

# Capital Budgeting and Cost Evaluation Techniques: A Conceptual Analysis

Frank Oki<sup>1</sup>, Sivanathan Sivaruban<sup>2</sup>

<sup>1</sup>Lecturer, International Training Institute, Port Moresby, Papua New Guinea

<sup>2</sup>Senior Lecturer, International Training Institute, Port Moresby, Papua New Guinea

**Abstract:** *Capital budgeting decisions are crucial to a firm's success for several reasons. Firstly, capital expenditures typically require large outlays of funds. Secondly, firms must ascertain the best way to raise and repay these funds. Thirdly, most capital budgeting decisions require a long-term commitment. Finally, the timing of capital budgeting decisions is important. When large amounts of funds are raised, firms must pay close attention to the financial markets because the cost of capital is directly related to the current interest rate or investor's expected rate of return. This Published paper focuses on advances in Capital Budgeting Techniques theory through and practical. Also its impact in the decisions of the investment while focusing on evaluation practices such as risk and uncertainty but not considering the numerically appraising of the principles of investment. The sensitivity analysis of capital budgeting depends on a number of uncertain independent variables which may have some impacted on the investment results. The positive value of the investment appraisal is value added to the firm, and it can be enhanced return for the shareholders. The success of the project is assessed on stage post completion audit with proper stage by stage completed.*

**Keywords:** Capital budgeting, Cost analysis, Payback Period, Net Present Value, Accounting Rate of Return, and Internal Rate of Return.

## 1. Introduction

Capital budgeting concept or Investment appraisal techniques means the same. It's a Challenge to managers to balance long and short term issues for the business with a project. It also analyzes ways to increase capital (value) or shareholder values of businesses with projects that operate years.

Capital appraisal technique looks at long term decisions, those spanning multiple years. It focuses on the operation of the project with the year to year approach and to the entire life span of a project. The accounting for capital budgeting on a project-by-project approach is similar to life-cycle costing. The role of the management accountant is highlighted in the six stages of capital budgeting.

An investment is involved with a large amount of money and decision making should be done prudent manner. Most of the investment appraisal techniques are involved with quantity factors but do not included quality factors. The investment appraisal needs to be done with feasible studies. It is dealing with the future forecast revenue and expenditures and on the assumption that the inflation rate remains unchanged. An Investment appraisal is done based on economics and social factors are remained unchanged. An Investment appraisal is concerned with tangible cash inflow and cash outflow therefore leaving out notional flow. The notional flow now stands in for non-cash flow factors such as depreciation and other notional expenditures. The correct application on an investment appraisal plays a vital role in determining the investment viability.

The successes of the investment appraisal techniques depend on the information provided and the corrected computation of investment appraisal techniques. Furthermore, an investment appraisal needs to consider the quantity and quality factors of the investment.

An Investment may be financed by equity sources or debts sources. The Investment starts with the initial cash outflow followed by the cash inflow. Most of the time investment is referred to as project. The outcome of the project should be enhanced with the current operation of the business or value added to the shareholder of the company.

The four quantitative methods used in making capital budgeting decisions are described and illustrated. The two methods are the focus on cash flows and the time value of money such as net present value and internal rate-of-return. Typically, the discounted cash-flow methods are superior for providing information in the decision-making process because they are the most comprehensive in scope. The concept of money having time value is a main feature of these models. The other methods presented are the payback method and the accrual accounting rate-of-return. The payback method does use cash flow as a basis but does not incorporate time value of money nor profitability. The accrual accounting rate-of-return does not focus on cash flow but uses measures from the income statement. The role of income taxes and inflation is incorporated within those methods that do not require time money of value.

Investment appraisal is the evaluation of investment with regard to their profitability and / or cost of effectiveness (Panos Konstatin, Margarete konstatin 2018)

Though the methods presented provide a basis on which to make a quantitative financial decision, the capital budget concept examines the importance of non -financial quantitative and qualitative aspects for each decision. Any intention of evaluating a decision using a different model than the one used then the initial decision is discussed.

## 2. Cost Analysis

Importantly, there are two dimensions of cost analysis, firstly it recognizes the multiyear focus of capital budgeting. Hence a project dimension for capital budgeting over the entire life of the project (horizontal). Life of a project is more than one year. All cash flows or cash savings over the entire life is considered.

Secondly an accounting-period dimension which focuses on income determination and routine planning and control that cuts across all projects (vertical).

An accounting system corresponds to project dimension involving life-cycle costing: It accumulates revenues and costs on a project-by-project basis. The accumulation extends accrual accounting system to a system that computes cash flow or income over the entire of the project covering many accounting periods.

## 3. Stages of Capital Budgeting

There are six stages of capital budgeting for a project. Capital budgeting is the decision-making and control tool for making long-run planning decisions for investments in projects that span multiple years. While the six stages of capital budgeting of a project, it is important to make viable decision for investing into the project.

The Six stages in capital budgeting are subsequently given.

### Stage 1: *Identification stage*

- To distinguish which types of capital expenditure projects are necessary to accomplish the organization objectives and strategies.
- To use line management to identify projects linked to the organization's objectives and strategies.

### Stage 2: *Search stage*

- To explore the alternatives of capital investments that will achieve organization objectives and strategies.
- To use cross-functional teams from all parts of the value chain to evaluate alternatives.

### Stage 3: *Information-acquisition stage*

- To consider the expected costs and the expected benefits of alternative capital investments.
- To use financial and non-financial costs and benefits that can be quantitative or qualitative.

### Stage 4: *Selection stage*

- To choose projects for implementation of which expected benefits exceed expected costs by the greatest amounts – Cost Benefit Analysis.
- To use judgment of managers to consider the conclusion non-financial benefits based on formal analysis.

### Stage 5: *Financing stage*

- To obtain project funding –Equity or Debt.
- To use organization's treasury function for sourcing finance by using generated cash flow internal and externally through capital markets.

### Stage 6: *Implementation and control stage*

- To get projects underway and monitor their performance.
- To use a post investment audit to evaluate and compare the projections made at time of selection with the actual results

## 4. Capital budgeting appraisal techniques

There are four common Capital budgeting methods or appraisal technique that are used to evaluate projects prior to making reasonable decisions based on the standardized rate of return.

There are;

- Net Present Value
- Internal Rate of Return
- Payback method
- Accrual Accounting Method or Accounting rate of return

With respect to discounted cash-flow (DCF), there are two main discounted cash flow (DCF) methods that are used to evaluate business projects. They are Net Present Value (NPV) and Internal Rate of Return method (IRR).

### 4.1 The objective of DCF method is to;

- Measure all expected future cash inflows and outflows of a project as they occur at any single point in time.
- Use **time value of money**: PNG currency, Kina received today will worth more than the Kina Value in the future i.e. (opportunity cost from not having the money today).
- Usually the most comprehensive and the best methods to use by time value of money with the Weights cash flows.
- Focuses on cash flows rather than operating income as determined by accrual accounting.
- Expects cash amount to be greater in the future than cash invested now (present).

### 4.2 Required rate of return (RRR):

It is a minimum acceptable rate of return on an investment return of which the organization could expect to receive elsewhere for investment to comparable risk and it is also called **discount rate, hurdle rate, or (opportunity) cost of capital**

Point of comparison when using internal rate of return (IRR) The example of DCF methods requires time value of money are;

#### 1) Step 1: **Net present value (NPV) method**

- a) NPV calculates expected monetary gain or loss from the project by discounting all expected future cash inflows and outflows to the present point in time, using required rate of return (RRR)
  - i. Only projects with zero (return = RRR) or positive (return > RRR) net present value is acceptable
  - ii. Higher the NPV, the better when all other things equal

- b) NPV method
- i. Step 1: Draw a sketch of relevant cash inflows and outflows
    - Organize data in systematic way
    - Focuses only on cash flows
    - Indifferent as to where cash flows come from
  - 2) Step 2: Choose the correct compound interest table and use given discounts factors of time periods ( $n$ ) and interest rate ( $r$  or  $i$ ).  
Determine if annuity (series of payments of equal the time with the amount) or lump sum payment
  - 3) Step 3: Sum the present value figures to determine the net present value (net means some amounts are inflows and others are outflows—calculate the difference)  
If NPV is zero or positive, it is acceptable—cash flows are adequate to recover net initial investment and earn a return equal to or greater than RRR over the useful life of the project  
If NPV is negative, do not accept—expected rate of return is below RRR

#### a) NPV needs managers to also judge non- financial factors

The net present value is considered the timing value of money and the profitability of the investment. It is the most acceptable method for investment appraisal. Relevant costs, incremental cash flows and opportunity costs are considered for investment appraisal decision making whereas depreciation, past or any already committed cost and centrally allocated overhead are not considered for the net present value calculation.

Taxation is a relevant factor for the investment appraisal techniques and capital allowance for the project can reduce the tax payable to the revenue authority so that tax saving arising from the project should be considered. The investment must be considered in terms of money or real terms and the rate of return on project to be provided on money rate of return including the general rate of inflation. The forecast on inflation rate is not an easy task as the project evaluation is done based on risk and uncertainty analysis.

The adjusted present value can be computed for the subsidized loan, higher gearing on debt capacity and in comparing the different capital funding options. The adjusted present value is used for the weighted average cost of capital for the discount factor.

#### 4.3 Internal rate-of-return method

IRR calculates the discount rate at which the present value of expected cash inflows from a project equals the present value of expected cash outflows.

##### IRR method

Use calculator or computer program through excel to compute

Use trial-and-error approach

Step 1: Calculate NPV using a chosen discount rate

Step 2: Choose (and keep trying) a lower or higher discount rate to have NPV equal zero, the point at which the chosen rate is the IRR (If  $NPV < 0$ , use lower rate; if  $NPV > 0$ , use higher rate)

- Use factor from present value of an annuity table if cash inflows are equal
- Accept project if the internal rate of return (IRR) equals or exceeds required rate of return (RRR)

#### 4.4 Comparison of net present value and internal rate-of-return methods

NPV method uses Kina rather than percentages to aid in summing individual projects and to see effectiveness of accepting a combination of projects. However, IRR of individual projects cannot be added or averaged to represent IRR of a combination of projects. NPV assumes reinvestment at required rate of return in comparing projects with unequal economic lives whereas internal rate-of-return does not have such comparison available.

#### 4.5 Sensitivity analyses

Sensitivity analysis used to examine how a result from the use of NPV or IRR will change if predicted financial outcomes are not achieved or if an underlying assumption changes. It also helps managers focus on decisions that are most sensitive to different assumptions and worry less about decisions that are not so sensitive. The sensitivity analysis does not examine the probability. The sensitivity factors are such as selling price, sales volume, cost of capital, initial cost, operating costs and benefits. They are needed to be considered for the investment appraisal so that it's easy to identify the more critical factors. The changes in percentage on the critical factors will be impacted on the project viability. The project management needs to consider controlling the critical sensitivity factors so that project viability will be improved. Sometimes certain critical factors are not controlled by the manager. The sensitivity factors are done on the basis that each key factor is changed but other factors remain unchanged but factors are interdependent so that factors isolations is unrealistic in the real world.

#### 4.6 Payback methods

**Payback** measures, takes time or year to recoup in the form of expected future cash flows of the net initial investment in a project. It does not distinguish between origins of cash flows (like DCF models). It is the simplest method to use in calculating the project with uniform cash flows.

##### 4.6.1 Uniform Cash Flows

Throughout the project expect that cash flow is uniform. Thereby with uniform cash flows, net initial investment  $\div$  uniform increase in annual future cash flows per formula demonstrate

$$\text{Initial Cost} = \frac{\text{Cash flow}}{\text{Outlay}}$$

##### 4.6.2 Uninform cash flows

Year the cash flow is accumulated until the sum equals the initial net investment (initial net Investment is equal to the initial investment minus any residual of the same

investment). In addition it has the characteristics with respect to time measurement for specific projects. The projects with shorter paybacks are preferred compared to those with longer paybacks, when all other things are equal. The Organization can choose a cutoff period as the basis for accepting or rejecting the payback and the liquidity of the project.

#### 4.6.3 The Benefits of Payback

The payback method is easy to understand. It is necessary to be used for preliminary screening of many proposals as the expected cash flows in later years of the project can be of highly uncertainty. The answer for the Payback is ends with the number of years taken to recoup the initial investment.

#### 4.6.4 The Payback limitation

It fails to incorporate the time value of money and it does not consider a project's cash flows after the payback period and does not considered the risk factors. The payback

$$ARR = \frac{\text{Estimated annual profit after depreciation, before interest and Tax} \times 100}{\text{Average book values of Capital employed}}$$

The Accounting rate of return does not consider the timing of the cash flow but profit is computed based on the generally accepted accounting principles (GAAP). The ARR method is used as a traditional method (initial investment appraisal) to screen the investment viable with minimum return of the investment.

Once the ARR method confirms the viability of the investment, the detailed investment appraisal will begin, also with considering other relevant factors. Sometimes the initial project outflow or the initial investment is considered rather than the average book for capital employed to calculate the accounting rate of return. When the accounting profit is given, the depreciation amount needs to be added back to the accounting profit to meet the actual cash flow of the project.

#### 4.8 AARR computation

The increase in the annual expected average after the tax operating income is divided by the initial net investment. A Quotient is the rate (similar to IRR) or percentage. It calculates return using operating income numbers after considering accruals and taxes whereas IRR calculates return on basis of after-tax cash flows and time value of money (IRR method is regarded as better than AARR method since the timing value of money is considered). Calculation can be easily understood, and they use numbers reported in the income statement. It considers income earned throughout a project's expected useful life. (Unlike payback which ignores cash flows after payback period).

### 5. Management Control

The initial investments are relatively easy to implement whereas some initial investments are more complex and take more time. The management controls (internal control) of the project is through the tool of post investment audit. They compare the actual results for a project to the costs and benefits expected at the time the project was selected. It's also for providing the feedback on the circumstances of the

method may only promote short-lived projects from choosing short term cut off period.

#### 4.7 Accrual accounting rate-of-return method

**Accrual accounting rate-of-return (AARR)** method divides an accrual accounting measure of income by an accrual accounting measure of investment which is synonymous to the **accounting rate of return**.

Accounting rate of return is based on the accounting method in profit computation but it has been adjusted with non –cash flow factors on the profit calculation. The final figure of the accounting rate of the return is in percentage and it can be compared with the target percentage of the particular project. The return on capital employed (ROCE) may be referred to as accounting rate of return.

performance while implementing the project. The proper follow up on the stage in the investment, will result in successful achievement. The variance on each stage of the project must be computed to find out the reasons for any negative impact on the project. Therefore, a corrective measure on the action plan is needed to modify the planning of the project so it is in line with the actual result. When there is proper implementation of the internal control, there is no failure but success in the investment.

### 6. Strategic Approach

The Company's strategy is the source of its strategic capital budgeting decisions. Capital investment decisions are strategic and require considerable broad range of factors that may be difficult to estimate or measure. For example: brand names, customer based and intellectual capital of employees. Therefore, Capital budgeting method (NPV) is useful for evaluating a company's intangible assets. The new project approach to any organization can create competitive advantage in the business environment. The positive value of the project will add value to the company so that there is increase in prices of share and the return of investment; therefore, the investors are interested to keep investing within the company.

Capital rationing means that available funds are limited so that the positive Net Present Value for the project is selected to maximize the profitability for the firm. The profitability index can be used to select the best project to the organization. The financing of the investment is vital since the high gearing capital structure affect to the calculation for the adjusted net present value.

$$\text{Profitability Index} = \frac{\text{NPV of Project}}{\text{Initial cash outflow}}$$

The profitability index is more "one" (1) is acceptable its means present value of cash inflow is more than initial investment.

### Post –Completion Audits

The post –completion audit takes place after the completion of the project life cycle. The main objective of the post –completion audit is to compare the actual result with the estimated figures to find out there are any significant variance between the budgeted figures and the actual figures. The post –completion audit will help to improve the forecast figures and to have certain control value. External environment factors, the uncertainty for costs and benefits are costly and are time consuming exercise that can cause problem associated with the post –completion audit. The post –completion audit provides detail reports to the manager for improvements of the current and future investment.

### 7. Recommendation

There are number of evaluation methods used to evaluate the project, in assessing whether they are producing favorable returns or not because the returns are uncertain. Also in order make strategic decisions in a long term investment. Therefore, the following suggestions can be considered to assist in making decisive decision for the company in the long term investment.

The most relevant costs are needed to consider in determining the success of the project and for the project to be prepared to combat any risk and uncertainty in the foreseeable future.

Capital investment decision is difficult because there is an outlay of funds to buy unknown returns. Unknown returns are difficult when they are changes in demand, technology and competition environment. As we know, worse still-funds are scarce, so it is very important to choose well and prioritize based on returns. Today, money is considered having more worth more than the future therefore, a set of discounting factors will be used. Consideration can be given to Net Present Value (NPV) and Internal Rate of Return (IRR) rather than Accounting Rate of Return (ARR), Payback period and of course the others.

### 8. Conclusion

Capital budgeting is the process in evaluating investments and allocating scarce resources towards acquiring one asset over another. The reason being that it has opportunity costs, large outlay of capital, unknown returns for the future and of course poor decisions which can have huge negative impact on the investment and the shareholders' value. The evaluation for the investment appraisal must be done in a prudent manner with due diligence. Therefore evaluation strategies of investing in assets for use in the business with long life span is paramount. The investment appraisal does not only concern with the quantity factors but other quality factors are also needed to be considered. The investment appraisal techniques are based on the future unknown factors, inclusive of the high- risk factors. An investment appraisal is mainly concerned with correct discounted factors or cost of capital and is used to calculate the investment appraisal viability. The accounting rate of return and pay back method can be used as a first screen method to

select the best investment among alternative investments. The Net Present value is the best method and most recommend for an investment appraisal.

### References

- [1] Aggarwal, Raj, 1980, "Corporate Uses of Sophisticated Capital Budgeting Techniques: A Strategic Perspective and a Critique of Survey Results," *Interfaces* 10 (No. 2, April) 31-34.
- [2] Brealey, Richard A. and Stewart A. Myers., 1997, *Principles of Corporate Finance*, 5th edition, McGraw-Hill Companies, New York.
- [3] Brigham, Eugene F., 1975, "Hurdle Rates for Screening Capital Expenditure Proposals," *Financial Management* 4 (No. 3, autumn), 17-26.
- [4] Dorfman, Robert, "The Meaning of Internal Rates of Return," *The Journal of Finance*, Vol. XXXVI, No. 5, December
- [5] Panos Konstatin, Margarete konstatin 2018 "Investment Appraisal Methods. Power and Energy systems Engineering Economics.
- [6] Salias Umuropi "Cost Management Accounting. UPNG, 2012", *Capital Appraisal Techniques*