identified the following as the most common techniques: Internal Rate of Return, Net Present Value, Payback Period, Profitability Index, Accounting Rate of Return investment (Figure 5). The graph shows that IRR and NPV are the most common investment appraisal techniques used followed by ARR.

![Figure 5: Major Capital budgeting techniques used by South African firms](image)

The study by du Toit and Pienaar (2005) has shown that the following are the capital budgeting techniques mostly used by South African firms. The reasons for selecting the technique used were not mentioned. Table 2 shows capital budgeting methods used to evaluate investments.

**Table 1: Capital budgeting methods used to evaluate projects in percentages**

<table>
<thead>
<tr>
<th>Method</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal rate of return</td>
<td>37.1</td>
</tr>
<tr>
<td>Net present value</td>
<td>27.4</td>
</tr>
<tr>
<td>Profitability index</td>
<td>0</td>
</tr>
<tr>
<td>Accounting Payback period</td>
<td>8.1</td>
</tr>
<tr>
<td>Present value payback</td>
<td>8.1</td>
</tr>
<tr>
<td>Accounting rate of return</td>
<td>11.3</td>
</tr>
<tr>
<td>Adjusted internal rate of return</td>
<td>0</td>
</tr>
<tr>
<td>Other methods</td>
<td>8.0</td>
</tr>
</tbody>
</table>

*Source: du Toit & Pienaar (2005)*

Table 2 below shows a summary of previous surveys which have been done in South Africa. The information was compiled by the researcher after reviewing a number of articles written on South African capital budgeting practices.
Table 2: Summary of capital budgeting surveys done in South Africa.

<table>
<thead>
<tr>
<th>Year studied</th>
<th>Year results published</th>
<th>Author(s)</th>
<th>No. of firms</th>
<th>Response rate</th>
<th>Sample used</th>
<th>Preferred technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>1976</td>
<td>Lambrechts</td>
<td>100</td>
<td>48</td>
<td>Top quoted firms</td>
<td>IRR</td>
</tr>
<tr>
<td>1986</td>
<td>1986</td>
<td>Andrews &amp; Butler</td>
<td>500</td>
<td>26</td>
<td>Industrial &amp; mining</td>
<td>Payback</td>
</tr>
<tr>
<td>1998</td>
<td>2000</td>
<td>Hall</td>
<td>300</td>
<td>23.33</td>
<td>Industrial companies</td>
<td>ROI</td>
</tr>
<tr>
<td>2002</td>
<td>2005</td>
<td>du Toit &amp; Pienaar</td>
<td>524</td>
<td>13</td>
<td>Listed firms</td>
<td>IRR</td>
</tr>
<tr>
<td>2004</td>
<td>2005</td>
<td>Gilbert</td>
<td>318</td>
<td>37</td>
<td>Manufacturing firms</td>
<td>n/a</td>
</tr>
<tr>
<td>2006</td>
<td>2008</td>
<td>Correia &amp; Cramer</td>
<td>150</td>
<td>8</td>
<td>Listed companies</td>
<td>NPV</td>
</tr>
<tr>
<td>2009</td>
<td>2010</td>
<td>Hall &amp; Millard</td>
<td>177</td>
<td>38</td>
<td>Industrial firms</td>
<td>IRR</td>
</tr>
<tr>
<td>2009</td>
<td>2010</td>
<td>Olawale, Olumuyiwa &amp; George</td>
<td>124</td>
<td>n/a</td>
<td>SMEs</td>
<td>Non- discounted cash flow techniques.</td>
</tr>
</tbody>
</table>

The next part is going to look at the capital budgeting techniques available to managers.

2.4 Capital Budgeting Techniques
Capital budgeting techniques can be divided into two categories. These are the discounted cash flow techniques (DCF) and the non-discounted cash flow techniques (NDCF). According to Garrison and Noreen (2000), the DCF techniques are those which recognize the time value of money. Their concept stipulates that a € today is worth more than a dollar tomorrow. NDCF are those techniques which do not take into account the time value of money. In this study, the techniques are going to be discussed grouped according to these two categories (DCF and NDCF) for the following reasons: the grouping will enable the reader to know which technique falls under which group since these words are going to be used much in this study and it is
also going to enable us to easily identify the category being regarded as the best according to the literature study. Major techniques used in analyzing projects are described below.

**Characteristics of an ideal capital budgeting decision**

In a study by Bhandari (2009), it has been shown that a perfect capital budgeting technique is supposed to meet the following qualities: simple to understand, easy to calculate, measures profitability, ensures liquidity, can adjust for risk, considers all cash flows, adjusts for time value of money, consistent with the wealth maximization goal and assumes realistic reinvestment of intermediate cash inflow. For us to be able to get a better understanding of these qualities, it is good to look at all of them in more detail.

*Simple to understand:* a technique is simple or easy to understand if the figures (outcome of the calculations done) involved are easy to interpret and explain to a layman. Usually, a few figures are involved in the computation of the wanted outcome. For example the PB will tell management how many months or years it will take to recover the original cash cost. This does not need somebody to be well versed with the field of financial management.

*Easy to calculate:* this means that the formula used is not all that complicated. Let’s take for example our traditional PB; which is the amount of time it takes for an investment to cover its initial outlay. Thus, if the initial cash outlay is X and the annual cash inflow is Y then the PB will be X/Y.

*Measures profitability:* the method is able to show whether the investment is going to generate earnings. The method gives a direct measure of the dollar benefit of the project to the shareholders (Drury, 2004). Measurement of profitability is important to the shareholders since they derive their income in the form of dividends therefore the method which shows how profitable is the investment is the best to them (Gibson, 2009). The ability of an investment to make profits is of importance to the company in
the sense that profits are one source of funds for debt coverage and also, management uses profits as a performance measure (Ross et al., 2009).

*Ensures liquidity:* companies and even individuals are concerned about how quickly an investment will give them a return. A capital budgeting technique ensures liquidity if it is able to show how long it will take for a company to be able to pay its current bills and expenses. The PB emphasizes on the early recovery of the investment thus, it gives an insight into the liquidity of the project (Khan & Jain, 2006).

*Can adjust for risk:* riskiness of a project is defined as the variability of its cash flows from those that are expected (Van Horne & Wachowicz, 2001). The technique can adjust for risk if the project’s level of risk is incorporated into the capital budgeting process. In this case, the discount rate will be adjusted either upward or downward depending on the level of risk anticipated (Gibson, 2009). If the risk associated with the project is greater, the discount rate is adjusted upward to compensate for this added risk and downward to adjust for lower risk (Van Horne & Wachowicz, 2001).

*Considers all cash flows:* a technique considers all cash flows when it uses all the cash inflows to be attained during the life span of an investment in making its computations (Drury, 2004). This in my opinion a good measure of the investment’s performance since it might be possible that after for example five years, the project might start to produce negative cash flows.

*Adjusts for time value of money:* the technique is able to show the value of a € today to be received for example in ten years’ time. This is important because most people do not want to invest in a project which will yield less return as of today. In a Book by Steven et al., (2009), it has been stated that when decisions are affected by cash flows that are paid or received in different periods, it is necessary to adjust these cash flows for the time value of money. Because of our ability to earn interest on money invested, we would prefer to receive € today rather a year from now thus discounting the cash flows in order to find their present values.
Consistent with the wealth maximization goal: Effective financial decision making requires one to know the goal of the firm for example what should management try to achieve for the owners of the firm (Drury, 2004). The most widely known objective of the firm is to get the best out of the shareholder’s investments. According to Moyer et al., (2009), the shareholder maximization goal states that management should seek to maximize the present value of the expected returns to the shareholders (Moyer et al., 2009). These returns can be in the form of dividend payments. The present value is defined as the value today of some future payment or stream evaluated at an appropriate discount rate (Moyer et al., 2009). Steven et al., (2009) present a simple rule that managers can use to make capital budgeting decisions: Invest in all positive net present value projects, and reject those with a negative net present value. A technique is consistent with the wealth maximization goal if it makes use of the present values in its calculations.

Assumes realistic reinvestment of intermediate cash inflow: It is assumed that intermediate cash flows from the investment should be invested although this is not always the case. According to Khan and Jain (2006), cash inflows generated by a project should be reinvested using the same rate as the market cost of capital. The NPV has been seen to have a single and uniform rate (cost of capital) which can consistently be applied to all new investment proposals (Khan & Jain, 2006). A good technique should assume reinvestment of intermediate cash flows using the cost of capital.

These qualities discussed will enable us to be able to identify the methods which are said to be the best to use when evaluating projects. The preceding literature study will analyze the capital budgeting techniques based on these characteristics. The strengths and weaknesses of each technique is going to be highlighted. Only one article is available which has managed to rank the capital budgeting methods. This is the Bhandari study of 2009. My study is going to base on this article for the following reasons: for us to be able to come out with the best techniques for South African mines, we need a standard way of differentiating these methods which will enable us to identify the best and to add more weight to our recommendations, we need some
references to support our decision. This will also be supplemented by other information found in other studies since the Bhandari study did not look at all the techniques which are going to be looked at in this research. The results will be interpreted using scores. 1 score will be awarded for each quality fulfilled and the scores will be nine in total. For the purpose of this study, techniques which will score 5 and above will be regarded as better techniques. Further, those techniques who managed to satisfy six and above will be regarded as the best.

Non - Discounted Cash Flow techniques

2.4.1 Payback period (PB)
The Payback period is defined as the period necessary for the working cash surpluses created by a certain investment to equate, in total, to the capital sum initially invested (Maheshwari 2009; Mills 1988). This method evaluates the earnings per year from the beginning of the project until the accrued incomes are equivalent to the cost of the asset, at which time the outlay is said to have been paid back (Awomewe & Ogundele 2008; Lefley 1996). The payback decision rule states that, projects with a payback of less than some determined cutoff period are undertaken and those with prolonged paybacks are rejected (Shapiro & Balbirea 2000; Yard 2000). Under the PB method, the wanted payback period fixes the hurdle rate (threshold barrier) for project acceptance (Lefley, 1996). In several companies the payback period PB is employed as a measure of the desirability of capital investments (Pike 1985; Yard 2000). Frequently, the payback method is used as a selecting mechanism. The use of PB is most common in small and medium companies (Pike 1985; Yard 2000). In an in-depth study of the capital budgeting projects of 12 large manufacturing firms, Ross (1986), found that even though techniques that incorporated DCF were used to some point, firms depend relatively much on the unsophisticated payback method especially for smaller projects. This was also supported by a study done by (Kester et al., 1999; Ross & Westerfield 1988: William et al., 2001), who said that PB is often used for small expenditures that have obvious benefits such that the use of more sophisticated capital budgeting methods is not required or justified. Table 1 shows the frequency of
use of various capital budgeting methods as a result of a survey done by Graham and Harvey (2001). The payback method is well known for answering the question “How long does it take to get the money back”? (Binder & Chaput, 1996: 248). The payback period has appeared to be an important, widely held, primary and conventional method in the developed nations like the UK and the USA (Pike, 1985). Payback period can be calculated as:

\[
\text{Payback Period} = \frac{\text{Initial payment}}{\text{Annual Cash Flow}}
\]

Where initial payment is the investment made in the start and the annual cash flows are the net cash flows of a firm.

For example, if €800 000 is invested with the aim of earning €200,000 per year (net cash earnings) the payback period would be 4 years. This method however supposes that the cash flows would remain the same during the life time of the project (Soni, 2006). But in the real world, capital projects of business organizations don't yield even cash flows. The method also makes no assumption about cash flows from the project after the payback period.

Payback is said to highlight the management’s concern with liquidity and the need to reduce danger by means of a quick recovery of the original investment (Awomew & Ogunde, 2008). In certain circumstances, the threshold of the payback period is selected in relation to the economic lifespan of the project (Maheshwari, 2009). Occasionally, it appears that in many cases the determination of the wanted payback period is centered on individual evaluation, taking into account past knowledge and the level of project risk (Awomew & Ogunde, 2008). Nevertheless, for particular projects which are lengthy by nature and whose paybacks will accumulate in the future and further than the normal payback may not be taken based on calculation used by the payback method, although such projects may actually be valuable for the long term success of the business (Lefley 1996; Maheshwari 2009). It is vital to use the payback method to appraise the project’s liquidity rather than project profitability. Although
the use of this method as a single criterion has decreased ultimately, its use as a secondary measure has increased over time (Segelod, 1995).

**Table 3: Frequency of use of the capital budgeting techniques**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Large Firms</th>
<th>Small firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal rate of return</td>
<td>3.41</td>
<td>2.87</td>
</tr>
<tr>
<td>Net present value</td>
<td>3.42</td>
<td>2.83</td>
</tr>
<tr>
<td>Payback method</td>
<td>2.25</td>
<td>2.72</td>
</tr>
<tr>
<td>Discounted payback</td>
<td>1.55</td>
<td>1.58</td>
</tr>
<tr>
<td>Accounting rate of return</td>
<td>1.25</td>
<td>1.41</td>
</tr>
<tr>
<td>Profitability index</td>
<td>0.75</td>
<td>0.78</td>
</tr>
</tbody>
</table>

*Source: Graham and Harvey (2001)*

Although, the payback period determines the time for regaining of an investment and not profitability per se, its contribution toward maximizing a firm's wealth has been doubted by some writers (Lohmann & Baksh, 1993). The payback period has been considered as inferior, because at best they can only be used to estimate the IRR (Mao, 1970). Dean (1967) argues that the PB method does not assess or show all the magnitudes of lucrativeness which are important to capital expenditure choices, and it is neither comprehensive nor problematic enough to be used as a firm’s overall measure of investment worth. Martinsons *et al.*, (1999), also argued that this method offer a narrow and inadequate image of the business performance, and that dependence on such information deters the formation of forthcoming business worth. Further, Carsberg and Hope (1976), argue that the PB method is a “blunt instrument” and observes that the whole emphasis is on the rapid recovery of the outlay. The strong academic argument against the PB as a valid technique is further supported by Pike (1985), who states that: “Academic writers have almost unanimously condemned the use of the payback period as misleading and worthless in reaching investment decisions”. Although the PB is well known for incorporating risk, it has been criticized for its inapplicability in risk assessment (Mao, 1970). The Bhandari’s study of 2009 has shown that PB has the following attributes: simple to understand, easy to calculate,
ensures liquidity and can adjust for risk. This alone has proved that PB has got a weakness in the sense that it is not consistent with the wealth maximization goal which in my opinion is the most important objective for the existence of companies.

To reduce the shortcomings of the payback method, the greatest agreeable payback period must be selected as a fixed value, say 3 years and in some cases the boundary value of the payback has to be linked to the economic life of the investment, for example a payback period that is shorter than half the economic life (Maheshwari, 2009). When these two rules of thumb are brought together, a more academically precise assessment of investments can be achieved and such a combined payback method is based on assumption of constant yearly cash flows (Maheshwari, 2009).

**Arguments in favor of payback method**

The study by Awomewe and Ogundele (2008), has shown that the payback method is popular because of the following reasons: easy to understand, it favors capital projects that return large early cash flows, it allows a financial manager to cope with risk by examining how long it will take to recoup initial investment, although it does not treat risk directly, it addresses capital rationing issues easily, the ease of use and interpretation permit decentralization of the capital budgeting decision which enhances the chance of only worthwhile items reaching the final budget, it contains a built-in safeguard against risk and uncertainty in that the earlier the payback the lower the risk and it remains a major supplementary tool in investment analysis.

**Arguments against payback method**

The writings by Yard (2000) and Soni (2006), has highlighted that payback method omits cash flows meaning to say that it does not bear into account cash flows subsequent to the project's payback period. The method only considers project returns up to the payback period. Also, the payback method ignores the time value of money (Yard, 2000). In spite of this, a solution to this deficiency has been put forward by way of modifying the simple PB method into a discounted payback period (DPP); thereby
searching the payback period when the accumulated present value of the cash flows covers the initial investment outlay.

Looking at Bhandari’s points, the PB only satisfies the following four qualities: simple to understand, easy to calculate, ensures liquidity and can adjust for risk. Based on this, the PB seem to be a weaker technique to use in the evaluation of projects as it fails to meet more than half of the qualities. Also, the fact that it does not show the profitability of a project and does not take into consideration all the cash flows earned by a project during its life span shows that it is not a good technique to measure the viability of large projects. In my opinion, this technique can be used to evaluate social projects and administrative projects where companies are not worried about the returns to be obtained from undertaking the project. The technique can also be used in combination with other DCF techniques such as the NPV.

2.4.2 Accounting Rate of Return (ARR)
This can also be referred to as the average accounting return method. It is defined as the average project income after deducting taxes and depreciation divided by the average book value of the investment during its life time (Davies & Boczko 2005; Elumilade et al., 2006; Ross et al., 2009). The method uses net income and book value of the investment instead of the actual cash flows and these figures comes from the accounting books which in most cases are prepared by somebody who has got some interests in the results. According to Vatter (1966), ARR is a figure which has been established from information which is specifically for a particular year and there is no reference to other parts of the project. In a book written by Davies and Boczko (2005), it is shown that ARR can also be calculated by using total profits instead of average profits and then divide by the average investment. Management should continue to use the method which they have adopted right from the start of the project. The basic inputs used in the calculation of ARR are mainly affected by the accountant's judgment since for example the cost of a building is expensed under current accounting rules whilst some expenses such as maintenance are expensed (Ross et al., 2009). Elumilade et al., (2006), in his study has shown that ARR is mostly used by
financial managers in evaluating capital projects in conjunction with other discounted cash flows methods such as the NPV. According to Bhandari (2009), ARR has been seen to have the following attributes: simple to understand, easy to calculate, measures profitability and ensures liquidity.

For an independent project to be acceptable, its ARR should meet the set level which is the hurdle rate or the cutoff rate (Artrill & Maclaney 2009; Williamson 1996). For mutually exclusive projects, the rule states that accept the project with a greater ARR and the additional condition for accepting the selected project is that it should attain the predetermined rate (Williamson, 1996).

ARR can be calculated using the following formulas:

\[
\text{ARR (total investments)} = \frac{\text{Average annual profits}}{\text{Initial capital invested}} \times 100
\]

\[
\text{ARR (average investment)} = \frac{\text{Average annual profit}}{\text{Average capital invested}} \times 100
\]

**Arguments in favor of ARR**

The study by Soni (2006) has shown that the use of ARR has got the following benefits: the method uses information which is in the books of accounts therefore there is no need of doing some calculations. The method is easy to understand and so enables those who are not into finance to understand what is going on. This method can also be used to measure the performance of investments and even company subsidiaries.

**Arguments against ARR**

The accounting rate of return is prone to the same condemnation as the payback period as it does not take into consideration the properties of capital flows, but looks at the accounting profits instead of cash flows over the life time of the capital investment (Elumilade et al., 2006; Soni 2006). The method does not take into consideration the time value of money (Drury 2004; Pike & Neale 1996). “Managers would be indifferent in their choice between one project and other with after tax profits, which
may occur in the opposite chronological order because both projects would have similar accounting rate of return” (Elumilade et al., 2006; Van Horne 1992). The use of accounting variables such as depreciation could lead to a false analysis of net cash flows emerging from the project outlay since depreciation of the initial cost of capital over the future of the investment is treated as cash cost. This can also be as a result of the accounting standards being used during the evaluation period of this project (Soni, 2006).

Although ARR has been seen to have some advantages, the method has managed to satisfy four qualities of Bhandari which are simple to understand, measures profitability, ensures liquidity and easy to calculate as accounting information is available in the books of accounts. From this, we can deduce that the method has a low rating based on the scores which we mentioned above. The method has been proved to be unsuitable to use on large projects which require much care and attention. This method should be used to evaluate social and administrative projects.

2.4.3 The real options approach

“Real Option is the right but not the obligation to undertake some business decision; typically the option to make, abandon, expand, or contract a capital investment” (Trigeorgis, 1993). Many academies and practitioners have mentioned some problems with using the NPV for making capital budgeting decisions, the fact is, NPV and all other capital budgeting methods ignores the changes that management can make after the project has been accepted (Alkaraan & Northcott 2006; Ross et al., 2009). These adjustments or changes are called real options. Bailey and Sporleder (2000), states that the value of option reduces due to the passing of time and the potential of the project at hand becomes clearer. Real options are unique from other methods in the sense that at time t, it enables managers to consider all the options available to them, good and bad. The real options method takes into consideration the managerial flexibility over time since some projects involves sunk costs which can never be reversed any more (Bailey & Sporleder, 2000). “Real options models are based on the assumption that there is an underlying source of uncertainty, such as the price of a
commodity or the outcome of a research project. Over time, the outcome of the underlying uncertainty is revealed, and managers can adjust their strategy accordingly” (Bowman & Moskowitz, 2001:772). The method acknowledges that the options acquired in some capital projects has value for example the option to expand, defer, downsize or abandon a major capital investment project; this enables the firm to react to strategic and competitive prospects rather than hanging around in the same course of action (Black & Scholes, 1973). Many authors have supported the use of real options approach in evaluating strategic capital investments (Alkaraan & Northcott, 2006). Although this method has been seen as a valuable tool in evaluating strategic capital investments, the study by Busbya and Pittsb (1997), has shown that few managers understands or use this method. Real options are considered not to be so important since they lessen organizational dedication to a prearranged outcome or event also, these cannot be helpful especially where a regulation or legislation has to be met (Busbya & Pittsb, 1997).

Various types of real options which are of importance in capital budgeting was identified in a study undertaken by Vintila (2007), and these are as follows:

**Timing options**: these assume that the investor may postpone the investment decision until specific information arise and help him to understand, even partly, the uncertainty connected with the analyzed project.

**Staging options**: are useful in assessing multistage projects, when uncertainty is not resolved over time and investor must undertake the project even in small increments, in order to learn about cost pattern and profitability of the project;

**Exit (abandon) options**: this allows the investor to avoid or at least reduce loses if bad circumstances appear, by turning negative cash-flows into null payoffs;

**Operating options**: enable the firm to organize operations for adjusting its processes to business environment and react to economic changes by scaling up to enhance earnings or scaling down to reduce damages, depending on given circumstances;

**Flexibility options**: consist of purchasing or building a flexible production capacity or asset, so that it has two or more different uses, depending on market conditions;
Growth options: these are usually associated with strategic investments, which sometimes have negative NPV, but are indispensable for implementing following projects with substantial positive NPV, greater (in module) than loses from the initial project.

Arguments in favor of real options
This method enables decision makers to put together a number of options into a single investment. It allows a greater flexibility and improved method in valuing prospects. Real options increases the manager's general understanding of the investment decision and helps them in recognizing and accounting for uncertainty (Bailey & Sporleder, 2000).

Arguments against real options
The research by Awomewe and Ogundele (2008), has shown that real options have got the following disadvantages: when applied to stock evaluation real options technique is complicated, the method is suitable to a company deciding on its strategy than to an investor picking stock and the company must have the management skills and the resources to make use of the options; furthermore, an option is not worth pursuing if it cannot be funded effectively.

This method did not manage to fulfill the qualities mentioned in Bhandari’s study (2009). Real option is not used to evaluate projects to be undertaken because it is a strategic evaluation tool used to help managers in making decisions such as abandoning a project, expanding it or contracting it therefore, this method in other words is not used to evaluate projects planned to be undertaken by a firm. The method has been included in this study because it has been seen to overcome some of the weaknesses of the NPV technique which according to literature has been rated as the best technique to use in the evaluation of projects.
Discounted Cash Flow techniques

2.4.4 Net present value (NPV)
The NPV is described as the difference between the present value of the cash inflows and the present value of the cash outflows (Awomewe & Ogundele 2008; Van Horne 1992). In other words, this is the project’s present value less the initial investment. With this method, all cash flows are discounted to present values using the required rate of return (Van Horne, 1992). The evaluation of the NPV of a project must encompass measuring the project’s future net cash flows, discounting these at the suitable cost of capital to obtain their present value, deducting the initial capital cost or net investment outlay, at the project commencement period (Elumilade et al., 2006). For example, if the present value of a project is €1 million and the initial investment is €600 000; this means that the net present value of this project is €400 000. NPV analysis is sensitive to the reliability of future cash inflows that an investment or project will yield (Soni, 2006). In calculating the project’s net present value, the cash flows accumulating at different times are modified using a discount rate, that is the minimum rate of return required for the project to be acceptable (Awomewe & Ogundele 2008; Ross et al., 2009). The rule of thumb with the NPV method is that, projects with positive net present values or values at least equal to zero are acceptable and projects with negative net present values are unacceptable (Drury, 2004). NPV compares the value of a euro today to the value of that same euro in the future taking inflation and returns into account (Sony, 2006). The NPV assumes that cash inflows will be reinvested at the same rate that is the required rate of return or the rate at which cash inflows are discounted (Drury, 2004). The study of Bhandari (2009) has indicated that NPV has the following qualities which qualify it to be regarded as the best technique, these are: it measures profitability, can adjust for risk, considers all cash flows, adjusts for time value of money, consistent with the wealth maximization goal and Assumes realistic reinvestment of intermediate cash inflow.

The NPV is computed using the following formula:
Where $C_0$ is the present value of cash outflows, if cost is incurred over a period of time.

Note that higher NPVs are more desirable. The specific decision rule for NPV is as follows:
NPV = 0, reject project  
NPV > 0, accept project
For mutually exclusive projects, accept the project with a higher NPV.
A project NPV depends on the discount rate creating an opposite relationship between them. Meaning that, the higher the discount rate, the lower the NPV. Graphically, it can be explained as follows:

**Arguments in favor of NPV**
The NPV method takes into account the time value of an investment opportunity by discounting the cash flows (Awomewe & Ogundele 2008; Bennouna 2010; Sony 2006). Sony (2006), in his study has argued that since the computation of NPV is based on the predicted cash flows from the investment therefore accounting practices such as depreciation and non-cash expenditures, managements taste and profits from existing business do not affect the decision. Also, NPV uses all cash flows of the
project compared to other methods such as the payback period which ignores the cash flows after the payback period (Ross et al., 2009).

**Arguments against NPV**

Although the NPV method has been seen as a superior method by many writers. There are some drawbacks in using this method. NPV measure also shows an inconsistent behavior. In particular, it is possible for the NPV to increase as the discount rate increases, or to decrease as the discount rate falls (Oehmke, 2000). This causes the NPV method to be less useful especially when evaluating highly technical and risky projects. NPV systematically underestimates all investment projects. This is as a result of the strong inherent postulations made that no decisions would be taken in the forthcoming years after the investment decision (Sony, 2006).

The NPV being rated as the most superior technique has managed to satisfy six of Bhandari’s qualities which are: it measures profitability, can adjust for risk, considers all cash flows, adjusts for time value of money, consistent with the wealth maximization goal and it assumes realistic reinvestment of intermediate cash inflow. Although this method is regarded as the most complicated method to use, some of the difficulties have been lessened by the use of computers. This method, according to the researcher’s opinion qualifies to be ranked as one of the best techniques to use in the evaluation of a project’s viability because it has managed to fulfill more than half of the Bhandari’s qualities of a good capital budgeting technique. NPV technique can be used especially in large projects where large sums of money are involved.

**2.4.5 Profitability Index (PI)**

The Profitability Index (PI) also known as the “Benefits-Cost Ratio” is the ratio of the present value of future cash flows to the actual cash outflow (Elumilade et al., 2006; Van Horne & Wachowicz 2001). In other words, it is a method showing the number of times a project’s total net cash flows (in today’s value) cover its initial investment (Diacogiannis, 1994). It is an additional method available which can help managers or decision makers in selecting the best project among several options (Elumilade et al.,
The PI method has been seen to have the following attributes: simple to understand, measures profitability, can adjust for risk, considers all cash flows, adjusts for time value of money and assumes realistic reinvestment of intermediate cash inflow (Bhandari, 2009). The project is accepted if the profitability index is 1 or greater, this shows that the project's present worth is higher than the actual cash outflow which in turn implies that the net present value is greater than zero (Van Horne & Wachowicz, 2001).

Mathematically, this can be calculated using the following formula:

$$\text{Profitability Index (PI)} = \frac{\text{PV of cash flows subsequent to initial investment}}{\text{Initial investment}}$$

For independent projects, the PI decision rule is
Accept an independent project if PI > 1.
Reject if PI is < 1.

For mutually exclusive projects, the PI decision states that accept the project with a higher PI.

**Arguments in favor of PI**
Profitability index has been seen as a better method to use in evaluating capital budgets by Diacogiannis (1994), because it considers the size of the project and the timing of its cash flows over its life time. It also provides a comparative measure of the current worth for each euro of actual investment. This method considers the present values of a project relative to the capital cost (Williamson, 1996). Also, according to Hawawini and Viallet (2007), PI adjusts for risk. The method is also easy to understand (Botha et al., 2007).

**Arguments against PI**
This method has been seen by Diacogiannis (1994), as being difficult to use especially when interpreting the profitability because it does not have the innate attractiveness of a rate of return. Also, the method may provide unacceptable results when mutually exclusive projects with different sizes are being considered (Diacogiannis, 1994).
Although some academics do not consider this method to be superior among other DCF methods, it has managed to fulfill six out of the nine mentioned qualities in the Bhandari study. Qualities fulfilled are: simple to understand, measures profitability, can adjust for risk, considers all cash flows, adjusts for time value of money and assumes realistic reinvestment of intermediate cash inflow. This score is fair enough for PI to be considered as a good technique to be used in the evaluation of projects. Its use should be after considering the importance of the project since it is not consistent with the wealth maximization goal. In my own view, this method can be used in evaluating small, social and administrative projects.

2.4.6 *Internal rate of return (IRR)*

This is the discount rate at which the present value of expected capital investment outlays is exactly equal to the current value of anticipated cash earnings on that capital project (Awomewe & Ogundele 2008; Elumilade *et al.*, 2006; Kunsch 2008; Soni 2006). The study by Awomewe and Ogundele (2008) brought to light that IRR can also be referred to as the economic rate of return (ERR). This has also been defined by Soni (2006), as the rate at which the net present value of a project equals zero. It can also be considered as the annualized rate of return (in percent) of an investment using compound interest rate calculations (Soni, 2006). The rate of return over cost is that rate which is used in calculating the current values of all the costs and the present value of all the revenues which will make these two the same (Diacogiannis 1994; Elumilade *et al.*, 2006). This denotes that the IRR is the breakeven point of cost of capital and therefore a measure of investment liability with regard to the rate of return instead of value (Elumilade *et al.*, 2006; Van Horne 1992). IRR rule is straightforward and gives a valuable understanding to decision-makers about appropriate evaluation of expected rate of return per unit of time throughout the investment process (Drury 2004; Elumilade *et al.*, 2006). The study by Graham and Harvey (2001) has shown that IRR is the primary method mostly used by large firms. The study by Bhandari (2009) has shown that IRR is favored because of the following qualities: it is simple to
understand, measures profitability, can adjust for risk, considers all cash flows and adjusts for time value of money.

The rule of thumb for IRR states that the greater a project’s internal rate of return, the more attractive it is to undertake the project. As a result, it is used to rank several prospective projects a firm is considering (Awomewe & Ogundele, 2008). The IRR decision rule stipulates that all independent projects with an IRR bigger than the cost of capital ought to be accepted (Drury 2004; Soni 2006). When selecting between mutually exclusive projects, the project with the highest IRR should be selected as long as the IRR is greater than the cost of capital (Soni, 2006). Mathematically IRR can be calculated using the following formula;

$$\sum_{t=0}^{n} \frac{x_{t}}{(1+r)^t} = 0$$

Arguments in favor of IRR
There are some advantages in using IRR as a capital budgeting method. The IRR method calculates the current value of investment opportunities’ cash flows and hence takes into account the time value of money (Bennouna 2010; Diacogiannis 1994; Sony 2006). This value states that a euro today is more worthy than a euro tomorrow. This is a primary condition in the selection of investment appraisal methods (Correia & Cramer 2008; Sony 2006). The IRR uses net cash flows of the project in its computation. These cash flows are computed as total cash inflow less total cash outflow (Sony 2006; Van Horne 1992). The method is easy to understand; returns stated in terms of percentage are easier to understand and communicate for managers and shareholders compared to NPV, due to inexperience with the details of the appraisal techniques (Sony 2006; Van Horne 1992).

Arguments against IRR
IRR calculations develop reinvestment assumptions that make bad projects look beneficial and good ones look awful (Kelleher & MacCormack, 2004). The technique supposes that the intermediate cash flows can earn similar rate of returns as the initial
project, and this creates unrealistic returns to the management and shareholders. (Kelleher & MacCormack, 2004). Under normal circumstances, the returns changes over the life of the project therefore this method can mislead management and shareholders with regards to the viability of this project. The project has got difficulties in handling project with unconventional cash flows (Atrill & McLaney, 2009).

The IRR being seen by other academics as a better technique has managed to fulfill five of Bhandari’s qualities. These are: it is simple to understand, measures profitability, can adjust for risk, considers all cash flows and adjusts for time value of money. Based on this score compared to other techniques such as PB and ARR, IRR has proved to be a better technique although it is not the best. Looking at its shortcomings, I would suggest that IRR can be used to evaluate small projects. Since it is not consistent with the wealth maximization goal and it does not assume reinvestment of intermediate cash inflow.

2.4.7 Discounted Payback Period (DPP)

Bhandari (2009) defines DPP as the period in which the accumulative net present value of a project’s cash flows is equivalent to zero. This method is preferred in circumstances where the life span of a project is not clear due to some changes in consumer tastes, competing products and regulatory environment than other discounted cash flow techniques such as the NPV, IRR and PI (Bhandari 2009; Haim 1968). A project is acceptable if DPP is less than its economic life or some fixed period. Discounted payback period has got some characteristics which are the same as for the traditional payback and has got some connections with NPV, the IRR and the PI criteria (Bhandari, 2009). Also, in Bhandari’s study it has been shown that DPP has some qualities which make it to be a better technique to use in the evaluation of projects. These qualities are: it is simple to understand, measures profitability, ensures liquidity, can adjust for risk, adjusts for time value of money, consistent with the wealth maximization goal and assumes realistic reinvestment of intermediate cash inflow. Mostly, projects which are acceptable according to DPP criterion are assured
to be more beneficial (Bhandari 2009; Haim 1968). The study by Bhandari (2009) has shown that DPP is a better measure of the economic breakeven point than is the payback period. DPP has been seen to be more perfect in measuring the regaining of the initial cash outlay and is a desired measure of the determination of the uncertainty of a project than the PB method (Bhandari, 2009). This method permits for adjustment of risk by using a discount rate in which the issue of risk has been taken care of. The rule of thumb for DPP states that the larger the discount rate, the lengthier will be the DPP and the less the project will become appealing. Therefore, the accept-reject decisions for independent projects based on the DPP criterion will be the same as those on the NPV, the IRR and the PI criteria (Bhandari, 2009).

DPP can be calculated using this formula:

\[ \sum \frac{C_t}{(1+k)^t} = C_0 \]

Where ‘k’ is the cost of capital.

Arguments in favor of DPP

DPP has been seen to be a better method to use in making capital budgeting decisions by Haim (1968) and Bhandari (2009), due to the benefits which accrue as a result of using this method. The method is simple to understand and easy to calculate. By taking into consideration the time value of money and discounting cash flows at the required rate of return, this criterion ensures profitability. Also, this method measures the liquidity of an investment. DPP takes into account the time value of money. It has the capability to adjust for risk. It is also in line with the wealth maximization goal.

Arguments against DPP

The method has been criticized in the book written by Drury (2004), for not being able to consider cash flows after the DPP period.

DPP has managed to prove that it is a better technique to use when evaluating projects by scoring seven out of the nine qualities of the Bhandari study. These are: simple to understand, measures profitability, ensures liquidity, can adjust for risk, adjusts for time value of money, consistent with the wealth maximization goal and assumes
realistic reinvestment of intermediate cash inflow. Although some academics have never mentioned it as a good technique, the idea that it can be used in some situations where other DCF techniques are not suitable to use has rendered it to be considered as a best technique. This technique in my opinion can be used in situations where the economic condition is uncertain. In situations where large projects are involved, the technique can be used in collaboration with the NPV although it is time consuming but there is an assurance that a better decision will be made. It can also be used to evaluate small projects.

Summary
The literature study has highlighted that the importance of capital budgeting is to maximize shareholder value. Shareholder's value is created if the present value of the cash inflows exceeds that of the past cash outlay taking into consideration the interest lost if funds could have been invested into financial institutions rather than embarking in a fixed asset. Different stages are involved in the capital budgeting process which enables decision makers to make reasonable decisions. There are several techniques which have been dealt with in the literature study which managers can make use of when evaluating their projects. These are the Net Present Value (NPV), Internal Rate of Return (IRR), Discounted Payback Period (DPP), Profitability Index (PI), Payback Period (PB) and Accounting Rate of Return (ARR). These methods have their own advantages and disadvantages. These advantages and disadvantages make other techniques to be more superior to others.

Using the Bhandari qualities of a good evaluation technique, we have managed to come out with techniques which are considered to be the best based on this. The DPP, NPV and PI have proved to be the best techniques with a score of seven for DPP and six for NPV and PI out of the nine qualities which we looked at in this study followed by IRR with a score of five. ARR and PB have managed to attain a score of four and lastly the real option which did not manage to satisfy any of these qualities. The PB and ARR have been proved to be of little importance when making capital budgeting decisions. Based on this literature study, I will come up with the following
suggestions. The NPV method should be used on all the projects which involve large sums of money to minimize the risk of embarking on a project which is not viable (Table 5). The DPP can be used on all the projects in times when the economic condition is not certain since the NPV and PI have been proved to be not suitable under these conditions (Table 5). Under normal circumstances, DPP should be used to evaluate small projects. PI should be used on small projects, social and administrative projects because of it not being consistent with the wealth maximization goal (Table 5). IRR should be used on all small projects (Table 5). ARR and PB should be used in social and administrative projects (Table 5). The real option was completely out of range but this has to be used only in making decisions on whether to continue or abandon a project which has already been undertaken (Table 5). Overall, DCF techniques have been proved to be the best techniques to use in the evaluation of investments than NDCF.

Table 4 shows the results of the ranking of the techniques according to Bhandari’s study. None of the techniques managed to meet all the requirements of Bhandari. The scores indicated in the table shows the total number of qualities fulfilled by each technique. A + shows that the technique fulfills the quality at hand whilst ++ shows that the technique fulfills the quality more than other techniques. The symbol - means that the technique does not meet the qualities mentioned.
Table 4: Summary of the techniques’ ratings according to Bhandari’s qualities.

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<thead>
<tr>
<th>Qualities</th>
<th>Techniques</th>
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<td></td>
<td>DPP</td>
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<td>Simple to understand</td>
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<td>Easy to calculate</td>
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<td>Measures profitability</td>
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<td>Ensures liquidity</td>
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<td>Can adjust for risk</td>
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<td>Considers all cash flows</td>
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<td>Adjusts for time value of money</td>
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<td>Consistent with the wealth</td>
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<td>maximization goal</td>
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<td>Assumes realistic reinvestment</td>
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<td>of intermediate cash inflow</td>
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<td>Technique</td>
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<td>PB</td>
<td>- It is easy to calculate and understand.</td>
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<td>- It contains a built-in safeguard against risk and uncertainty in that the earlier the payback the lower the risk and it remains a major supplementary tool in investment analysis.</td>
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<td>Can be used on social and administrative projects.</td>
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<td>ARR</td>
<td>- The method uses information which is in the books of accounts therefore there is no need of doing some calculations. - It is easy to understand. - Measure the performance of investments.</td>
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<tr>
<td>Real option</td>
<td>- This method enables decision makers to put together a number of options into a single investment. - It allows a greater flexibility and improved method in valuing prospects. - Increases the manager’s general understanding of the investment decision and helps them in recognizing and accounting for uncertainty.</td>
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<tr>
<td>NPV</td>
<td>- Takes into account the time value of money.</td>
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<td>- Uses all cash flows of the project.</td>
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<td>- It is consistent with the wealth maximization goal.</td>
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<td>- Assumes realistic reinvestment of intermediate cash flows.</td>
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<td></td>
<td>- Is a good measure of profitability.</td>
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<td>- Can adjust for risk.</td>
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### PI
- Takes into account the time value of money.
- Uses all cash flows of the project.
- Easy to understand.
- Assumes realistic reinvestment of intermediate cash flows.
- Is a good measure of profitability.
- Can adjust for risk.

- Difficult to calculate.
- It does not ensure liquidity.
- It is not consistent with the wealth maximization goal.

This technique is suitable for small projects, social and administrative projects.

### IRR
- Takes into account the time value of money.
- The method is easy to understand.
- It measures profitability.
- It can adjust for risk.
- Considers all cash flows.

- It does not assume realistic reinvestment of intermediate cash flows.
- IRR calculations develop reinvestment assumptions that make bad projects look beneficial and good ones look awful.
- It is not easy to calculate.
- It does not ensure liquidity.

This technique is suitable for small projects.

### DPP
- Takes into account the time value of money.
- Easy to understand.
- Assumes realistic reinvestment of intermediate cash flows.
- Is a good measure of profitability.
- Measures the liquidity of an investment.
- It has the capability to adjust for risk.
- It is also in line with the wealth maximization goal.

It does not consider cash flows after the DPP period.
- It is not easy to calculate.

Suitable to be used on all large projects when the economic situation is not certain but under normal circumstances, it can be used on all small projects.

### 2.5 Conclusion
Capital budgeting is a process of making decisions on a cash outlay in order to get benefit in the future through cash inflows. Shareholder value is produced if the present value of the cash inflows exceeds that of the cash outlay but this will mainly depend on the minimum acceptable target set by the management. The major aim of capital budgeting is to maximize shareholder value. Capital budgeting is an important management tool and therefore, managers should make sure that the option they take is good for the survival of the firm. This is so because capital budgets involve spending large sums of money and they have long term effect on the future cash flows of the organization. The financial appraisal of projects has been seen as one of the
critical stages in the evaluation of projects since they confirm the possibility of the project to add value to the organization.

Many writers and academics have dealt with the importance of different capital budgeting appraisal methods which are available. FOs has to thoroughly evaluate their projects using a suitable capital budgeting technique before embarking on any project. In South Africa, previous studies have shown that IRR was the most preferred technique used by the companies. The NPV was also mentioned as being used by some companies although it was not all that popular as the IRR. Other techniques which have been mentioned are the PI, PB and ARR although their use was limited.

Based on the literature review that we have conducted in this chapter we can now come to some concluding remarks about capital budgeting techniques. Techniques such as the DPP, NPV and PI have been proved to be better methods according to Bhandari’s qualities of a good investment method. IRR has managed to satisfy five of Bhandari’s qualities. ARR and the PB failed to meet half of the Bhandari qualities whilst the real option did not satisfy any of Bhandari’s qualities. The DPP should be used on all the projects when the economic situation is not certain. Under normal circumstances, it can be used on all small projects which involve less amount of money. The NPV technique should be used in all large projects which involve large sums of money because it considers all cash flows and is consistent with the wealth maximization goal. Therefore managers will be in a position to go ahead with a project which they know very well that it will maximize the shareholder value. PI should be used for small projects, social and administrative projects because of it not being consistent with the wealth maximization goal. The IRR can be used on small projects. ARR and PB can be used in social and administrative projects where the company is not worried about the profitability of the project.

Although DPP, PI, and NPV have been seen as the best methods to use in evaluating projects, they need somebody with the knowhow and skills to calculate the present values. The use of the investment appraisal methods will be of significant importance if the strategic position of the firm is taken into consideration. The method should give
the decision makers flexibility in making further decisions after the project has been implemented. The real option technique has come into place as a strategic tool to evaluate projects which are already running. This method enables the managers to make decisions about abandoning, postponing a project, operating options etc. Once a firm has adopted one method in evaluating a project, it is wise that they should continue using that same method for them to be able to get comparable results. The next chapter is going to look at the theoretical framework. In the next chapter, the theory to support the formulation of our hypotheses will be looked at in detail.
3.1 Introduction

After a comprehensive analysis of the capital budgeting process and the techniques available in literature during this research, it is time to look at the theoretical framework which is going to help in the formulation of the hypotheses. These hypotheses will help us in validating our research model in Chapter 1 thereby answering our sub question; are the methods used related to the organisational and decision maker’s characteristics? There are two main characteristics which have been seen to affect the capital budgeting techniques to be used by a company and these are the Finance Officer (FO) and firm’s characteristics. This is evidenced from a study by Graham and Harvey (2001) which shows that organizational and Chief Finance Officer (CFO)’s characteristics have an influence on the capital budgeting method to be used. Therefore, this chapter is going to be based on Graham and Harvey (2001) and Danielson and Jonathan (2006) studies. The chapter is going to look at these specific characteristics and give a detailed overview of the variables to be used in the hypotheses testing. The techniques used by companies seem to differ from company to company and some techniques may not be suitable for some firms and this might be as a result of these characteristics found within these companies. Besides the above mentioned previous studies, there are other studies which shows that FO and firm characteristics have an influence on the capital budgeting technique to be used by a company (see Ang 1991; Brounen et al., 2004; Drury & Tayles 1997; Hambrick et al., 1993; Hermes et al., 2007; Herrmann & Datta 2005; Kannadhasan & Nandagopa 2010; Leon et al., 2008; Prather et al., 2009; Wiersema & Bante 1992). This study is going to focus on South African mines to see whether previous results of Graham and Harvey (2001) and Danielson and Jonathan (2006) also hold to this sector. Hypotheses will be formulated for each and every characteristic dealt with in this research. The following aspects will be covered in this chapter: FO’s characteristics (FO’s age, tenure and academic qualification) and firm characteristics (firm size and firm age).
We will end up with having some propositions for each sub-section. The chapter will end with a conclusion.

### 3.2 Financial Officer’s characteristics

These have been seen to influence the capital budgeting decision to be made within an organization. In a study by Pike (1988), it has been highlighted that the tools used to make capital budgeting decisions depends on aspects that influence the behavior of the FO in allocating resources among competing investment alternatives. According to Kannadhasan and Nandagopa (2010) and Brunzel et al., (2011), demographic such as age, tenure and academic qualification are noticeable features that have an influence on decision making. The following characteristics will be looked at under this subheading: FO’s age, academic qualification and tenure. These are the only characteristics to be looked at in this section because they were the major determinants used by other authors in previous studies (see Graham & Harvey 2001; Danielson & Jonathan 2006; Hermes et al., 2007; Leon et al., 2008; Prather et al., 2009) and in my opinion, I think these are the most important factors based on previous studies.

#### 3.2.1 Age

The FO’s characteristic such as age has an influence on the capital budgeting methods used in an organization (Brunzel et al., 2011). According to Wiersema and Bante (1992), an individual’s age influence strategic decision making perspectives and choices. The study by Graham and Harvey (2001), has pointed out clearly that old and young people tend to prefer different methods when evaluating their projects. Mature CFOs (those with 59 years and above) were seen to be using the payback period whilst young CFOs were using the Net Present Value (NPV) technique. Also, Hermes et al., (2007), shows that older FOs tends not to use the NPV compared to younger FOs. The study by Prather et al., (2009) also shows that older managers evaluate capital investments using less sophisticated models and rely more on experience or "gut feel" than young managers. The study by Brounen et al., (2004) shows that the use of the payback criterion is more popular among firms with CFOs who are older than those with CFOs who are young. Also, in Brunzel et al., (2011), it has been shown that
young CFOs prefer to use NPV technique than old CFOs. Although the information found to support the inclusion of this variable in our hypothesis is limited, I think this variable is of importance in influencing the capital budgeting technique to be used by a firm. Therefore, this variable is going to be considered in this study.

Thus, the following hypothesis about age of the FO is posted:

**Hypothesis 1: FOs who are young prefer to use more sophisticated techniques than older FOs.**

### 3.2.2 Academic qualification.

Demographic such as education, experience, tenure, and functional background are significant characteristics which figure out principles of the FOs which in turn influence decision making (Herrmann & Datta 2005). Academic qualification is defined as an award issued by an approved authority (college or university) certifying that an individual has successfully completed a programme of study or has the expertise to perform a particular job effectively (Herrmann & Datta 2005). A qualification signifies the range of knowledge, understanding and skills that has been acquired (http://www.wmo.int). The study by Wiersema and Bante (1992) shows that the level of education reflects an individual’s reasoning ability and skills. Graham and Harvey (2001) did a research where they wanted to investigate whether having an MBA affected the choices made by corporate executives. Their results shows that companies whose CFOs had MBAs were more likely to use NPV than firms whose CFOs did not. Also, in a study by Leon et al., (2008) where they expected that a greater percentage of the university educated respondents would use the Discounted Cash flow (DCF) techniques as opposed to those without a university education. Their results shows that a greater percentage of University educated respondents use the DCF techniques compared to those without a university education. A study by Hermes et al., (2007), shows that the educational level of the CFO has an influence on the capital budgeting method to be used by a company since it may be expected that CFOs with higher levels of education will have less problems in understanding and using
more sophisticated capital budgeting techniques than CFOs with lower levels of education. Prather et al., 2009 did a survey where they wanted to find out whether the use of DCF techniques depends on firm size, industry, form of business organization, firm age, FO’s age and education level of the primary FO. Their results showed that the educational level of the FO could influence the capital budgeting process. Thus, the importance of educational qualifications has been highlighted since some FOs has an incorrect or incomplete understanding of how to analyze capital budgeting alternatives. They concluded that proper training was required for the FOs to be able to make sound decisions. In Danielson and Jonathan (2006)’s study which was aimed at studying the capital budgeting practices of small firms, their results showed that the educational training of business owners might impact the capital budgeting decisions making. Their results also shows that over 50 per cent of the business owners do not have a four-year college degree, and only 13 per cent have an advanced or professional degree. Therefore, this could impact the capital budgeting decision making. The study by Brunzel et al., (2011) shows that CFOs who are well educated prefer to use sophisticated techniques such as the NPV.

Thus the following hypothesis about academic qualification is made:

*Hypothesis 2: FOs who are more qualified prefer to use more sophisticated capital budgeting techniques.*

### 3.2.3 Tenure

Little information is available in the literature about this characteristic. In my opinion, I think this is an important variable to include because there is a possibility that FOs might continue to use the same technique which they have been using for the past years as a result of them not wanting to make any changes within their organisations. Likewise, newly appointed FOs might want to use methods which they were using with their previous employers. In a study by Hambrick et al., (1993), it has been shown that longer tenured decision makers tend to prefer to continue with the way they were operating their businesses. They tend to be reluctant to make some changes.
within the organisation. This was supported by the study of Wiersema and Bante (1992) who states that long tenure increases understanding of organisational policies and procedures resulting in decision makers being reluctant in changing their strategies.

Thus the following proposition about FO tenure is made:

**Hypothesis 3: The longer an FO's tenure in the firm, the greater the possibility that there is no change in the capital budgeting technique used by the firm.**

### 3.3 Firm characteristics

The characteristics of the firm have been seen to influence the capital budgeting technique to be used by a company. Under this section, we are going to look at the following characteristics: firm size and firm age.

#### 3.3.1 Firm size

Different authors have tried to define firm size. Firm size can be defined as the total amount of shareholder’s funds, number of employees which the companies have, annual turnover and the total fixed assets which the company is in possession of (Harif & Osman 2010; Awomewe & Ogundele 2008). According to Barclay and Smith (1995), “firm size has frequently been used as an exogenous variable in explaining financing decisions”. Thus, companies make their decisions based on the different ways of defining size. Theoretically, it is stated that large firms tend to use more sophisticated techniques than small firms (Danielson & Jonathan, 2006). The results of Danielson and Jonathan (2006) suggest that the investment appraisal processes for large and small firms might differ. Precisely, survey results show that small companies make use of DCF analysis less frequently than the gut feel, payback period, and accounting rate of return (Prather et al., 2009). In a study by Graham and Harvey (2001), it was clearly indicated that firm size significantly affects the practice of corporate finance. For example, results shows that large firms (with at least $1 billion sales) prefer to use NPV than small firms when making capital budgeting decisions.
(rating of 3.42 versus 2.83). Small firms (with less than $100 million sales) use the payback period (rating of 2.72). Their study was also supported by (Brounen et al., 2004; Hermes et al., 2007)’s findings who stated that there is some evidence that larger firms are more inclined to use more sophisticated capital budgeting techniques. Brounen et al., (2004)’s study also shows that smaller firms who are not much more worried about maximizing shareholder value use the payback period when evaluating the viability of their projects. Based on the results of Graham and Harvey (2001), Leon et al., (2008) also did a research expecting to find a positive relationship between firm size and the usage of DCF techniques. This anticipation was based on the supposition that huge firms would be able to afford qualified and knowledgeable managers who use sophisticated management techniques. Surprisingly, the results of Leon et al., (2008) were different from those of Graham and Harvey (2001), they found out that all firms, regardless of their size groups, show a high percentage of the use of DCF techniques. Therefore, their test result shows that size does not have any influence on whether or not firms use DCF project appraisal techniques in their capital investments. The study by Drury and Tayles (1997) has shown that DCF techniques are used far more extensively by larger organisations ($\alpha=0.01$). Also, in another study done by Prather et al., (2009), their results were the same as those of Graham and Harvey (2001). Although one author has mentioned that size does not influence the capital budgeting technique to be used by the company, our hypothesis will be formulated based on the fact that size affect the capital budgeting technique to be used. This is so because the majority of the authors who looked at this indicated that there is a relationship between firm size and the capital budgeting technique used.

Thus, the following hypothesis for firm size is posted:

**Hypothesis 4: The size of the company affects the capital budgeting technique to be used in the organization.**
3.3.2 Firm Age
This is the number of years from when the company was incorporated. This has been seen as influencing the capital budgeting technique to be used by a company. According to Danielson and Jonathan (2006), the number of years in business could influence both the type of investments a firm will make and the capital budgeting technique to be used to evaluate the projects. For example, companies who have been in business for some time can have more equipment in need of replacement than those who have been in business for some few years. Hence, the use of capital budgeting techniques might differ since those companies who have been in business for a shorter period might be focusing more on maintaining the viability of the firm, rather than to maximize its value therefore they might prefer to use the unsophisticated techniques. Ang (1991) states that many young firms have limited management resources, and lack expertise in finance and accounting therefore, they may not evaluate projects using discounted cash flows techniques.

Thus, the following hypothesis about firm size is posited:

*Hypothesis 5: Older firms tend to use more sophisticated techniques than young companies.*

3.4 Conclusion
The demographic characteristics and firm characteristics are of paramount importance in coming up with the suitable variables to be used in the hypothesis testing. The FO’s age has an influence over the strategic investment decision making. Previous studies have shown that old and young people tend to prefer different methods when evaluating their projects. The other aspect of demographic which is of importance is the academic qualification of the FO. A qualification signifies the range of knowledge, understanding and skills that has been acquired. This has also been seen as a significant characteristic which figure out principles of the FOs which in turn influence decision making. Highly qualified FOs has been seen to be using more sophisticated methods than lowly qualified. The FO tenure has also been seen as
another determinant which affects the use of the capital budgeting techniques within an organisation. Long tenured FOs has been seen to be more reluctant in making some changes in the way they undertake their strategic decisions. Size of the firm has been seen to have an influence on the technique to be used by a company. The age of the company has also been seen to influence both the type of investments a firm will make and the capital budgeting technique to be used to evaluate these projects.

Based on the theory which we have gathered in this chapter we can now come to some concluding remarks about the FO and organisational characteristics which influence the capital budgeting techniques to be used within the firm. Characteristics such as the FO’s age, FO’s tenure and academic qualification have been seen to influence the decision making of FOs with regards the capital budgeting technique to be used. Also, the firm’s characteristics such as firm size and firm age have been seen to have an influence on the capital budgeting technique to be used by the company. The techniques used by companies seem to differ from company to company. This could be as a result of these characteristics, therefore in this research; we would like to test whether these characteristics really have an effect on the technique to be used by a company. The next chapter is going to give a detailed analysis of the methods used to gather data used in this study. It is also going to give an overview of how the data was analysed.
Chapter 4
Research methodology

4.1 Introduction
This chapter details the research approach which was undertaken in this study, explaining how the data was obtained and the statistical tests performed. The previous chapter dealt with the theoretical framework which helps in the formulation of the hypotheses. Field work was carried out during the month of March and April 2011.

A total of thirty five companies listed on the Johannesburg Securities Exchange (JSE) were considered for participation in this research. Companies were phoned first in order to be able to find out those who were willing to participate in the research. Out of thirty five companies, 20 companies showed interest in participating in the research. Different reasons were given for not willing to participate in the research. One of them was of the confidentiality of the information. The other companies mentioned that they were busy preparing for their year-end financial statements while others indicated that they were not just interested in participating in the research. Three companies were not in a position to fill in the questionnaire but participated in face to face interviews. Seventeen questionnaires were sent to the Financial Officers (FOs) of the participating companies by use of email. The total response from the population of 17 amounted to 10 questionnaires which were all eligible to be used in this research.

4.2 Research Design
The research design used in this study is quantitative and qualitative. Capital budgeting techniques available in the literature were identified during a review of publications, mostly English language. An online literature search was conducted using Scopus (http://info.scopus.com), ScienceDirect (www.sciencedirect.com) and Google Scholar (http://scholar.google.co.za). The following keywords were used to search for literature inside the databases: capital budgeting, capital budgeting techniques, capital investments, investment appraisal methods. References were also identified by searching library collections of Wageningen University.
Research strategy
Since industries may react differently to similar conditions, only mining industry companies were studied. The information about companies used in this research was obtained from the Johannesburg Securities Exchange (JSE) website and the contact details of the FOs were obtained from company websites by use of Google search. A pilot questionnaire was sent to two companies so as to see how the respondents were going to fill in out the questionnaires.

4.3 Operationalization of variables.
The purpose of operationalization is to translate concepts into something observable, something we can measure (de Vaus, 2001). In this research project we would like to investigate the organisational and FO’s characteristics that affect the capital budgeting method used by a company. The dependent variable in our case is the capital budgeting method used by a company.

4.3.1 Indicators
The main capital budgeting indicators were described and defined in the theoretical framework chapter. The theoretical framework chapter concluded that important indicators are, age of the FO, academic qualifications of the FO, tenure of the FO, firm size and firm age.

4.3.2 Measurement of variables

(1) Age of the FO
We are going to measure age in terms of the FO’s total number of years since birth.
In this research, we will consider those FOs who are over 57 years as old people. In Graham and Harvey’s study (2001), CFOs with 59 years and above were considered as old while in Hermes et al., (2007) those who were above 50 years were regarded as older people. Also, in Prather et al., (2009), those with 55 years were considered as old. In this study, I want to move a little bit towards the 59 years but I do not want to
throw away the issue of Hermes et al., (2007) and Prather et al., (2009), therefore, I will go between Graham and Harvey (2001) and Prather et al., (2009). This in my opinion is more reasonable.

Regarding this survey, one questionnaire item was used in gathering the information about the age of the FOs (see Question 2 Part 1, in Appendix).

(2) Academic qualification
In this study, academic qualification is defined as the highest level of education the FO holds.

For the purpose of this research, highly qualified FOs are those with the following academic qualifications: Chartered Accountant (CA), Masters in Business Administration (MBA), Non MBA Masters and PhD. In the study by Graham and Harvey (2001), CFOs with MBA and Non MBA were regarded as highly qualified. In Hermes et al., (2007) CFOs with Non MBA and PhD were considered as highly qualified. My study has included CA in the list of highly qualified because according to South African standards, all those who are to occupy senior positions in the finance section should be CA holders.

Based on this survey, one question was used in gathering information about the academic qualifications of the Finance Officers (see Question 1, Part 2 in Appendix).

(3) Tenure
This is the number of years the FO has been working for his/her company.

In this study, FOs who are above 9 years will be regarded as long tenured. Graham and Harvey (2001) consider those who were above 9 years as long tenured. I have decided to adopt the Graham and Harvey (2001)’s cut off.

Based on this survey, one question was used to gather information about the tenure of the FO (see Question 3, Part 1 in Appendix).
(4) **Firm size**

In order to know the size of the firm, this study basis its definition of firm size to the value of the total assets which the company is in possession of.

Firms with total assets which are less than R11 billion will be said to be small. In the study by Graham and Harvey (2001), firms with total sales less than US$1 billion were regarded as small. After converting Rand to US$ with an exchange rate of 1US$ as to R7 it becomes R7 billion but I have decided to move a little bit further because after visiting the website of one of the mining companies, I realised that their total assets were R30 billion.

Based on this survey, one question was used to gather information about the size of firms (see Question 7, Part 3 in Appendix).

(5) **Firm age**

We are going to measure firm age in terms of the total number of years since the company was incorporated.

In this study, firms who are 21 years or more will be regarded as old firms. In Danielson and Jonathan (2006), companies who were 21 years and more were regarded as large companies. Therefore, my 21 years is based on their research.

Based on this survey, one question was used to gather information about the age of the company (see Question 4, Part 2 in Appendix).

**4.4 Data collection methods**

An extensive literature review was done in The Netherlands based on existing literature from books and journal articles. Data gathered was used to give a quantitative and qualitative understanding of the capital budgeting practice of mining firms in South Africa. Two types of data were collected which are primary and secondary data.

**Secondary data**

This is data which has already been collected by other individuals and is available in published or unpublished records (Singh & Mangat, 1996).
**Literature review**

This was done during the first stage of the research; a thorough literature review was done using different sources listed in the research design part. The literature review was done so as to ensure as much of the available literature as possible is researched, thus providing quality and practical information on the use of different investment appraisal techniques. Past research work done by other authors in line with this subject was used as secondary data in order to have a basic insight into the importance of different techniques used in capital budgeting. Reviewing the accumulated information about a question at hand is an important early step in the research process.

**Primary data**

This is data collected by the researcher from the original source (Singh & Mangat, 1996). Two methods were used in this study to collect primary data and these are questionnaires and face to face interviews.

**i. Questionnaires**

This was used to obtain quantitative and qualitative information. The respondents of the questionnaire were chosen by use of purposive sampling method. This was done so as to make sure that only willing FOs will be considered for participation. This was done by first phoning all the mining companies in South Africa listed on the JSE. Out of the thirty five companies listed on the JSE, only seventeen companies showed their willingness to participate in this research by use of this method which is 49% of the total population. The questionnaire was structured, consisting of both open-ended, close-ended questions and multiple choice questions. As a way of increasing the response rate, direct contact with the participants was done using telephone before sending the questionnaires. This was followed by an email which was personalized and a final reminder was sent reminding the participant to respond in case they had failed to do so. The advantages of using this technique are as follows: cheaper and quicker to administer, there is a reduction in cost and is suitable where the sample is geographically broadly isolated, questionnaires can be sent by use of an email and can be distributed in large quantities at the same time, absence of interviewer effect, bias
which can be as result of the way questions are posed by the interviewer is reduced, the problem of the interviewer asking questions in a different way is overcome and this is convenient to the respondents, respondents can complete the questionnaire at their own convenience and they provide a reliable means of getting information that can be qualitative as well as quantitative in nature and they are easy to analyze using computer software packages such as SPSS (Bryman 2004; McClelland 1994). More information about the questionnaire construction is found in appendix A. Also, the results of the questionnaire responses will be dealt with in Chapter 5 of this research.

ii. Interviews
Three structured interviews were conducted in early April 2011 upon getting consent from the participants. The interviews were aimed at obtaining detailed information about the subject at hand. Interviews were also held as a result of some of the participant who indicated that due to the pressure which they have, they might not be able to remember to fill in out the questionnaire. According to Kumar (2005), this method has got the following advantages: it is more appropriate, in-depth information can be collected, the researcher can explain the questions to the participants and interviews can be used with almost any type of population. Questions asked were those which are on the questionnaire so as to enable the analysis of the results to be much easier. Extra information found which was useful to the research was also taken into consideration during the analysis of results. A proper interview agenda was designed so as to reduce the chances of booking two companies on the same date. Notes were taken during the interviewing process. The interviews helped in getting some valuable information which through a questionnaire only could not have been revealed.

4.5 Data analysis
Data was organized and analyzed using SPSS and Excel. A spreadsheet showing the participants’ answers was compiled and programmed for use in the input to SPSS. Because much of the data collected in this study was descriptive in nature, statistical analysis included a basic descriptive analysis. This will include describing the main
features of the data by use of tables and graphs which are easily understandable by a wide audience. Pearson correlation was used to find out whether there is any relationship between the identified variables and the capital budgeting technique to be used by a company. Inconsistencies and unique statements were noted and given particular attention. The results for Pearson correlation are shown in chapter 5 of this research.

4.6 Conclusion
This chapter highlighted the research methodology used to gather information about the capital budgeting techniques used by South African mining companies. A survey research was done guided by the research objectives. A self-administered questionnaire was designed composed of open and closed ended questions in order to collect detailed information about capital budgeting methods used by South African mines in evaluating their projects. Face to face interviews were conducted with the FOs. A number of variables were used in performing the statistical analysis to find out the effect of organizational and FO’s characteristics on the method of capital budgeting used. Limitations of the research were also highlighted. The next chapter will focus on the analysis of results obtained from the literature study plus the survey done.
Chapter 5
Results and Discussion

5.1 Introduction

In this chapter, the results collected from the study on the capital budgeting practices of South African mines will be evaluated. Major techniques used in the evaluation of projects will be identified as well as the reasons behind their use. The outcome of the hypothesis testing will also be looked at. In the previous chapter, we looked at the methodology used in data gathering and analysis.

Data was collected by means of questionnaires and face to face interviews with the officers responsible for the capital budgeting at each of the identified companies. Out of thirty five companies, 20 companies showed interest in participating in the research. Three companies were not in a position to fill in the questionnaire but participated in face to face interviews. Seventeen questionnaires were sent to the Financial Officers (FOs) of the participating companies. The total response from the population of 17 amounted to 10 questionnaires plus the three interviews held this is 37% of the whole population. Based on 13 companies, it is very difficult for us to make sound conclusions. This research will base its conclusion on the information obtained from these thirteen companies.

The chapter is organized as follows: first is a presentation on the results of the FO and firm characteristics. Secondly, the answers to each and every sub question in Chapter 1 of this research will be provided. Finally, the chapter concludes with an examination of results of other capital budgeting aspects looked at in this research.

5.2 Financial Officer’s characteristics

The profile of the company FO provides information on his/her education, age and level of experience within the firm. The first question dealt with the age of the FO. The results showed that 2 of the respondents were between 25 to 35 years, 8 were between 36 to 46 years and 3 were between 47 to 57 years (Table 5). Based on our categorization shown in chapter 4 of this research, the results show that most of the
FOs who participated in this research are young. The next two questions were
designed to establish the FO’s level of education and experience within the company.

Table 5: Characteristics of the Financial Officers.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
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<tr>
<td>&lt; 25 years</td>
<td>0</td>
</tr>
<tr>
<td>25-35 years</td>
<td>2</td>
</tr>
<tr>
<td>36-46 years</td>
<td>8</td>
</tr>
<tr>
<td>47-57 years</td>
<td>3</td>
</tr>
<tr>
<td>&gt;57 years</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
</tr>
</tbody>
</table>

| Current qualification   |        |
| PhD                     | 0      |
| MBA                     | 0      |
| Non MBA                 | 0      |
| CA                      | 11     |
| B. Compt Honours        | 1      |
| No Qualification        | 1      |
| **Total**               | **13** |

| Tenure                  |        |
| 0 to 4 years            | 5      |
| 5 to 9 years            | 5      |
| 10 to 14 years          | 2      |
| 15 to 19 years          | 1      |
| **Total**               | **13** |

It was established that eleven of the FOs were Chartered Accountants (CAs), one had a
B. Compt Honours and one had no qualification (Table 5). Also, the results showed
that five of the FOs had been working for their companies for less than 5 years, five
had working experience with their companies of 5 to 9 years, two had been with their
companies for 10 to 14 years and one had working experience with his/her company of
15 to 19 years. These results reveal that most of the respondents were eligible to
answer the questionnaire of this current study since the majority was CAs. In our
methodology chapter, we indicated that CA qualification falls under the category of
those who are highly qualified.
Looking at tenure, we can see that most of the respondents were in the category of those who are short tenured. More information about tenure is found in chapter 4 of this study. Based on academic qualification, we can deduce that the FOs had a good academic grounding and were in a position to make informed decision.

5.3 Profile of the companies
The profile of the company provides information on the size of the company in terms of its annual turnover, total assets and its capital budgets. It can be seen from Table 6 that 5 of the companies had annual turnover of less than R1 billion whilst 5 had annual turnover of between R1 billion and R10 billion (Table 6). 1 of the companies had an annual turnover of between R11 billion and R20 billion, while 2 of the companies had annual turnover above R30 billion.

With regards to annual capital budgets, the analysis in Table 6 shows that the respondents fall into two main categories, namely, R0 to R1 billion (8 companies) and more than R1 billion (5 companies). From the questionnaire responses, we managed to see that companies with low annual turnover are also associated with a low annual capital budget. From this, we can assume that the amount budgeted for capital projects depend on the company’s annual total turnover. 7 respondents had total assets of R10 billion and below, while 6 of the respondents had total assets of R11 billion and above (Table 6). Also, Table 6 shows that 6 companies have an asset replacement of 0 to 5 years, 3 with an asset replacement of 0 to 10 years and 4 companies replace their assets within a range of 0 to 15 years. Based on the results of the interviews, it has been shown that asset replacement is usually done in accordance with the useful life of the asset and on average the useful life of most of the mining assets is within the range of 0 to 15 years. Respondents were also asked about the year of incorporation of their companies. The results show that most of the companies were more than 21 years old whilst only 4 were less than 21 years (Table 6). The mean age of these companies is 47 years. Based on the questionnaire responses, it has been shown that 8 companies are below the mean age whilst 5 companies are above the mean age. The youngest
company is 2 years whilst the oldest is 123 years. There is a difference of 121 years between the oldest and youngest company.

Table 6: Profile of the companies

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual turnover</strong></td>
<td></td>
</tr>
<tr>
<td>Less than R1billion</td>
<td>5</td>
</tr>
<tr>
<td>Between R1billion and R10 billion</td>
<td>5</td>
</tr>
<tr>
<td>Between R11 billion and R20 billion</td>
<td>1</td>
</tr>
<tr>
<td>Between R21billion and R30 billion</td>
<td>0</td>
</tr>
<tr>
<td>More than R30 billion</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13</td>
</tr>
</tbody>
</table>

| **Annual capital budget**    |        |
| Less than R500 million       | 7      |
| R501 million – R1 billion    | 1      |
| R1.1 billion – R1.599 billion| 0      |
| R1.6 billion – R2.099 billion| 2      |
| Greater than 3billion        | 3      |
| **Total**                    | 13     |

| **Total assets**             |        |
| Less than R1billion          | 2      |
| Between R1billion and R10 billion | 5 |
| Between R11 billion and R20 billion | 2 |
| Between R21billion and R30 billion | 2 |
| More than R30 billion        | 2      |
| **Total**                    | 13     |

| **Frequency of asset replacement** | |
| 0 – 5 years                      | 6 |
| 0 – 10 years                     | 3 |
| 0 – 15 years                     | 4 |
| **Total**                        | 13 |

| **Firm Age**                    | |
| Below 21 years                  | 4 |
| 21 years and above              | 9 |
| **Total**                       | 13 |
Although most of the companies are below the mean age, based on our cut off age of 21 years written in chapter 4, most of the companies fall under the old age. These results show that most of the companies which participated in this research are well established.

5.4 What kinds of capital budgeting methods are commonly used in practice by South African mining companies?

The results of this study showed that South African mines use NPV, IRR and PB (Figure 6). The NPV was the most commonly used technique by the companies in evaluating major projects with 9 respondents, followed by IRR with 6 respondents; PB with 3 respondents and 1 of the respondents do not use any technique to evaluate its projects (Figure 6). Some of the companies do not rely on one method (Figure 6). One of the companies use all the three methods mentioned above. Two companies used NPV and PB whilst other two companies used IRR and NPV to evaluate their projects (Figure 6). Nevertheless, none of the companies make use IRR or PB when evaluating major projects in their organisations (Figure 6). Furthermore, the respondents were asked to determine how regularly they use the seven capital budgeting techniques dealt with in this research. The answers were based on a five-point Likert scale: always, often, sometimes, rarely and never. To measure the responses, the ensuing percentages were attached to each alternative: “always” (100 per cent), “often” (approximately 75 per cent), “sometimes” (approximately 50 per cent), “rarely” (approximately 25 per cent) and “never” (0 per cent). Table 8 shows the number and the percentage of companies that used each capital budgeting technique.
Figure 6: Venn diagram showing the capital budgeting techniques used to evaluate major investments by South African mining companies.

Note: The total percentage does not add up to 100 due to the fact that some companies were mentioning more than one technique. The percentages were found by dividing the number of respondents who indicated that they use the technique with the 13 respondents who participated in the survey. (For example for NPV, it is 9/13 = 69%).

A score for each capital budgeting technique was calculated as follows (formula adopted from Khamees et al., 2010):

Score = Σ (P x N)/ 12

This formula is based on 12 companies which indicated that they use capital budgeting techniques to evaluate their projects.

where:

P = the alternative percentage (this is the % given to our alternatives: always, often, sometimes, rarely and never).

N = the total number of companies using the technique.

12 = the number of companies who use at least one of the evaluation techniques.
The results of the scores show that there is a great difference between techniques (Table 8). The Discounted Cash Flow (DCF) techniques have been shown to be regularly used by the mining companies in South Africa with NPV attaining a score of 89.6%, IRR with a score of 47.9% and DPB 6.3% (Table 8). The NPV has clearly been shown as the most popular capital budgeting technique used by the mining companies regardless its sophistication (Table 8). DPP was indicated to be used in evaluating other projects thus the reason why it only appears on Table 8. The only Non Discounted Cash Flow (NDCF) which has been shown to be used by the companies is the PB with a score of 17%. The outcome of these results show that DCF techniques are more superior than NDCF techniques, and according to Drury (2004), the DCF techniques have been seen to cover up all the main weaknesses of the payback and accounting rate of return and hence are considered the best tools for value maximization.

These results are in line with the finance theory which states that companies should make use of the DCF techniques, for example the NPV as it is the best technique to use compared to other techniques (Gilbert, 2005). The high rate of the use of DCF methods could be as a result that most of the FOs in these companies are CAs, therefore the complexity of calculations involved in these techniques is not a hindrance to them. As can be seen from the results in Table 5 and Figure 6, the participant who indicated that he does have a qualification has indicated that they do not use any technique in evaluating their projects. Therefore, the lack of education could have contributed to the unuse of any capital budgeting technique. Also, in my opinion, the idea that these companies are involved in large projects which are capital intensive in nature enables them to prefer the DCF techniques because they do not want to risk investing in projects which are not lucrative. Previous research by Andrews and Butler (1986) comprising mining and large industrial companies showed that the most popular method used was the IRR with a 45.3% rating, PB (26.5%), ARR (15.4%) and NPV (7.7%). IRR was also found to be a popular capital budgeting technique by du Toit and Pienaar in (2005). The results of this current study show that there is a shift from the use of IRR to NPV. The reasons for the high score in NPV
could be as a result that in previous studies, few companies in the mining sector participated in these studies resulting in NPV not being popular. The use of NPV could also be as a result of company policy as was mentioned by one of the interviewees. Also, this could be as a result that most of the projects which they undertake are important to them. In the questionnaire and interview responses, we managed to find out that the use of NPV is influenced by the importance of the project. Also, the industry differences could have contributed in low score in the use of the NPV in previous studies as some industries might prefer to use another technique than the other. Surprisingly, techniques such as the Real Option, DPB, PI and ARR were not mentioned as being used by any of the companies. So many reasons might have contributed to the unpopularity of these techniques. Unfortunately, this issue was not covered in this research. Through the questionnaire responses, we managed to get the reason of not using the real option from one respondent who mentioned the maturity of the organization does not make the real option more practicable. Since the life span of a mine is determined during the exploration phase, thus the reason why the real option is not being practicable because management knows well in advance that after so many years, they will not be able to get any mineral from the mine at hand.

Table 8 Frequencies of using capital budgeting techniques by South African mining companies in evaluating all the projects

<table>
<thead>
<tr>
<th>Technique</th>
<th>Always (100%)</th>
<th>Often (75%)</th>
<th>Sometimes (50%)</th>
<th>Rarely (25%)</th>
<th>Never (0%)</th>
<th>Score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>P (%)</td>
<td>n</td>
<td>P (%)</td>
<td>n</td>
<td>P (%)</td>
</tr>
<tr>
<td>NPV</td>
<td>6</td>
<td>50</td>
<td>5</td>
<td>42</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>IRR</td>
<td>4</td>
<td>33</td>
<td>2</td>
<td>17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PB</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>33</td>
</tr>
<tr>
<td>DPP</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PI</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ARR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Real Option</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Respondents were asked to indicate the minimum level of investment in which they use the above mentioned techniques. Figure 7 shows that for all the levels of investments, the NPV has been rated as the mostly used technique followed by IRR. PB was used on investment levels of up to R1 billion. On the level of investments which are above R1 billion, no company has mentioned the use of PB. This could be as a result of the risk associated with the amount of money involved on other levels of investments. This also indicates that the PB is only used on smaller projects, which is in line with studies done by Correira et al., (2007), who found that PB technique is used for evaluating smaller capital projects. Also, the use of PB on small projects is supported by the results of the interviews as one participant indicated that they use PB to evaluate small projects within their firm. The continual use of PB by other companies could be that the technique is easy to estimate and understand as was indicated on the responses given on the reasons behind the use of the selected technique.
Figure 7: Use of capital budgeting techniques by South African mining companies based on level of investment

Respondents mentioned six different operations which included expansion in new operations, expansion in existing operations, foreign operations, and capital investment projects in general, general administrative projects and social projects. PB method is mostly used by South African mining companies in social and general administrative projects with 3 (25%) and 2 (17%) respectively (Figure 8). These are projects which do not require much attention, hence the use of PB which is easy to understand and calculate. The NPV method was shown to be used for all the operations, with the highest being in expansion in new operations with a 9 (75%) rating. This technique was also widely used in capital investment projects in general and expansion in existing operations with 8 (67%) for each operation of the companies using it (Figure 8). IRR was also shown to be used in all the operations with the highest ratings being in expansion in new operations, expansion in existing operations and capital investment projects in general. Previous research by Hall (2000) has shown that IRR was the most technique used in evaluating different operations.
The survey also requested the respondents if there was any change in the capital budgeting technique used by their firms in the past five years. All the respondents indicated that there was no change in the techniques they used. The continual use of these techniques could be as a result of the reason mentioned by one of the interviewees to say that the use of NPV is in line with their company policy.

5.7 What are reasons behind the use of the selected methods?
Different views have come out as the main reasons of using the selected techniques. These range from company policy to theoretical argumentation (Table 9).
Table 9: Reasons for the use of the selected methods by South African mining companies.

<table>
<thead>
<tr>
<th>Method</th>
<th>Reasons</th>
</tr>
</thead>
</table>
| NPV    | -The method accurately takes into account the time value of money and adjustments for risk factors.  
-It enables the company to determine the viability of the project based on the company’s cost of capital. |
| Summary| Accounts for the time value of money and adjusts for risk thereby enabling managers to be able to determine the feasibility of a project. |
| IRR    | -It enables the managers to know whether an investment will increase the firm’s value.  
-It considers all cash flows of the project and takes into consideration the time value of money.  
-The method indicates the actual return of each project.  
-It is a good device for ranking projects. |
| Summary| This method is used because managers are able to tell whether an investment is profitable based on the calculations done using all the cash flows of the project. |
| PB     | -It is easy to calculate and understand and is usually used for small projects.  
-Reduces costs because of its non-complexity |
| Summary| In brief, this method is used because it is easy to calculate and understand. |

Conclusion

The results of this survey have shown that the use of NPV, IRR and PB is as a result of:

(i) Company policy: this is regarded as reason for the use of some of the selected methods. Decisions are made by their holding companies therefore the subsidiaries will then use the recommended techniques.
(ii) Easy to calculate and understand: most of the decision makers who seat in board meetings do not have the technical knowhow of financial issues therefore some companies would prefer to use simple techniques.

(iii) Shareholders prefer to know the value of the Rand today which they will get for example in five years’ time. This results in the use of techniques which discounts the cash flows.

(iv) The techniques which consider the cash flows to be attained by a project within its useful life is preferred because you can anticipate how the project is going to perform in the near future.

5.6 Are the methods used related to the organisational and decision maker’s characteristics?

This part presents the outcome of our hypothesis testing. We failed to use Pearson correlation as a result of our data set which was very small. Therefore, we did not manage to validate our research model in chapter 1. This part is going to give a description of the information which is found from our questionnaire and interview responses for each and every hypothesis formulated in this study.

*Hypothesis 1: FOs who are young prefer to use more sophisticated techniques than older FOs.*

Sophisticated capital budgeting techniques are those that employ present value analysis and account for risk for example NPV, DPP, IRR and PI (Haka et al., 1985). The results of our survey show that all the companies who participated in this research indicated that they either use NPV or IRR. No company indicated the use of PB alone. Table 10 shows that respondents fall into three categories. These are young, middle aged and a little bit old FOs. Two respondents fall into the category of young people (25 to 35 years), eight fall into the category of middle aged (36 to 46 years) while three fall into the category of a little bit old people (47 to 57 years). In table 10, it can be seen that FOs who falls in the category of young people prefer to use the NPV and IRR while those in the category of middle aged and a little bit older prefer to use the NPV, IRR and PB. In chapter 4 of this study, we indicated that FOs who are above 57
years will be regarded as old. Looking at our results in Table 10, it is shown that all the participants fall into one category which is young people. This data set was not good enough for us to be able to compute statistical tests because it was one sided meaning to say that the sample falls under one category. Therefore, the null hypothesis is not rejected because there is no evidence to reject the null hypothesis.

<table>
<thead>
<tr>
<th>Age category</th>
<th>No. of respondents</th>
<th>Techniques used</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 to 35 years</td>
<td>2</td>
<td>NPV and IRR</td>
</tr>
<tr>
<td>36 to 46 years</td>
<td>8</td>
<td>NPV, IRR and PB</td>
</tr>
<tr>
<td>47 to 57 years</td>
<td>3</td>
<td>NPV, IRR and PB</td>
</tr>
</tbody>
</table>

**Hypothesis 2: FOs who are more qualified prefer to use more sophisticated capital budgeting techniques.**

Results in Table 11 show that we have three groups of respondents with regards academic qualification. We have those who are highly qualified, lowly qualified and no qualification. In Table 11 we can see that 11 respondents have a CA qualification, 1 has a low qualification and 1 has no qualification. Table 11 also shows that FOs with a CA qualification make use of the NPV, IRR and PB when evaluating their projects whilst the one with a B. Compt Honours make use of the NPV method. The one with no qualification does not make of any technique in evaluating projects. From this, we can see that there was no difference in the use of sophisticated methods between the highly qualified and the one with a low qualification. In chapter 4 of this study, we highlighted that a CA qualification falls under those who are highly qualified. Therefore, in this study we can see that the majority of the participants were highly qualified and in terms of the use of the sophisticated methods, all the 12 participants who indicated that they make use of the capital budgeting techniques to evaluate their projects have shown that they make use of these sophisticated techniques. Making a comparison of this data set was difficult since the majority of the respondents fall into one category. With regards our hypothesis, rejecting the null hypothesis is not
possible because of lack of evidence therefore, FOs who are more qualified do not prefer to use more sophisticated capital budgeting techniques

Table 11: Analysis of respondents’ academic qualifications

<table>
<thead>
<tr>
<th>Academic qualification</th>
<th>No. of Respondents</th>
<th>Techniques used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartered Accountant</td>
<td>11</td>
<td>NPV, IRR and PB</td>
</tr>
<tr>
<td>B. Compt Honours</td>
<td>1</td>
<td>NPV</td>
</tr>
<tr>
<td>No qualification</td>
<td>1</td>
<td>None</td>
</tr>
</tbody>
</table>

**Hypothesis 3: The longer an FO's tenure in the firm, the greater the possibility that there is no change in the capital budgeting technique used by the firm.**

The respondents tenure’s results were widely spread. 5 of the respondents were with their companies for a period between 0 to 4 years, 5 between 5 to 9 years, 2 between 10 to 14 years and lastly 1 was with his/her company for a period between 15 to 19 years. The results show that the majority of the respondents have been with their companies for a period which is less than 10 years. In chapter 4, we indicated that respondents who have been with their companies for a period which is above 9 years will be regarded as long tenured FOs, therefore in this study; only 3 respondents were seen to be long tenured. We were assuming that in the case that the FO is long tenured, they will not be any change in the technique to be used by the company. Our results show that for all the companies, there was no change in the technique used. Based on the information which we have, it is not possible to reject the null hypothesis therefore the change in the capital budgeting technique used by the firm is not influenced by the tenure of the FO.
Table 12: Analysis of respondents’ tenure

<table>
<thead>
<tr>
<th>Tenure</th>
<th>No. of respondents</th>
<th>Change in capital budgeting technique (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4 years</td>
<td>5</td>
<td>No</td>
</tr>
<tr>
<td>5 to 9 years</td>
<td>5</td>
<td>No</td>
</tr>
<tr>
<td>10 to 14 years</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td>15 to 19 years</td>
<td>1</td>
<td>No</td>
</tr>
</tbody>
</table>

**Hypothesis 4: The size of the company influences the capital budgeting technique to be used in the organization.**

The results in Table 13 show that companies falls in different categories of total assets. The highest number of companies falls in the category of between R1 billion and R10 billion (5 companies). Two companies have total assets which are less than R1 billion while two have total assets of more than R30 billion. In our definition of firm size in chapter 4, we indicated that companies with total assets which are R11 billion and above are regarded as large companies. From our results in Table 13, we can see that 6 companies have total assets which are R11 billion and above. The data for this hypothesis was nicely spread such that we were in a position to do the hypothesis tests but there was another drawback which was still there, all the categories of the companies have indicated the use of NPV. This was going to affect the outcome of our results. The category of Between R21 billion and R30 billion has indicated the use of NPV & PB whilst the rest have indicated the use of NPV and IRR (Table 13). Nevertheless, we were limited by the number of our responses. Due to lack of evidence in rejecting the null hypothesis, we have failed to reject the null hypothesis therefore the size of the company does not influence the capital budgeting technique to be used in the organization.
Table 13 Analysis of total assets results

<table>
<thead>
<tr>
<th>Assets</th>
<th>No. of companies</th>
<th>Techniques Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than R1 billion</td>
<td>2</td>
<td>NPV and IRR</td>
</tr>
<tr>
<td>Between R1 billion and R10 billion</td>
<td>5</td>
<td>NPV and IRR</td>
</tr>
<tr>
<td>Between R11 billion and R20 billion</td>
<td>2</td>
<td>NPV and IRR</td>
</tr>
<tr>
<td>Between R21 billion and R30 billion</td>
<td>2</td>
<td>NPV and PB</td>
</tr>
<tr>
<td>More than R30 billion</td>
<td>2</td>
<td>NPV and IRR</td>
</tr>
</tbody>
</table>

Hypothesis 5: Older firms tend to use more sophisticated techniques than young companies.

The companies can be grouped into six categories (Table 14). These are: 0 to 20 years (4), 21 to 41 years (2), 42 to 62 years (3), 63 to 83 years (2), 84 to 104 years (0) and >104 years (2). This division is based on our cut off age of 21 years in chapter 4 where we indicated that companies who are below 21 years are small. Smallest companies fall in the category of 0 to 20 years while largest fall in the category of >104 years. The results show that there is a big gap between the age groups. In our methodology chapter, we indicated that companies who are 21 and above are large companies. 9 of the companies fall in this range. The results of our questionnaire and interviews show that companies make use of NPV or IRR which are sophisticated techniques (Table 14). This resulted in us having difficulties in testing the hypothesis because there was nothing to compare with as the techniques indicated as being used are all sophisticated. Therefore, because of lack of evidence, the null hypothesis is not rejected. Older firms do not use more sophisticated techniques than young companies.
Table 14 Analysis of company age

<table>
<thead>
<tr>
<th>Age category</th>
<th>No. of companies</th>
<th>Techniques Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 20 years</td>
<td>4</td>
<td>NPV and PB</td>
</tr>
<tr>
<td>21 to 41 years</td>
<td>2</td>
<td>NPV, IRR and PB</td>
</tr>
<tr>
<td>42 to 62 years</td>
<td>3</td>
<td>NPV and IRR</td>
</tr>
<tr>
<td>63 to 83 years</td>
<td>2</td>
<td>IRR</td>
</tr>
<tr>
<td>84 to 104 years</td>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>&gt;104 years</td>
<td>2</td>
<td>NPV, IRR and PB</td>
</tr>
</tbody>
</table>

**Summary**

The nature of our data has resulted in us not being able to compute any statistical tests. This was contributed much by the number of people who participated in this research. Thirteen out of thirty five was a small number for us to be able to run the Pearson correlation.

**5.7 What are the different methods available in literature which managers are not making use of despite the usefulness of these methods?**

Although most of the FOs who participated in this study indicated that they make use of the capital budgeting techniques available to evaluate their projects. Managers are not making use of the DPB and PI which have been shown to be better techniques according to the literature review. Maybe, companies are only focusing on those techniques which have been recommended earlier therefore there is no anticipation to make any changes in their capital budgeting decision making.

**5.8 Can we, based on our research, advice the companies to use a specific method, and in what situation?**

Based on our literature review in Chapter 2 (Table 5) we advice companies to use the following specific methods. DPB should be used on all the projects when the economic situation is not certain. Under normal circumstances, it can be used on all small projects which involve less amount of money. The NPV technique should be
used in all large projects which involve large sums of money because this is the only technique which assumes realistic reinvestment of intermediate cash inflow. PI should be used on small, social and administrative projects because of it not being consistent with the wealth maximization goal. The IRR can be used on small projects. ARR and PB can be used in social and administrative projects where the company is not worried about the profitability of the project. The real option which has been seen as an important tool to make decisions on whether to abandon or continue with the project can only be used after the project has already been implemented in the post audit phase.

Based on the above discussion, we can come to a conclusion that mining companies in South Africa should frequently make use of the following techniques because of their proved strength: NPV, DPP, and PI.

5.9 Other aspects of the capital budgeting decision

The respondents were also asked whether capital budgeting has an impact on asset replacement. Different views were put forward with regard to this question. Out of the twelve respondents who answered this question, 7 (58%) indicated that capital budgeting has an effect on asset replacement while 5 (42%) indicated it does not have an effect (Table 11). The main effects of capital budgeting on asset replacement mentioned by the respondents who answered YES are as follows:

- The decision to replace an asset depends on the outcome of the evaluations done using the capital budgeting techniques. The benefit of replacing an asset or not replacing it is determined by the calculations done using these techniques.
- The evaluation of the benefits of the old and new machine can result in an asset not or being replaced.
- More systematic approach eliminates much of the guesswork.
Table 11: The impact of capital budgeting on asset replacement.

<table>
<thead>
<tr>
<th>Impact of capital budgeting on asset replacement</th>
<th>No. of companies</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>7</td>
<td>58</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>42</td>
</tr>
</tbody>
</table>

Stages in the capital budgeting process

As can be seen in Figure 9, 6 (46%) of the participants view financial appraisal of projects as the most important stage in capital budgeting, followed by strategic planning 5 (38%) Financial appraisal of projects 5 (38%) and project implementation and monitoring 5 (38%) are regarded as the most risk stages in the capital budgeting process (Figure 9). This is in contrast with the findings of Hall (2000), and Hall and Millard (2010). Hall (2000) found that the project definition and cash flow estimation were considered to be significantly more risky (46.2 per cent) than any other stage. In the study of Hall and Millard (2010), it was shown that project definition, cash flow estimation and project implementation were more risk compared to other stages. Overall, the financial appraisal of projects has been rated as the most important and most risk stage of the capital budgeting process (Figure 9). This shows that the FOs have a detailed understanding of the attention that should be put in place when capital projects are appraised because the success of the decision made depends on the accurate approximation of the cash flows. Although the respondents look at the strategic planning as most important, it was not regarded as most risk. Surprisingly, the post – implementation audit stage regarded as an important stage of capital budgeting process by Hall (2000) was regarded as not important in this study (Figure 9), and 1 (7.7%) rated it as most risk. The preliminary screening of projects was rated equally by the participants with 2 (15%) indicating that it is most important and most risk (Figure 9). The accept/ reject decision has been rated by 2 (15%) of the respondents as most important and 1 (7.7%) as most risk.
Besides quantitative factors, the use of the capital budgeting techniques can be affected by other factors. In this research, five factors have been identified which are: finance theory, experience, and importance of the project, easy to understand and top management understandability. Finance theory recommends that managers should undertake capital investment projects only if they add to the value of the firm (Gilbert, 2005). The theory implies that managers should use DCF techniques such as NPV to establish the expected value. Respondents were asked to rank the above factors according to their degree of influence on the use of the available capital budgeting techniques. Figure 10 shows that the use of NPV is based on considering the following factors: importance of the project (24), experience (18) and lastly top management understandability (15). The use of IRR was said to be based on these factors; importance of the project (15) and experience (12). PB was said to be used based on the factor of easy to understand (9). The results also show that the use of DPB is based on top management understandability and easy to understand both having a score of 3 each (Figure 10). It is surprising to note that FOs have ranked low on the finance theory considering the fact that this theory stipulates that they should
use the DCF techniques. Looking at the two major techniques which have been identified as being used by most of the companies who participated in this research, the importance of the project and the experience of FOs have been seen as the most factors affecting the use of these techniques.

![Figure 10: Other factors influencing the degree of use of a capital budgeting techniques by South African mining companies.](image)

*Note: 1 = Low rank, 2 = Medium rank, 3 = Higher rank*

Respondents were asked whether they conduct post audits of major capital expenditures. The answers were based on a four-point Likert scale: always, occasionally hardly and not once. Figure 11 shows the results of this question: 9 (75%) indicate always, 2 (17%) occasionally and 1 (8%) indicate that they hardly do post audits. These results correlate strongly with the findings of Lambrechts (1972), who found that 74% of the companies conducted post audits.
Respondents were also asked to determine the extent they consider the qualitative factors when evaluating their projects. Figure 12 shows the results of the extent to which the qualitative factors are being considered. The results show that impact on the organisation’s image if the project is socially questionable and the environmental impact of the project are being considered most with 12 and 10 companies mentioning them respectively. Surprisingly, the results show that companies are not concerned with issues which have to do with their employees as the societal impact of an increase or decrease in employees and positive or negative relationships with labour unions about the project have been rated the lowest with 4 respondents each on very extensively scale. On the scale to a great extent, 7 of the respondents indicate that they will consider the societal impact of an increase or decrease in employees while 9 indicate that they will consider the positive or negative relationships with labour
unions about the project. 7 of the respondents have indicated that they will consider possible legal difficulties with respect to use of patents, copyrights and trade or brand names.

Figure 12: Extent of considering qualitative factors when evaluating projects.

In this study, respondents were also asked to specify the usual purposes of their projects. Projects can be done for the purpose of expanding into a new business/diversification, replacing equipment or expansion into existing business. The results in Figure 13 shows that 9 companies engage in their projects for all the purposes whilst 2 indicate that the projects are only for the purpose of equipment replacement and expansion of existing business, and 1 of the respondents have indicated expansion into new business or diversification and equipment replacement as their usual purpose of their projects.
5.10 Conclusion
Considering the capital budgeting techniques we find out a strong preference of the DCF techniques among South African mining companies. We found out that the use of DCF techniques is stronger in both small and large companies. The major reasons for the use of these techniques range from company policy, the ability of technique to take into consideration the time value of money and the use of all cash flows in its calculations. The old fashioned PB has also been mentioned as being used by some companies in this sector. The reasons for its continual use were its simplicity and being easy to understand. In all samples we find that firms are more likely to use NPV and IRR on large projects while the PB is mostly used on small projects. The use of NPV has been seen to be more frequent compared to IRR and the PB technique. The preference of DCF techniques over NDCF is more comparable to the techniques preferred by U.S. firms. Although these results of this study were different from those of other previous South African studies (e.g., Andrews & Butler 1986; du Toit & Pienaar 2005; Hall & Millard 2010; Lambrechts 1976), there were the same as those of Correia and Crammer (2008) who also found the popularity of the use of the NPV and

Figure 13: Usual purpose of projects
IRR among South African companies. Furthermore, we find no evidence of the influence of the firm and decision maker’s characteristics on the method used by the company.

Based on the survey which we have conducted in this chapter we can come to some concluding remarks about the capital budgeting practice of South African mines. South African mines have moved from the use of IRR to NPV technique. The continual use of DCF techniques by these companies shows that this category is more superior to the NDCF techniques. The fact that this industry is involved in large projects which are capital intensive in nature might have contributed to the use of DCF techniques. However, traditional rule of thumb technique like the payback period has also maintained its position as an easy to understand method. Comparatively other DCF techniques such as the DPP and PI which have been proved by the literature study that there are best techniques to be used in the evaluation of projects have been shown not to be accepted by the mining companies. The next chapter is going to focus on the conclusion of the whole research and some recommendations will be made.
Chapter 6
Conclusion and Recommendations

6.1 Introduction
The present research was executed in order to find out the kind of methods commonly used in practice by mining companies in South Africa in making capital budgeting decisions taking into consideration the firm and decision maker’s characteristics and their influence on the method selected, and to find the best capital budgeting methods for South African mining companies to be used in different situations. In order to be able to answer our central research question, several sub questions were formulated. This chapter provides answers to each and every sub question found in this study. The main findings will be arranged as follows: we will start by looking at the general information about the companies and Financial Officers (FOs), followed by giving answers to all the sub questions and we then look at other capital budgeting aspects looked at in this study. Lastly, we will give an answer to our central research question. Further, some recommendations to this sector will be made based on the outcome of the study and some limitations of this study will be looked at. The chapter will end with an overall conclusion.

6.2 The Main Findings

General information about the FOs and companies
The FO profile of the respondents indicates that 11 are Chartered Accountants (CAs). Hence, it would seem that based on their academic qualifications, the respondents for this study were suitably qualified enough to be able to make valuable capital budgeting decisions and to use suitable techniques to evaluate their projects. The results also show that only 1 of the respondents has been working for his/her company for a period which was between 15 to 19 years. Also, the results show that all the respondents are below the age of 57 years which means that all the respondents were young according to our categorization in chapter 4 of this research. Looking at the companies profile the results have indicated that 5 of the companies had annual turnover of less than R1 billion whilst 8 companies have annual turnover which is above R1 billion. Also, the
majority of the respondents were having annual capital budgets which were between R0 to R1 billion. Total assets were R11 billion and more for 6 of the respondents while 7 of the respondents' total assets were less than R11 billion. Also, the majority of the companies were old in terms of their age from the date of incorporation.

**What important information can be obtained from scientific literature on capital budgeting and the different techniques available?**

Capital budgeting has been seen as an important decision made by managers with the aim of maximizing shareholder value. In order to accomplish this objective, managers are supposed to use suitable techniques when evaluating their projects in order for them to be able to come out with sound decisions. The techniques available to managers found in literature are: Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PB), Discounted Payback Period (DPB), Profitability Index (PI) and Accounting Rate of Return (ARR). These can be used in helping managers in making decisions on project to undertake. Although all these techniques can be used to evaluate the viability of projects, the information from the literature study has highlighted that these techniques have their own strength and weaknesses which management have to take into consideration when planning to use a certain technique. The real option has only been mentioned to be a tool used by the managers to make a decision on whether to abandon or continue with the project.

**What are the pro’s and con’s of the methods that are out there?**

In order to come up with the best techniques for South African mines, it was best to look at the pros and cons of each technique over and above Bhandari’s qualities. PB has been seen to be a good technique because it is easy to calculate and understand. Its limitations were that it does not take into account the time value of money and its failure to use all the cash flows to be obtained by the project during its useful life. ARR has been seen to be easy to understand and calculate. It also measures the performance of the investment. This has been criticized for using accounting profits not cash flows. The NPV has been seen to have the following major advantages: it takes into account the time value and uses all cash flows of the project and is in line
with the wealth maximization goal. Its pitfalls are its difficulty in making calculations and understanding. PI takes into account the time value of money and is easy to understand. The major disadvantages of this technique are that it is difficult to calculate and does not ensure liquidity. IRR has been seen to be a good technique because it takes into account the time value of money and it measures profitability of a project. IRR have been criticized for not being suitable to evaluate mutually exclusive projects. DPB takes into account the time value of money and it measures profitability of the project. It ensures liquidity and is easy to understand. The major limitation of DPB is that it does not consider the cash flows after the DPB period. Real option enables decision makers to put together a number of options into a single investment and it allows a greater flexibility and improved method in valuing projects. Its main limitations are it requires a lot of skills and is only suitable when managers want to make a decision on whether to abandon or expand a project.

What kinds of capital budgeting methods are commonly used in practice by South African mining companies?

The NPV technique has been the most preferred method by academics. This has been seen as the most efficient technique as decision makers can accept all positive NPV projects for maximizing shareholder value. In South Africa, previous studies have shown that NPV was not as popular as IRR. This has been shown in the studies done by (see Andrews & Butler 1986; du Toit & Pienaar 2005; Hall & Millard 2010; Lambrechts 1976). The IRR has been the most preferred technique by South African companies this can be as a result that it is easy to understand and it enables managers to know whether an investment will increase the firm’s value. Its ability to take into consideration all cash flows of the project and its capability of taking into consideration the time value of money may be another reason for its popularity among South African companies in previous studies. The traditional rule of thumb the PB has continued to be used by most companies besides its limitations. This could be as a result that the method is easy to calculate and understand. Also, PB has the capability of showing the managers how long it will take for the project to be able to payback its
initial cost that could the major reason for its continual use within the companies. However, academics has seen this as an inferior technique because of its shortcomings of not using all the cash flows of the project and not taking into consideration the time value of money.

Based on the 13 companies who participated in this research, South African mines have indicated that they use NPV, IRR and PB when evaluating their projects. In this survey, the NPV method has been shown as the most favored capital budgeting technique followed by IRR. The NPV and IRR are used on all the levels of capital projects (small, below R1 billion and large, R1 billion and above) while the PB is popular in small projects.

As investment appraisal is seen as an important factor in the future growth of companies, FOs in this study have indicated using more than one technique when evaluating their projects. This could necessitate in coming up with sound decisions.

**What are reasons behind the use of the selected method?**

As it is possible that FOs can use a certain technique due some reasons which can be different from other companies. The results of this survey have shown that the three techniques mentioned in this study are used because of the following reasons. These reasons are mostly based on theoretical underpinning and company policy. The main reasons for the use of the mentioned methods were as follows: NPV: it accounts for the time value of money and adjusts for risk thereby enabling managers to be able to determine the feasibility of a project. Because shareholders prefer to know the value of a Rand today which they might get for example in 10 years’ time, that’s the reason for the preference of the NPV technique. Also, the capability of this technique to take into consideration all the cash flows to be attained by the projects during its useful life has rendered this technique to be most popular. Company policy has also contributed to the use of this technique among South African mining firms. IRR: it enables managers to state whether an investment is profitable based on the calculations done using all the cash flows of the project. The method has been said to be used because it indicates the actual return of each project and is a good device for ranking projects. Projects need to be ranked in order to see which is more viable. PB is used because it is easy to
calculate and understand. Also, the PB method enables managers to know how long it will take for a project to return its initial cost which in my opinion is very important because the shorter the period it will take, the lesser the risk that the firm will lose at the end of the day.

**Are the methods used related to the organisational and decision maker’s characteristics?**

We failed to come out with the results on whether organizational and decision maker’s characteristics influence the capital budgeting method to be used by a company. This was as a result of our data set which was very small. Out of thirty five mining companies listed on the Johannesburg Securities Exchange, only thirteen companies participated in the research. Therefore, the null hypothesis is not rejected. There is no relationship between the method used and the organizational and decision maker’s characteristics. This decision has been necessitated by the lack of evidence to support our alternate hypotheses.

**What are the different methods available in literature which managers are not making use of despite the usefulness of these methods?**

The literature study has provided several techniques which can be used by decision makers in evaluating their projects. The strength and weaknesses of these techniques have been highlighted. Based on the literature study and the results of the survey, we managed to come up with the techniques not being used by the managers although these techniques are regarded as the best to use. Managers are not making use of the DPB and PI which have been shown to be better techniques according to the literature review. So many reasons could contribute to the unuse of these techniques but unfortunately, this aspect was not covered in this research. One of the reasons could be that companies are only focusing on those techniques which have been recommended by their board previously as some companies indicated in the questionnaire responses that the techniques they are using are in line with their company policy.
Can we, based on our research, advice the companies to use a specific method, and in what situation?

The literature study conducted has highlighted the weaknesses and strength of each and every technique available to managers which they can use to evaluate their projects. Based on the outcome of this research, we can now give the following advice to companies. The NPV technique should be used on all large projects which involve large sums of money. Although NPV has been rated as one of the best techniques, it is not suitable to use on small projects because of the amount of time needed to do the calculations. DPB should be used on all the projects in situations where the use of other techniques is not possible. Under normal circumstances, it can be used on all small projects which involve less amount of money. PI should be used on small, social and administrative projects because of it not being consistent with the wealth maximization goal therefore it is not suitable for large projects. The other techniques available to managers not mentioned above such as the IRR, ARR and PB can be used on the following situations. The IRR can be used on small projects. ARR and PB can be used in social and administrative projects where the company is not worried about the profitability of the project. The real option which has been seen as an important tool to make decisions on whether to abandon or continue with the project can only be used after the project has already been implemented in the post audit phase.

In general, based on Bhandari (2009) qualities this study advice South African mining companies to frequently make use of the NPV, DPB and PI as these techniques have been proved to be the best.

Other aspects of the capital budgeting

Capital budgeting has been seen to have an effect on asset replacement. Financial appraisal of projects and strategic planning were regarded as the most important stages whilst project implementation and monitoring and financial appraisal of projects were regarded as most risk stages in the capital budgeting process. The use of capital budgeting techniques has been seen to be affected by other factors such as importance of the project, experience, top management understandability and lastly easy to
understand. Further, the results have shown that companies conduct post audits of their major projects as a way of monitoring the performance of these projects.

Qualitative factors seem to play an important role in the evaluation of capital budgeting projects according to literature. In this study, respondents have regarded impact on the organisation’s image if the project is socially questionable and the environmental impact of the project as important when evaluating their projects. The usual purpose in which different projects were undertaken was in expanding into a new business/diversification, replacing equipment and expansion into existing business.

Central research question:

What are the best capital budgeting methods for South African mining companies and in what circumstances?

In order to come up with the best capital budgeting techniques for South African mines, we used our survey results plus the outcome of the literature study. The results of this study have shown that South African mines are making use of the NPV, IRR and PB when evaluating their projects. The nine qualities of the Bhandari study (2009) have helped us in ranking the capital budgeting techniques which are available to the managers. According to this study’s rankings, DPP has been ranked as the best technique followed by NPV and PI. Because DPB does not take into consideration the cash flows after the payback period, this has rendered it not to be the best technique to use especially when evaluating large projects which involves large sums of money. This major limitation of DPB has rendered the NPV to be a better technique as it has managed to overcome this major weakness of the DPB. PI has managed to score the same as the NPV but its main shortcoming is of not being consistent with the wealth maximization goal therefore this also renders it to be a weaker technique than the NPV. The NPV technique should be used in all large projects due to its strengths which have been mentioned earlier on in this study. DPB should be used on all the projects when the economic situation is not certain but under normal circumstances,
this can be used on all small projects. PI should be used for small projects, social and administrative projects because of its shortcomings.

In summing up, based on the Bhandari (2009) rankings, South African mines should make use of the NPV, DPB and PI.

6.3 Recommendations

It seems that there are some limitations with regards to the evaluation of capital projects by South Africa mining companies. The major pitfall is the un-recognition of the importance of other capital budgeting techniques which can be used to evaluate projects before and after they have been implemented. Therefore, the study recommends that:

- FOs should make use of the DPB on all the projects when the economic situation is not certain. Under normal circumstances, it can be used on all small projects which involve less amount of money. A project involves less amount of money if its failure will not put the company into a serious financial crisis.
- PI should be used on all small projects (below R1 billion), social and administrative projects.
- IRR should be used on all small projects (below R1 billion).
- FOs in South African mines should make use of methods such as the Real Option to assess the viability of the projects which are already running so as to reduce the risk of continuing with a project which is no longer profitable.
- FOs should make use of ARR and PB especially to evaluate social and administrative projects since these methods serves costs in terms of the time spent in doing some computations.
- Managers should consider qualitative factors seriously when evaluating their projects as some of them have got serious repercussions to the company if not being considered for example the environmental impact of the project can result in loss of huge sums of money especially if the project involve emission of gasses which can pollute the environment.
6.4 Limitations of the research
Before coming to a conclusion, it is essential to note a number of limitations of this study. The main limitation is that the study is limited to listed companies. The capital budgeting practices of listed companies are not likely to be a representative of all the mining companies in South Africa. Another possible limitation of this research is the trustworthiness of the data found. Inaccurate results could be a result of the survey respondents misunderstanding the questionnaire questions or terminology. In addition, Aggarwal (1980) points out that responses to questionnaires by individuals in large companies do not always reflect the practices used throughout the sector. This is so because people have got different tastes and feelings hence, resulting in them acting differently. Also, the fact that the process of capital budgeting were not observed can result in making conclusions on incorrect information since the researcher is only depending on the information furnished by the company’s employees. Also, most of the questions were directed to the FOs therefore, the responses are individual opinions which does not wholly reflect the firm’s actual position. The total number of companies who participated in this research is another limitation. Out of the 35 companies listed on the JSE, only 13 companies participated in the research. The number of companies who participated is not a true representation of the whole population.

6.5 Conclusion
The present results of this survey which studies the capital budgeting practices of South African mines shows that this industry has seem to adopt the use of Discounted Cash Flows (DCF) techniques for the appraisal of their projects together with the oldest Non Discounted Cash Flows (NDCF) method which is the Payback Period. However, the survey has brought some interesting results, although South African mines are making use of some DCF capital budgeting methods, there has been some reluctance by these companies in making use of modern methods such as the real option. This technique is of importance to the managers because it takes into account the managerial flexibility and strategic factors which are ignored by the DCF techniques. The DCF techniques used by the companies are the NPV and IRR. NPV
was seen to be the most popular technique within this industry. The use of the PB was most common in small, social and administrative projects. There is little recognition of some sophisticated techniques such as DPB and PI. These methods although not being common among this sector, they take into account the time value of money and they use cash flows in their calculations.

South African mines should make use of the DPB on all the projects when the economic situation is not certain. Under normal circumstances, it can be used on all small projects which involve less amount of money. The NPV technique should be used in all large projects (R1 billion and above) which involve large sums of money because of its superiority. PI should be used for small projects, social and administrative projects because of it not being consistent with the wealth maximization goal. The IRR can be used on small projects. ARR and PB can be used in social and administrative projects where the company is not worried about the profitability of the project. Overall, the use of NPV, DPB and PI should be more frequent as these techniques have been proved to be the best.

In ending the conclusion of this study, it is of importance for us to compare the results of this study with other South African and international surveys. The results of this study are generally consistent with those of Graham and Harvey (2001) survey of US companies. Graham and Harvey (2001) found that NPV and IRR are the most popular techniques used to evaluate projects with about 75% of the Chief Financial Officers (CFOs) mentioning the use of these techniques. While in South Africa the study by Correia and Crammer (2008) has brought to light that NPV and IRR were the most popular techniques with 82.1% of the Financial Officers (FOs) making use of them. This study found that FOs in South African mines follow practices that are coherent with the finance theory. However, further research is required to investigate the reasons behind the unpopularity of other techniques such as the DPB, PI, Real option and ARR. Also, further research is required to find out whether there is a relationship between the capital budgeting method used and the organizational and decision
maker’s characteristics as we failed to prove this in this study due to the sample size which was very small.
References


http://www.wmo.int


APPENDIX

A. Questionnaire

B. Definition of concepts
A. QUESTIONNAIRE

WAGENINGEN UNIVERSITY

DEPARTMENT OF MANAGEMENT STUDIES

CAPITAL BUDGETING PRACTICES: A SOUTH AFRICAN PERSPECTIVE

My name is Vongai Maroyi. I am studying Management, Economics and Consumer Studies at Wageningen University in the Netherlands. I would like you to help me by filling in this questionnaire which is meant for me to gather information about the capital budgeting method you are using in your companies. This information is only meant for studying purposes, the research will enable me to complete my Masters programme. Capital budgeting decisions determines the future success of most companies. The research I am doing is meant to highlight the capital budgeting methods used by mining companies in South Africa and the reasons behind using the selected method. When completing this questionnaire, please indicate your preferred answer by highlighting it in color. Please, help me by filling in all the questions which are in this questionnaire.

The participation in this research is voluntary, if you feel that you do not want to answer a particular question, I will gratefully accept your decision. Thank you for participating and taking your time in filling in the questionnaire, information collected is strictly private and confidential. It will not be disclosed to third parties. The questionnaire will only need about 25 minutes of your time. Below is an appendix meant to familiarize you with some of the terms used in this questionnaire?

The questionnaire is divided into three parts:

Part 1 Decision-maker profile
This will give the profile of the finance officer or whoever is responsible for investments in your organization. Please note that this part has to be filled in by the person who is responsible the investments in your company.

Part 2: General information about the organization.

Part 3: Capital budgeting techniques used in practice.
For any further questions, please contact me on this email address: Vongai.maroyi@wur.nl.

*Please note, some explanations of other terms used in this questionnaire are found in the appendix.*

In this research, the questionnaire has been grouped into parts. Grouping questions that are similar will make the questionnaire easier to complete, and the respondent will feel more comfortable (Walonick, 2010). The questions that cover the same topic have been grouped together so as to improve the response rate. Previous studies have shown that the order of the questions can affect the way people respond (Walonick, 2010). The decision maker and the company profile have been included as part 1 and 2 because this is in line with the writings of Ng Chirk (2006) who states that it is good to start with simple questions before moving to more complex questions.

**Part 1 Decision maker profile**

1. Can you please specify your educational level?

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartered Accountant</td>
<td>1</td>
</tr>
<tr>
<td>Bcompt Honours</td>
<td>2</td>
</tr>
<tr>
<td>MBA</td>
<td>3</td>
</tr>
<tr>
<td>Non MBA Masters</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>5</td>
</tr>
</tbody>
</table>

- This question is included so as to gather the demographic information of the decision maker.
- The study by (Graham and Harvey 2001; Brounen *et al.*, 2004; Hermes 2007) has shown that the educational level of the decision maker can have an influence on the capital budgeting method to be used by a company.
- This question intends to determine whether there is any relationship between the educational level of the decision maker and the method to be used by a company. The research wants to test whether this hypothesis is true.
• This question has been structured in this manner because these are the levels of educational qualifications found in South Africa (general knowledge). The participant can choose his or her highest qualification. In the case that the respondent indicates more than one, the highest qualification will be considered in this research. Also, according to Walonick (2010), multiple choice items are the most popular type of survey questions because they are generally the easiest for a respondent to answer and the easiest to analyze.

• This part will help in answering the 3rd question under the empirical survey section.

2. In which age group do you fall under?

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 25 years</td>
<td>1</td>
</tr>
<tr>
<td>25 to 35 years</td>
<td>2</td>
</tr>
<tr>
<td>36 to 46 years</td>
<td>3</td>
</tr>
<tr>
<td>47 to 57 years</td>
<td>4</td>
</tr>
<tr>
<td>&gt;57 years</td>
<td>5</td>
</tr>
</tbody>
</table>

• This question seeks to get some information about the age of the CFO.

• Previous studies have shown that there is a relationship between the age of the CFO and the capital budgeting technique to be used by a company (see Graham and Harvey 2001; Brounen et al., 2004).

• This question has been formulated so as to test the hypothesis that the age of the CFO influences the capital budgeting method to be used by a company. This is one of the variables found on our research model and for us to be able to validate our research model, this information is needed.

• The question has been formulated in this manner so as to enable the analysis of the results to be easier especially if the sample is bigger. A gap of 10 years has been maintained so as to make sure that at least a number of people can be found in each category thereby enabling the analysis of the results to be much easier.
This part will help in answering the 3rd question under the empirical survey section

This question is included in this part because it gives general information about the decision maker.

3. For how long have you been working for this company?

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4 years</td>
<td>1</td>
</tr>
<tr>
<td>5 to 9 years</td>
<td>2</td>
</tr>
<tr>
<td>10 to 14 years</td>
<td>3</td>
</tr>
<tr>
<td>15 to 19 years</td>
<td>4</td>
</tr>
<tr>
<td>&gt;20 years</td>
<td>5</td>
</tr>
</tbody>
</table>

The question will focus on the CFO’s level of experience within the firm. This information gives an indication as to the seniority of the decision-maker. The seniority of the decision maker might result in a company continuing to use the same method even if it’s not good for the company. This could be as a result of the CFO resisting change within the organization.

This question has been adopted from the study of Hall and Millard (2010). Their argument of taking this information as important is that it places in perspective the results of the actual capital budgeting processes and techniques that individual firms apply in practice.

The question wants to ascertain whether a change in CFO will result in the company changing its method of evaluating projects.

The question has been framed the way it is so as to enable the analysis of the results to be easier. Participants usually do not like to write a lot of information hence giving them some options.

In summary the profile of survey respondents has been known to provide assurance that the respondents had a good understanding of the capital budgeting practice of the firms that they represented (Truong et al., 2008) and that they are well qualified and have got experience.
Part 2 General information about your organization

4. Kindly specify the year of incorporation of your company-------------------
   - The question will give some general information about the organization in terms of its size which is based on the year it was incorporated. This indicates how well the company is established since smaller companies might not follow proper capital budgeting procedures and their experience is limited.
   - There is no theoretical ground for the inclusion of this question; the question is there to gather general information about the organisation.
   - This question has been incorporated so as to find out whether the methods used by firms which are older in terms of their year of incorporation are different from those which are small.
   - The question has been framed in such a way that each respondents can fill in the year of incorporation.

5. Please specify the annual turnover (approx. In Rand) of your company for the year 2009-2010.

<table>
<thead>
<tr>
<th>Turnover Range</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 Billion</td>
<td>1</td>
</tr>
<tr>
<td>1-10 Billion</td>
<td>2</td>
</tr>
<tr>
<td>11-20 Billion</td>
<td>3</td>
</tr>
<tr>
<td>21-30 Billion</td>
<td>4</td>
</tr>
<tr>
<td>&gt;30 Billion</td>
<td>5</td>
</tr>
</tbody>
</table>

   - This question has been included so as to find out the information about how the company is performing in terms of their annual turnover. The possibility of a company to invest depends on its annual turnover therefore, it is important to know the annual turnover of each and every company for us to be able to draw reasonable conclusions.
• This question deals with the company’s characteristics. The company’s size can also be defined according to its annual turnover (Loecher, 2000). According to Payne et al., (1999), larger firms tend to use more sophisticated capital budgeting techniques.

• The question tries to find out whether companies with a bigger annual turnover invest more compared to those with a small turnover and whether they use sophisticated methods. A comparison will be done based on these results.

• The question has been formulated in this style (intervals) so as to increase the chances of getting this question answered. Some CFOs might think that the information is sensitive therefore; they are not comfortable in answering it. Giving an interval will enable them to fill in the question. Also, having intervals enables the analysis of the results to be much easier. After a survey of other companies’ annual statements, I realized that some companies’ annual turnover exceeds 10 billion so my intervals were based on these figures. Based on different articles which I read, I realized that different authors were using different interval ranges, with this, I assumed this has something to do with someone’s preferences although the ranges in between has to be maintained.

6. How large is the gross annual capital budget of your company?

<table>
<thead>
<tr>
<th>Amount</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to R500 million</td>
<td>1</td>
</tr>
<tr>
<td>R501 million to R1 Billion</td>
<td>2</td>
</tr>
<tr>
<td>R1.1 Billion to R1.599 Billion</td>
<td>3</td>
</tr>
<tr>
<td>R1.6 Billion to R2.099 Billion</td>
<td>4</td>
</tr>
<tr>
<td>R3 Billion and above</td>
<td>5</td>
</tr>
</tbody>
</table>

• The question has been included so as to find out the amount of money which companies put aside for their capital budgets.
The study by Hall (2000) shows that the importance of the capital investment decision can be clearly seen when one analyses the amount spent on capital investment projects. He also goes on to state that the use of the capital budgeting methods is influenced by the size of a company's annual capital budget as there is a correlation between the annual capital budget and the method to be used by a company.

I would like to find out the methods used by companies based on their annual capital budgets. If the annual capital budget is bigger, there is a possibility that the firm might prefer to use some methods which are more sophisticated and they will also follow the proper capital budgeting procedures so as to reduce the chances of the company going under financial problems.

This will enable us to see how firms recognize the importance of capital budgeting in decision making.

The question has been formulated in this manner so as to encourage all the participants to fill in this question. The way the question has been formulated makes it easier to analyse and it encourages most respondents to fill in the question.

7. Please specify the total assets which your company is in possession of?

<table>
<thead>
<tr>
<th>Total Assets</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 Billion</td>
<td>1</td>
</tr>
<tr>
<td>1-10 Billion</td>
<td>2</td>
</tr>
<tr>
<td>11-20 Billion</td>
<td>3</td>
</tr>
<tr>
<td>21-30 Billion</td>
<td>4</td>
</tr>
<tr>
<td>&gt;30 Billion</td>
<td>5</td>
</tr>
</tbody>
</table>

This question has been included in this questionnaire so as to help the researcher to determine the size of the company based on their total assets.
• The study by Graham and Harvey (2001) shows that the size of the company has got an impact on the method to be used by a company. Company size can be defined in different ways; it can be defined by the number of employees which the company has, the annual turnover or the total assets it hold (Brounen et al., 2004). In the research, company size will be determined by its total assets.

• This information is going to be used to test the hypothesis that larger companies tend to use more sophisticated methods.

• Respondents usually do not like to write a lot of things especially in a survey research where questionnaires are used thus the reason why this question has been formulated in this manner. Also analysis of results will be made easier if intervals are used.

8. What is the frequency of asset replacement in your company?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years</td>
<td>1</td>
</tr>
<tr>
<td>0-10 years</td>
<td>2</td>
</tr>
<tr>
<td>0-15 years</td>
<td>3</td>
</tr>
<tr>
<td>0-20 years</td>
<td>4</td>
</tr>
</tbody>
</table>

• We want to find out how frequently the companies are replacing their assets.

• According to Dayanada et al., 2002, capital budgeting also involves asset replacement. In addition, as the physical condition of the asset declines, deferring maintenance and/or replacement could increase long-term costs and liabilities (CEDCP, 2010). The frequency of asset replacement determines whether the firm is using the correct methods in evaluating its projects.

• We want to find out whether assets are being replaced in accordance with the it’s useful life. This replacement is part of capital budgeting since decision
makers have to calculate the return of replacing an asset rather than to continue using what was there already.

- The respondents have been given some options to choose from so as to minimize their involvement in a lot of writing. This increases the response rate.

Part 3 Capital budgeting techniques used by the companies

9. Which of the following capital budgeting technique (s) are used in your company for the appraisal of major investments? More than one answer is possible.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Present Value</td>
<td>1</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>2</td>
</tr>
<tr>
<td>Payback Period</td>
<td>3</td>
</tr>
<tr>
<td>Discounted Payback Period</td>
<td>4</td>
</tr>
<tr>
<td>Profitability Index</td>
<td>5</td>
</tr>
<tr>
<td>Accounting Rate of Return</td>
<td>6</td>
</tr>
<tr>
<td>Real Option</td>
<td>7</td>
</tr>
<tr>
<td>Other___________________________</td>
<td>8</td>
</tr>
</tbody>
</table>

- This question serves as the backbone of this research. This research is based on the detailed analysis of the methods used by South African mining companies in evaluating their projects. Therefore, this question enables us to get information about the capital budgeting methods used in practice by South African mines.

- Different methods are available in literature which can be used to evaluate project (Drury, 2004). The real option method is one of the modern methods which have been included in this survey. We want to find out whether decision makers consider other option after embarking into a certain project (Bailey & Sporleder, 2000).
Based on the methods which are available in literature, we want to investigate the methods used in practice.

The question gives the respondents some options to choose the method(s) which they use in their companies. Multiple choice questions are easier to fill in and they do not take much time of the participants. Participants have been asked to give more than one answer because it might be a policy of the company to use for example, one method to evaluate the liquidity of the project and the other one to evaluate the profitability of the project (Awomewa and Ogundele, 2008; Bennouna, 2010) as a way of reducing the risk of embarking in a project which will not add value to the firm. Some companies might be using another method which is not indicated on the list therefore, they will have to insert it under the column written other.

This question will help in answering the first question under the empirical survey part.

10. Please specify the reason of using the selected method (methods), indicate the reason for each selected method:
• This question has been included so as to find out the reasons behind the use of a selected method.

• According to literature, there are some advantages and disadvantages of using the different capital budgeting methods (Diacogiannis, 1994; Sony, 2006; Bennouna, 2010). Some methods are superior to others. Pike's study in 1996 also asked firms for their reasons for choosing the methods they use.

• The question tries to evaluate the basis of selecting a certain method to evaluate projects. This might be in line with literature or it might be a tradition of a company to use that method.

• This is an open ended question. The question allows respondents to explore more information about the subject at hand. Respondents are able to give the reasons for using the different method(s) in their firm.

• The question is going to answer question two which is under the empirical survey section question.

11. Please indicate how often you use the following capital budgeting techniques? Indicate your answer by putting an X in the appropriate box.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Never (1)</th>
<th>Rarely (2)</th>
<th>Sometimes (3)</th>
<th>Often (4)</th>
<th>Always (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IRR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payback Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discounted Payback Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profitability Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Option</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• This question will enable us to know how useful a technique is to an organization.
• The question has been adopted based on the study which has been done by Hermes et al., 2007; Truong, & Peat: 2008. The reason for including it is that it provides information with respect to the methods that are being used, as well as with respect to the relative importance of the different methods.
• The question tries to figure out the frequency which these methods are used by the companies. The frequency of use shows the importance of the method to the company.
• The options which have been given show the usefulness of the method to an organization. The participants have been given the options so that they can indicate the frequency of their use of a certain method.
• This question will help in answering the first question under the analysis section.

12. From the mentioned capital budgeting practices, what minimum level of investment (in Rand) do you decide to employ those techniques? Indicate your answer by putting an X in the preferred method. For other, Please fill in the method.

<table>
<thead>
<tr>
<th>Level of investment</th>
<th>Net present value(1)</th>
<th>Internal rate of return(2)</th>
<th>Payback period(3)</th>
<th>Discounted payback period(4)</th>
<th>Profitability Index(5)</th>
<th>Accounting rate of return(6)</th>
<th>Real option (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 500 million</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>501-1Billion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1-1.599 Billion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 1.599 Billion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• This question tries to find out whether companies use different methods when faced with a different level of investment.

• The theoretical argument of including this question is based on the study of Lumby (1991) which shows that discounted cash flow techniques are more popular in larger projects. Also, the study by Hall (2000) has shown that this type of question will enable us to know if the preference for capital budgeting methods used are analysed according to the size of the annual capital budget.

• We want to find out whether companies use a different method when faced with a different level of investment. A level of investment determines how risk the project is if proper evaluation is not undertaken. Projects which require more capital need to be evaluated with methods which show the profitability of a project.

• This question has been structured in this manner so as to allow firms using methods not listed above to insert them under the column written other. The participant is required to put an (X) on the preferred answer, making it easier to fill in the questionnaire.

13. Which methods do you usually use to assess the following operations in your organization? Indicate by putting an X on your preferred answer.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PB (1)</td>
</tr>
<tr>
<td>Expansion in existing operations</td>
<td></td>
</tr>
<tr>
<td>Capital investment projects</td>
<td></td>
</tr>
<tr>
<td>Expansion in new operations</td>
<td></td>
</tr>
<tr>
<td>Foreign operations</td>
<td></td>
</tr>
<tr>
<td>General administrative projects</td>
<td></td>
</tr>
<tr>
<td>Social projects</td>
<td></td>
</tr>
</tbody>
</table>
Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PB), Discounted Payback Period (DPB), Profitability Index (PI), Accounting Rate of Return (ARR)

- This question will provide us with the information on whether different methods are used for assessing different operations.

- Companies may use different methods to assess different operations. This has been found in a study done by Hall in 2000. Where respondents indicate that when assessing the viability of capital investment projects in general, the majority of respondents indicated that the most often used capital budgeting techniques are IRR and ROI with a percentage rate of 27.7% each, followed by NPV (21.5%) and PVP (15.4%). With regard to the various operations where applicable (except social projects), all the respondents stated that the most often used and second most often used capital budgeting techniques are ROI and IRR respectively. With regard to social projects, 38.5% of the respondents indicated that they use other techniques to assess the viability of these types of projects.

- We want to investigate whether different methods are being used by companies to assess the viability of different operations. Companies embark on different projects which are implemented in order to meet certain objectives therefore; different methods might be used to assess these projects.

- The question is a closed ended question with some options given to the participants so motivate them to continue filling in the questionnaire. Respondents are more interested in filling in questionnaires where there are given multiple choice questions hence less work is involved.
14. Has there been a change in techniques used over the last 5 years?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

If yes, please state the reason of changing:

- This question has been included so as to find out whether companies continue to use the same capital budgeting methods which they have been using previously.
- There is no theory to support this question; it has been designed to get general information.
- We want to find out the reasons behind the changes if there are any. This will provide information on whether the change was a strategic move or it was a change for the better. This question has a link with the question where the CFOs have been asked to indicate for how long they have been working for the company at hand. This information is important since the change could be as a result of the new CFO employed within the organization.
- The question has been divided into two parts. The first part requires the respondents to give a yes or no answer; this in my opinion will motivate a person to continue answering a question. The second part is an open ended which requires the respondents to give the reasons behind the change if there is any. We are able to get an explanation with this form of question.
- This question gives general information on whether the company has changed its capital budgeting method which was in use previously.
15. Do you think capital budgeting have got an impact on asset replacement?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

If yes, please clarify what could be the effect

- The question tries to find out whether decision makers also use capital budgeting techniques when replacing their assets.

- According to Grzegorz and Peter (2003), the real option theory states that “in a non-strategic framework, there exists an option value of waiting for better (but never complete) information which is taken into account before committing the corporate resources. As uncertainty about the demand grows, the firm is going to wait with replacement for a higher level of demand”

- The question tries to assess whether managers knows that capital budgeting affects the decision to replace an asset.

- This question has been designed in this manner so that respondents can give a brief explanation on why they think it has some impact.
16. Please rank the following factors on the basis of their degree of influence on the capital budgeting techniques employed in your company. Please rank from 1 to 3, where:

1= Low rank
2= Medium rank
3= Higher rank

<table>
<thead>
<tr>
<th>Factors</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PB (1)</td>
</tr>
<tr>
<td>Finance Theory</td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td></td>
</tr>
<tr>
<td>Importance of the Project</td>
<td></td>
</tr>
<tr>
<td>Easy to understand</td>
<td></td>
</tr>
<tr>
<td>Top management understandability</td>
<td></td>
</tr>
</tbody>
</table>

- The question has been formulated so as to get an insight on other factors which impact the use capital budgeting techniques.

- Besides quantitative and qualitative methods, there are other factors which might influence the selection of capital budgeting methods. According to Gilbert’s study in 2005, finance theory states that when managers are trying to establish the expected value that a project is expected to create, they should use discounted cash flow techniques.

- We want to find out whether besides the qualitative and quantitative factors are there any other factors which influence the use of a certain method within the organization. Managers can use a certain method due to the experience they have in using that method although that method might not be the best for the project at hand.
• The ranking shows the degree of influence which the factor has got. Options have been given to make it easier for the respondents to fill in the questionnaire whilst at the same time enabling the analysis of results to be easy.

17. Which of the following do you think is the most important stage in the capital budgeting process?

<table>
<thead>
<tr>
<th>Stage</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Planning</td>
<td>1</td>
</tr>
<tr>
<td>Identification of investment opportunities</td>
<td>2</td>
</tr>
<tr>
<td>Preliminary screening of projects</td>
<td>3</td>
</tr>
<tr>
<td>Financial appraisal of projects</td>
<td>4</td>
</tr>
<tr>
<td>The accept/reject decision</td>
<td>5</td>
</tr>
<tr>
<td>Project implementation and monitoring</td>
<td>6</td>
</tr>
<tr>
<td>Post-implementation audit</td>
<td>7</td>
</tr>
</tbody>
</table>

• Since the capital budgeting process has got many stages. This question tries to find the opinion of the decision makers with regards these stages.

• The possibility of the decision maker to identify the most important stage shows that they have got a thorough understanding regarding the care that should be taken when capital investment decisions are evaluated, because the successful outcome of a decision depends on the accurate estimation of cash flows and efficient financial analysis of the proposed alternative (Hall, 2000).

• We only want to find general information about which stage do the CFO thinks is the most important. Also, the question has been designed to get some information about whether company CFOs stick to the capital budgeting process stages which are available in literature when evaluating their projects. This shows the determination of the decision makers with regards capital projects. The success of capital projects depends on following all the stages when evaluating the projects therefore, identifying the most important stage
can help the managers to strive very hard to make sure that all the stages have been followed since there are interrelated.

- Because the questionnaire has got a number of questions, that is the reason of having the question in this style. The main strength of this type of question is that the form is easy to fill in and the answers can be checked easily.

18. Does your company conduct post audits of major capital expenditures?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>1</td>
</tr>
<tr>
<td>Occasionally</td>
<td>2</td>
</tr>
<tr>
<td>Hardly</td>
<td>3</td>
</tr>
<tr>
<td>Not once</td>
<td>4</td>
</tr>
</tbody>
</table>

- The question tries to find out whether decision makers conducts post audits after the project has been implemented.

- This assesses whether the decision makers follows all the stages which are available in literature when assessing the viability of their projects (see Shapiro & Balbirer, 2000; Drury, 2004; Elumilade et al., 2006). An assessment of the performance of previous resolutions, however, can contribute greatly to the perfection of present investment decision-making by scrutinizing the past ‘rights’ or ‘wrongs (Awomewe & Ogundele, 2008). Capital budgeting post-audits play a potentially critical role in helping firms to learn from their past experiences and in providing a mechanism for transferring knowledge relevant to improving procedures and therefore more effective decision-making throughout an organization (Hall & Millard, 2009).

- Post audits have been seen by some authors (e.g., Dayanada et al., 2002; Hall, 2000) important to be carried on after implementing a project. We want to see the importance which the capital budgeting process is put by management.
This is a closed ended question which has been designed to minimize the time spent by the respondents whilst enabling the analysis of the results to be easier.

19. Which of the following do you think is the highest risk stage in the capital budgeting process?

<table>
<thead>
<tr>
<th>Stage</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Planning</td>
<td>1</td>
</tr>
<tr>
<td>Identification of investment opportunities</td>
<td>2</td>
</tr>
<tr>
<td>Preliminary screening of projects</td>
<td>3</td>
</tr>
<tr>
<td>Financial appraisal of projects</td>
<td>4</td>
</tr>
<tr>
<td>The accept/reject decision</td>
<td>5</td>
</tr>
<tr>
<td>Project implementation and monitoring</td>
<td>6</td>
</tr>
<tr>
<td>Post-implementation audit</td>
<td>7</td>
</tr>
</tbody>
</table>

This question has been included so as to get an insight about what the decision makers thinks is the highest risk stage in the capital budgeting process.

In line with literature, (see Elumilade et. al., 2006; Hall 2000), capital budgeting process involves several stages which have to be followed when planning to carry on an investment project.

We want to find out the opinion of the respondents with regards these stages, what they think is more risky than the others. The ability of the CFO in identifying the highest risk stage enables him/her in making informed decisions.

The respondents have been given some options because some of them might not know the correct name for each and every stage. This will serve them time in answering the questionnaire and they will not need to refer to literature. That is why the question is closed ended.
20. To what extent do you consider the following qualitative factors when evaluating your projects? Please indicate your answer on a scale from:

1= slight  
2= very little  
3= to a great extent  
4= very extensively  
NA = not applicable

<table>
<thead>
<tr>
<th>Qualitative Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>the societal impact of an increase or decrease in employee numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the environmental impact of the project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>possible positive or negative governmental political attitudes towards the project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the strategic consequences of consumption of scarce raw materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>positive or negative relationships with labor unions about the project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>possible legal difficulties with respect to use of patents, copyrights and trade or brand names</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on the organization’s image if the project is socially questionable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The question has been included so as to find out whether besides quantitative issues what other factors are considered by the decision makers when they want to undertake a project.

- There are qualitative factors which have to be considered when planning to embark on a project. Some of them may hinder the possibility of the project to be feasible for example the production of a new product which can cause more pollution can have a negative impact to the environment therefore its acceptance can be questionable. According to Awomewe and Ogundele (2008), some of these factors can have an effect on the value of the firm and some do not have an effect therefore, management can address factors which have got an impact on the firm’s value during the project analysis phase by means of having some discussions and making consultations with various relevant parties. That is the reason for including this question.
• We want to find out whether companies take into consideration qualitative factors and to what extent when evaluating their projects. We also want to assess the respondents’ opinions with regards quantitative factors.

• The question has been formulated in this style (Likert scale) since this shows the attitude of a respondent towards this aspect. This shows the extent to which the participant agrees with a certain view. Also, because we want to hold the respondent’s interest in completing our questionnaire, it is good to provide a variety in the way we ask our questions. Also for us to get reasonable responses it is important to maintain a lesser number of options on the scale. According to Ng Chirk (2006), 5 point or 7 point scale is commonly used that is why I chose a 5 point scale.

21. Please specify the usual purpose of your projects

i. Expansion into new business/ Diversification
ii. Expansion of existing business
iii. Equipment replacement

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<td>ii &amp; iii</td>
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<td>All of them</td>
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• This question has been designed to get an insight on the usual purpose of the different projects.

• Investments can be done for different purpose, the study by Danayada et al., (2002), shows that investments can be undertaken for replacing or purchasing
of new property, plant or equipment, investing into a new line of product or expansion of existing business etc.

- The question wants to get information about the purposes which different companies put their investments for considering that there are different purposes of projects within an organization.

- The question has been designed in this manner such that if the respondents’ purpose of their project is to replace equipment; there can indicate with a (i). This makes it easier for them to fill in the questionnaire considering the fact that we are trying to minimize the time they can spent on one question so as to increase the response rate.

B. Definition of concepts

*Capital budgeting*: is a technique of making long term planning decisions for investments and their finance. It includes current cash outlay or a series of cash outlays in return for an anticipated flow of future benefits. This is employed to assess long term expenditure decisions which involve current outlays and the benefits that occur in the future years.

*Net Present Value (NPV)*: is described as the difference between the present value of the cost inflows and the present value of the cash outflows. A negative neither NPV means the project is not desirable and vice versa.

*Internal Rate of Return (IRR)*: This is the discount rate at which the present value of expected capital investment outlays is exactly equal to the current value of anticipated cash earnings on that capital project. This can also be said to be the rate of return on invested capital, which the project is returning to the firm, when the net present value is equal to zero.
**Payback Period (PB):** the period necessary for the working cash surpluses created by a certain investment to equate, in total, to the capital sum initially invested. Any project with PB above the specified payback period maximum is however rejected because it will take too long a time to retrieve initial capital.

**Discounted Payback Period (DPB):** is the period during which the cumulative net present value of a project is equal to zero.

**Profitability Index (PI):** also known as the “Benefits-Cost Ratio” is the ratio of the present value of future cash flows to the actual cash outflow. It assists decision makers in choosing among several courses of actions.

**Accounting Rate of Return (ARR):** It is defined as the average project income after deducting taxes and depreciation divided by the average book value of the investment during its life time.

**Real Option:** this is the right but not the obligation to undertake some business decision; typically the option to make, abandon, expand, or contract a capital investment. For example, the opportunity to invest in the expansion of a firm's factory, or alternatively to sell the factory, is a real call or put option, respectively.

**Strategic Planning:** A strategic plan could be referred to as the actual plan of the company which stipulates the kind of business the company is involved in and where it intends to position itself in the future. Strategic planning translates the organization’s corporate goal into specific policies and directions, sets priorities, specifies the structural, strategic and tactical areas of business development and guides the planning process in the pursuit of solid objectives.

**Identification of investment opportunities:** This stage involves the identification of projects which are profitable to the organization.
Preliminary screening of projects: Identified investment opportunities are exposed to an initial screening process by the company management to isolate the marginal and illogical proposals, because it is not wise wasting resources to thoroughly evaluate such proposals. This might include some preliminary quantitative analysis and judgments based on natural feelings and experience.

Financial appraisal of projects: Projects which have succeeded during the preliminary screening phase are then subjected to a rigorous financial appraisal so as to confirm their possibility of adding value to the organization. The quantitative analysis may predict the expected future cash flows of the project, analyze the risk associated with those cash flows, develop alternative cash flow forecasts, examine the sensitivity of the results to possible changes in the predicted cash flows, subject the cash flows to simulation and prepare alternative estimates of the project’s net present value.

The accept/reject decision: After making some cash flow estimates, the project can be evaluated in financial terms and assessing whether the decision to go ahead with the project is in line with the strategic goal of maximizing shareholder value.

Project implementation and monitoring: When a project has passed through the decision making stage, then management has to implement it. The implementation phase involves close monitoring of the project progress with the aim of identifying bottlenecks thereby allowing immediate intervention. Differences noted from the estimated cash flows need to be monitored frequently with a view to taking corrective actions where necessary.

Post-implementation audit: This is the evaluation of the performance of ongoing projects. The post-implementation audit involves comparing the project’s cash flows with the projected figures. This stage provides useful feedback to project appraisal.