

CHAPTER - 2

Review of Literature

Corporate Practice of Capital Budgeting in
India and Abroad

REVIEW OF LITERATURE

Corporate Practice of Capital Budgeting in India and Abroad

Considerable literature is available in the area of capital budgeting decision-making. Many research works in this field, both in India and abroad, have been undertaken by scholars, eminent finance experts and consultancy houses. However, the majority of the studies have their focus on survey of the methods of normative financial appraisal and tools of incorporating financial risks into project analysis. Besides surveying the trends in using the tools of financial appraisal, the scholars have also examined the methods of determining cut-off rate especially for discounting the future pay-offs. Survey of these studies provides the record of gradual developments occurred in the corporate practice of capital budgeting.

Many of the early studies uncovered the gap between theory and practice. Notably the early studies by Porwal (1976), Gitman and Forrester (1977) reported the prevalence of traditional practice in the seventies and eighties of last century. However, longitudinal study by Pike Richard (1996) presented a record of gradual move towards advanced methods. Arnold and Hatzopoulous (2001) noticed UK corporations to increasingly adopt scientific practice as outlined in financial theory. Verbeeten Frank H M (2006) examined the relationship between uncertainty and use of Sophisticated Capital Budgeting Practices, which includes Real Option Analysis, Game Theory, Simulation and 'Certainty Equivalent Method. A brief review of some of the relevant empirical studies has been presented in the following paragraphs: The survey of studies made in India has been presented in Part - A. Survey of foreign studies has been presented in Part- B

Part – A: Indian Studies

Chandra Prasanna (1975) conducted a study on 20 Indian companies to examine the methods used in investment appraisal. The study revealed that for evaluating investments of small size the corporate houses used Payback Period method (PBP), while for

evaluating large size investments the companies placed emphasis on the use of 'Accounting Rate of Return' (ARR). They used ARR as *primary method* and 'Payback Period' as a *supplementary criterion*. Use of Discounted Cash Flow (DCF) techniques was confined to evaluation of large investments only. The firms used conservative estimates of cash inflows for handling risks.

Porwal L S (1976) made a comprehensive study on capital budgeting practice of 52 Indian companies. It covered qualitative, quantitative, organizational and control aspects of capital budgeting. The study revealed that ARR was preferred method for evaluation of existing product lines; however, IRR was preferred method for appraisal of new product lines. The study revealed that 36% of companies used IRR for appraisal of capital projects proposing investments in new product lines and 43% companies used ARR in case of selecting projects in existing product lines. Payback Period remained as second most preferred method due to its simple calculations.

The corporate houses ascribed factors like uncertainty in supply of raw-material and uncertainty in government policy as reasons for project risks. For handling risk the firms applied shorter 'Payback Period' and higher 'discounting rate'. Most of the corporate houses used rate higher than WACC for the cut-off rate for discounting.

Bansal (1986) surveyed the process of capital budgeting as well as the tools and techniques of evaluation. On the basis of responses received from large number of Indian manufacturing companies, public and private, he reported the popularity of ARR both for expansion and new product lines. He found Payback Period as the most important secondary method. For risk adjustment, majority of the companies used traditional methods of Shorter Payback Period and higher discounting rate.

While surveying capital budgeting process, Bansal (1986) noted that "legal requirements, competitive position, employer-employee relations and community relations were important qualitative considerations" at the early stage of project formulation. As a part of project planning and control firms used techniques such as PERT, CPM and project audit. Over 50 percent companies were seen to undertake post completion audit of capital expenditure proposals.

Pandey I M (1989) conducted a study on capital budgeting techniques of 14 medium and large sized Indian companies and found that Payback Period method was most

widely used method of financial appraisal followed by IRR and NPV. All companies except one were found regular users of Payback Period. In majority of the cases payback period was within the range of 3 to 5 years. Two-thirds of the companies were found using IRR, while the proportion for NPV stood at only two-fifths of the companies.

The author observed that the executives were not duly familiar with the Discounted Cash Flow methodology. For incorporating risk analysis the companies mostly used Sensitivity Analysis and conservative forecasts. The study reflected that the firms did not discard any profitable investment for want of fund; in some cases the investment had to be delayed for failure of finishing mobilization of fund in time.

Sahu P K (1989) studied the practice of capital budgeting techniques of companies in Orissa. From the study of a sample of 15 companies he found that companies financed routine investments through internal sources of funds, whereas in case financing growth investments the companies used external sources of funding. He found that traditional PBP and ARR were the most preferred methods to the companies compared to scientific DCF methods such as Internal Rate of Return and Net Present Value.

Purohit Lall and Panda (1994) conducted a study on 100 non-financial companies listed on BSE. For financial appraisal four methods such as Payback Period, ARR, IRR and NPV were prevalent. However, they found that PBP and ARR were the preferred methods due to their simplicity. They also noticed that firms used internal finances for routine investments, while for growth and new project they used external finances.

Jain, Jain and Tarde (1995) conducted a study on 64 non-financial companies listed on BSE. They noticed nearly fifty percent companies to rely on traditional non-DCF techniques such Payback period and ARR. While asking the reason for using traditional methods, the respondents expressed preference for these methods due their simplicity. They observed only 10% of the companies to use DCF techniques like NPV and IRR.

Dhankar R S (1995) made a study on a sample 75 Indian companies and investigated the methods used for incorporating risk in project appraisal. The researcher found that the firms used CAPM and Risk Adjusted Discounting rate as tools for handling risk in capital budgeting. The scholar also surveyed methods of making financial appraisal of investments; he found 33% of the firms to rely on traditional Payback and ARR. Only 16% firms were found to use DCF methods.

Babu C P and Sharma A (1995) conducted a study of 73 companies located around Delhi and Chandigarh to examine the techniques used for evaluating capital projects. They found increased percentage (73%) of the companies to use DCF technique in capital budgeting decisions. The responding companies used prime lending rate or WACC for discounting the inflows. The authors note that departments concerned prepared investment proposals; however, the final authority of deciding the investments was vested with other authorities like boards and committees. As tools to handle uncertainty the companies used sensitivity analysis as well as risk adjusted discounting rates.

Rao Cherukuri (1996) surveyed of the capital budgeting practice of 74 Indian companies and found that 51% of the companies used IRR as primary project appraisal criteria. The companies used ARR and Payback Period as supplementary decision criteria. 70% of the companies used discounting rate between 14% and 17%; whereas, 35% of the respondents used 'WACC as discount rate'. This study revealed the losing importance of Payback Period and ARR as primary methods of project evaluation. The researcher examined the practice of incorporating risk in investment analysis. Sensitivity analysis was found very popular. In addition to this, companies also used shorter payback period and higher discounting rate as means to handle investment risks.

Bhattacharya (1997), studied 11 companies from India and observed Internal Rate of Return as the most popular method for financial appraisal of projects; 10 out of 11 responding companies reported to have the practice of using IRR. This was followed by NPV (8 companies) and Payback Period (5 companies).

Regarding the process of capital investment decision making it was found that investments proposal was conceived by Divisional or Unit Heads. In some companies proposal for new projects were initiated by Strategic & Corporate Planning Groups and finally approved by CEOs or Board of Directors.

Jain P K and Kumar M (1998) in their study on 'Capital Budgeting Practices in Indian Context' analyzed the capital budgeting practices of selected enterprise in private sector and compared them with those followed by companies in other countries of South East Asia (SEA) . The study covered 96 non-financial, non-government manufacturing companies and 5 companies from SEA (i.e. Japan, Malaysia and Singapore).

Based on responses of 20 companies (15 from India and 5 from SEA) they observed that investments for replacement and maintenance constituted highest percentage of the capital budgeting of the respondent companies. One-fourth of the sample companies invested for expansion and diversification. As per their findings, the most preferred method was ‘Payback Period’ (80%) followed by NPV (47%) and IRR (40%). 25% employed combination traditional and Discounted Cash Flow method for appraising the capital investments. Companies mostly used WACC for hurdle rate; some companies also used ‘marginal cost of additional funds’ for discounting future inflows. Over one-third of Indian and one-fifth of SEA companies reported that new investments proposals were originated at the top level only.

Parashar S P (1999) conducted a survey of 32 medium and large private sector companies and found that IRR (68%) and Payback Period (68%) methods were very popular followed by NPV (42%). The WAAC was the most commonly used (81%) hurdle rate in the project choice. The use of risk adjusted cost of capital is uncommon (13%). The use of beta to estimate cost of equity was also found quite uncommon as just 18.5% respondents used it.

Patel B M (2000) studied a sample of Indian firms and examined how many methods a single firm is using at the time of financial appraisal of an investment. His findings are as given below:

Use of Multiple Methods:

Number of Methods	1	2	3	4	5	More than 5
% of users	16.1	25.0	30.4	19.6	3.6	5.4

Source: Patel, B.M.: *Project Management- Strategic Financial Planning*; Vikas Pub. New Delhi, 2000

His findings reveal that companies and firms instead of using a single appraisal technique, they use multiple techniques. The result is consistent with the fact that there are several dimensions in an investment project. Different methods may help to take care of those dimensions properly.

Anand Manoj (2002) investigated 81 big Indian companies, chosen on the basis of market capitalization, to find out corporate finance practices such as capital budgeting decision, capital structure decision and dividend policy decision.

Most respondents used NPV and IRR as their most frequently used evaluation tools. *Eighty-five per cent* of the respondents considered *IRR* as a very important/ important project choice criterion. The level of popularity for NPV method was *about 65 per cent* only. The *Payback Period* method was also popular (67.5%).

The most interesting results came from examining the responses conditional on firm size and growth characteristics. Large firms were significantly more likely to use NPV than small firms. Small firms were more likely to use payback period method than large firms. High growth firms were more likely to use IRR than the low growth firms, whereas low growth firms are more likely to use break-even analysis than high growth firms.

Gupta Sanjeev et al. (2007) conducted a survey of Capital Budgeting Practices in Punjab-based companies to examine influence of factors like size of capital budget, age and nature of the company, professional qualification of CEO. They observed that majority of sample companies were still using non-discounted cash flow technique mostly Payback Period criteria to evaluate new project. These findings are really surprising that while corporate houses in developed countries are trying the latest sophisticated methods, the sample companies are still practicing traditional unscientific tools. Only a few companies were seen to use DCF and among them a very negligible number of companies were found to apply NPV. The companies used WACC for determining the discounting rate needed for discounting of future pay-offs.

Shah Kamini (2008) found that almost all the companies are using now multiple techniques for evaluating their capital budgeting proposals. The researcher also observed that the companies prefer 'IRR and NPV' to Payback period method. Interestingly she observed two different trends in choosing evaluation tools. She noted that for investing in new projects firms use IRR, PBP and NPV, while for expansion, replacement, modernization, etc., firms largely rely on Payback period method. She also found Sensitivity analysis as the most important technique for risk analysis and scenario analysis as the second most important technique for this purpose.

Verma, Gupta and Batra (2009) made a survey of 30 India companies from manufacturing sector. The authors observed that globalization and exposure of Indian companies to global competition have compelled to be more judicious and rational in making capital budgeting decisions. These companies were seen to apply formal capital budgeting analysis including DCF so as to avoid any mistakes resulting in losses. The authors also observed that, instead of relying on one single technique of evaluation, the companies were seen to try multiple appraisal methods for evaluation of investments. They noted the emergence of a trend of increased adoption of sophisticated discounted capital budgeting tools like NPV and IRR as compared to the non-DCF capital budgeting techniques. However, majority of companies exhibited their preference for Payback Period Method as a supplementary method as well as primary method.

Singh, Jain and Yadav (2012) studied the contemporary practices in capital budgeting in Indian companies. Result of the study is based on responses received from 31 non-financial companies listed in BSE 200 index. The study confirmed the ongoing trend towards use of advanced techniques of capital budgeting. All responding companies used Discounted Cash Flow (DCF) techniques along with non-DCF techniques. There was a strong preference for DCF, in which more than 78.57 percent preferred IRR instead of NPV. This is contrary to textbook prescription that NPV is better than IRR; survey results reveal that firms exhibited a preference for IRR compared to NPV.

The authors found sizeable percentage of companies to follow non-DCF methods such as Payback period (64.28 percent) and Accounting Rate of Return (39.28 percent). They also noticed that sensitivity analysis was the most widely used tool for handling risk in capital budgeting decision-making. The study reports the emergence real option analysis such as re-investment options (50 percent) and abandonment options (17.64 percent).

It further covered analysis of capital budgeting process too. It revealed that in 72 percent cases proposals for new investment emerged from head office. It reflects the prevalence of control of top management on such decisions. A big majority of the companies (86.24 percent) focused on capacity build-up by investing in the existing line of business followed by modernization. Technology up-gradation emerged as the second most important constituent for capital expenditure outlay (44.82 percent of the companies).

New investment in other areas (diversification) was the third important constituent for capital expenditure outlays.

Arora, Preeti (2012) made a study of Capital Budgeting practice of top 500 companies of India, enlisted in market index in terms of their size of market capitalization. She collected data through structured questionnaire from 125 companies covering 9 industries.

She observed that the major goal of the firms was to maximize market share followed by maximizing the market value per share. In respect of methods her findings were different. She noted that 92% of the companies preferred Discounted Payback Period as the most important appraisal technique. The other popular methods were simple Payback Period, Internal Rate of Return and NPV. Noted levels of popularity of these methods were 82.4%, 70.4% and 66.4% respectively. The highest number of firms used sensitivity analysis followed by Payback Period to adjust for risk.

Using a sample of 75 companies, **Gupta Divya (2013)** noticed existence of a positive relationship between frequency of using capital budgeting techniques and application of discounted cash flow techniques with the firm the size of the firm. According to her findings, large size firms exhibited reliance on DCF, while small firms exhibited preference for traditional payback period.

Yadav Vinod Kumar (2013) finds that firms in small-scale industries mainly use traditional payback period and Accounting Rate of Return instead of scientific evaluation methods like IRR and NPV.

Part – B: Literature Review: Capital Budgeting Studies Abroad

Evidences from studies on capital investment practices all over the world reflect a gradual development in this field. In the sixties and seventies of last decade there was greater trend of using traditional methods [Suk H Kim, et al. (1988)]; however, in the eighties and nineties of the last century corporate houses began to shift to DCF as primary method; traditional non-DCF methods were given the status of supplementary methods [Arnold and Hatzopoulous (2000); Ryan and Ryan (2002)]. Later, IRR, in terms of popularity as a primary method, gained top position pushing NPV down to the second position [Graham and Harvey (2002)].

The studies on capital budgeting in US and UK are extraordinarily relevant and pioneering. Some scholars [Miller and Waller (2003); Verbeeten Frank H M (2006)] examined the applicability of sophisticated techniques such as real option, game theory and option valuation. Others, keeping watch on developments in approaches to management, shifted the focus of study from mere quantitative appraisal to strategic appraisal and market competition [Slagmulder Regine, *et al.*, (1995); Carr, Criss; Kolehmainen, K. and Mitchell, F (2010)]. The notable contributions in this field have been discussed below: Another group of scholars drew the attention to qualitative and process aspects of capital budgeting. They [Bower (1970); Kersyte Agne (2011)] argue that capital budgeting is complex organizational process subject to procedural rational and politics. According to them, a project has little prospect unless it serves the interest of people involved with its implementation. Findings of some of the notable studies have been presented in the paragraphs given below:

Klammer, Thomas P(1972) conducted a longitudinal study on 369 American Firms from 1969 Compustat listing of manufacturing firms having average annual capital expenditure of \$ 1 million or more over a period of five years during the period from 1963 to 1967. The findings revealed the trend of the firms' gradual shift towards the use of DCF methods such as NPV and IRR. The study reported that 57% of the respondent firms preferred DCF to non-DCF methods.

Klammer Thomas (1973) made an investigation into the association between firm's 'financial performance and use of capital budgeting techniques'. He observed that despite the growing adoption of sophisticated capital budgeting methods, the results

didn't show any consistent significant association between performance and capital budgeting techniques. He noticed that mere adoption of sophisticated analytical tools is not sufficient to bringing about superior performance; according to him, other factors such as marketing, product development, executive recruitment and training, labour relations etc. might have greater impact on profitability. With due caution he inferred that though the use of sophisticated capital budgeting techniques was not found to be closely related to performance, but these finding should not be interpreted to mean that the sophisticated techniques are not preferable.

Fremgen James (1973) made a survey of capital budgeting practice of 250 sample firms. He used questionnaire method to collect data regarding the methods of financial appraisal as well as tools used to handle risk. He observed that Internal Rate of Return was the highest used appraisal method. Firms mostly hiked the projected profitability requirement as cushion against probable risk.

Petty J William et al. (1975) conducted a survey on 284 large United States Corporations from Fortune 500 list. He found that 61% of respondent companies were using IRR followed by Payback Period (58%), NPV (33%) and Rate of Return on investment (33%). Further the researcher observed that 74% were applying more than one technique in evaluating capital projects. IRR and NPV were the preferred techniques for appraisal of capital intensive industries. Along with these DCF methods companies used Payback Period as a 'supplementary method'. The companies were seen to use cost of capital as a cut-off rate for discounting of future cash flows. To handle risk firms used to set a higher discounting rate.

Brigham (1975) surveyed 33 large US firms having sizeable investment in plants and equipments. He observed that that 94% of the responding firms used to apply DCF methods such as NPV, IRR and PI criteria for financial appraisal of long-terms investments. Instead of using multiple hurdle rates, firms preferred WACC for discounting purpose.

Cooley Philip L, et al. (1975) made a systematic effort towards building a theoretical model of quantitative model that can account for inflation in the process of arriving at the optimum capital budgeting decision. They pointed to the limitations of traditional NPV model and argued that in a risky world characterised by persistent and high inflation

rates, the traditional model becomes over simplified and less useful to produce optimum investment decisions except under restrictive conditions. The authors argued for discounting the real cash flows instead of nominal cash flows. To do so they demonstrated the mechanism of translating nominal cash inflows into real cash inflows and incorporated those values into NPV model for getting an index of real NPV instead of nominal NPV.

Gitman and Forrester (1977) made a capital budgeting survey on 103 major US firms listed in Forbes list in terms of market capitalization. The study revealed that IRR was the most popular method. 53.6% of responding companies used IRR as their primary evaluation technique. ARR was the second most popular as primary method. Responding companies used Payback Period as secondary evaluation technique. In majority of the companies 'Finance Department' was responsible for analyzing the capital investment projects. Responding companies expressed that in the process of capital budgeting, defining a project and estimation the stream of future cash inflows were the most difficult tasks.

Kim Suk H and Farragher Edward (1981) made a study on Fortune 100 companies. They examined the methods that the companies used in their capital budgeting programmes in 1975 and 1979. They intended to note the gradual developments over the period. They observed that in both years the responding companies used DCF methods (*either IRR or NPV*) as primary method and Payback period as secondary method for financial appraisal of their capital budgeting proposals.

De, P. K. et al. (1982) in their paper entitled "A Chance-constrained Goal Programming Model for Capital Budgeting" presented a zero-one goal programming problem in the production area whose coefficients in the technological matrix are stochastic. The authors presented a numerical example of goal programming with clearly defined goal hierarchy consisting of i) meeting budget requirement, ii) meeting NPV requirement, iii) meeting working capital requirement and other goals in the order of priority. Focus of their analysis was on indicating which of the projects have the greater chances of under-performance, so that such project might be excluded from analysis and selection.

Stanley, M and Block S (1983) presented a study of capital budgeting practice of 339 US based multinational firms enlisted in the Fortune 1000. They used questionnaire directed to Chief Financial Officers of the MNCs. They observed that the firms surveyed assigned more emphasis on stockholder interests, contrary to maximizing managerial interests. They reported that the Internal Rate of Return dominated as the primary method of financial appraisal for capital projects; 65% of respondents expressed their preference for IRR as primary method. The study presented evidence in support of the presence of a significant relationship between 'use of IRR' and size of firm.

The researchers noticed 88% of the responding firms to use weighted average cost of capital as cut-off rate for discounting purpose. Cost of capital of the parent firm was more extensively used compared to the cost of capital of concerned project; 34% of respondents reported that they make adjustment to cost of foreign currency debt, if there is a substantial change in foreign exchange rates.

With regard to risk analysis, the authors noticed widespread use of risk-adjusted cash flows than what was observed in earlier studies. The risk of foreign projects was noticed to have a relationship with size of earning and corporate remittances.

With regard to operational aspects of capital budgeting, project initiation exhibited a bottom-up approach (82%); however, final decision-making in this regard was centralized (70%). In assessing financial merit of the investments, the majority of the firms used either parent cash flows or both parent and subsidiary cash flows; it indicated that sound capital budgeting resulted in substantial operational progress toward considering project impact on the firm as a whole. In short, they noticed a narrowing gap between the normative prescriptions and the actual practice in the in the area of capital budgeting.

Pruitt, W. S. and Gitman, L. J. (1987) surveyed Capital Budgeting practice of 500 firms included in the 1986 Fortune 500 List to evaluate various aspects of bias in forecasting benefits and costs associated with the projects.

The results support that managers entrusted with the task of forecasting have the tendency of making over-estimate of the revenue and under-estimate of the costs. The

researchers noticed this practice in 80% cases. Experienced management individuals tend to adjust the projected profits downward in an informal process to leave some elbow space for their flexibility and job-security. The researchers advocated that this practice of downward adjustment should be done formally using scientific methods such as Bayesian Statistical Method.

Woods, J. C. and Randall, M. R. (1989) adds that very extra amount of NPV is looked upon as an addition to shareholders wealth. On the other hand, shareholders' wealth is generally understood as sum of the market values of shares held by an investor. Had there been an efficient market, every addition of NPV would get reflected into the share price; in such circumstances, the direct link between NPV and maximization of shareholders wealth could be reasonably accepted to be valid [Woods, J. C. and Randall, M. R. (1989)]. As almost all markets are imperfect, the validity of the relationship between NPV and shareholders wealth cannot be reasonably justified. The authors again pointed to the differences in discounting rates. To ascertain quantum of wealth an evaluator should use cost of equity as the discounting rate. Since overall cost of capital is used for determining NPV, it cannot be readily guaranteed that every addition of NPV will result in maximization of wealth always.

Bierman Harold (1993) made a study on Capital Budgeting of Fortune 100 Companies. He observed that 73 of 74 responding Fortune 100 companies used Discounted Cash Flow techniques. IRR was the most preferred method compared to NPV. Although Payback Period method was used extensively (84% of respondent firms), it was not used as a primary measure. 93% of the responding companies used WACC for deciding the discounting rate.

Drury, Braund and Tayles (1993) conducted a study on 300 UK manufacturing companies with annual sales exceeding £20 million and found that 86% of the companies used Payback Period and 80% used IRR for project appraisal techniques. Sensitivity Analysis was the most widely used method of project risk analysis. They reported that 95% of the responding companies neither used CAPM for computing cost of equity nor used Monte Carlo Simulation for risk analysis of the projects.

Petry and Sprow (1993) studied 151 firms included in the 1990 Business Week 1000 and found that 60% of the firms used traditional Payback Period and 90% of the firms

used NPV or IRR, either as a primary or secondary method of capital budgeting decisions. CFOs of responding firms did not talk about difficulties using IRR, especially they did not encounter the problems of multiple IRR.

The capital investment decision making is a very complex process and complicated one. There is something beyond the financial aspects which must be considered. **Shapiro Allan (1993)** presented examples of American Home Products, which had earned remarkable return on shareholders' equity during the decade (1974-1983) of deepest economic decline. Even in turbulent market in India, ITC is working nicely. While many industries face a downturn, home products record a steady rise, pharmaceuticals shine. The author argued that if a corporate house can adopt right strategy at the right time, it may create value for its shareholders.

Jog and Srivastava (1995) in their study of Capital Budgeting Practices in large Canadian corporations noticed that use of Discounted Cash Flow techniques became a norm in corporate houses in Canada. 75% of the 133 responding companies used DCF methods. IRR was used more frequently used than NPV. Payback period was also used in conjunction with the DCF methods. Companies surveyed were found to use Sensitivity Analysis for analyzing project risks. However, they noticed the use of subjective and non-standard qualitative methods for estimation of future cash inflows.

Gilbert and Reichert (1995) surveyed firms enlisted in 1990 Fortune Magazine Directory and observed that the firms were resorting to apply multiple project evaluation techniques for capital investment decision making. The authors also noted that the firms developed a trend of greater use of NPV and IRR.

Slagmulder Regine, et al., (1995) present an analytical discussion on evaluation of strategic technology investments. They point to the competitive market scenario, where numbers of companies confront the problems of evaluating strategic technology investments using traditional DCF method. Normative quantitative models such as NPV and IRR are said to be inadequate to helping evaluation of investments in technology projects and innovations; this is mainly because of the inability of DCF models to incorporate strategic dimensions and qualitative benefits into the analysis. As the distant discounting factors are almost insignificant, thus while DCF is applied, the benefits of distant future cash inflows are grossly underestimated. Traditional capital budgeting

methods that depend much on the DCF methods have been heavily criticized for heavy penalization of long-term prospects; heavy discounting of the future benefits eventually results in rejection of many strategically important investments proposed for advanced manufacturing technologies such as CAD and CAM. Some experts in this field suggested that DCF methods should not be used in evaluation of strategic investments, while others have developed sophisticated methods for performing an integrated evaluation by incorporating strategic and financial evaluation together.

Because of the limitations of DCF stated above, experts argue that evaluation of technology investments should not be based on DCF alone; this is often considered to be just as misleading. The most rational alternative is that as a necessary condition, investments in new technology may be justified in terms of the indices of DCF methods; however, the highest importance should be given on their consistency with the competitive strategy of the company [Hill, T.J. (1985); Goldhar, et al. (1983)]. Scholars advocating for strategic appraisal of investment argue that purely quantitative approach is inevitably short-sighted, hence, strategic considerations should be given reasonably higher weights.

Horngren, et al. (1996) compiled data on popularity of the methods in different countries, expressed as percentage of users. Their compiled table is as given below:

Evaluation Method	Countries						
	US	Australia	India	Ireland	Japan	UK	Korea
Payback	59	61	69	84	52	76	75
IRR	52	37	55	84	4	39	75
NPV	28	45	38	84	6	38	60
ARR	13	24	25	24	36	28	68

Source: Horngren, Foster and Datar: *Cost Accounting – A Managerial Approach*, PHI, New Delhi, 1996, p-703.

Note: Above percentages cover uses as primary method as well as secondary method.

Richard Pike (1996) conducted a longitudinal study over period of 17 years from 1975 to 1992. He collected responses from the same sample companies at a regular interval of 5 years. He compiled the data to trace the gradual evolution of the practice of using

better scientific methods. He did not notice any correlation between firm size and method of project appraisal; however, use of computerized software package had some relation with the size of the firm. His study can be regarded as a milestone in history of capital budgeting study in UK. His findings have been presented in the following table:

Changing Popularity of Appraisal Methods

Evaluation Method	1975	1980	1986	1992
Payback	73	81	92	94
ARR	51	49	56	50
IRR	44	57	75	81
NPV	32	39	68	74
PBP/IRR/NPV	10	9	21	26

Source: Pike R (1996): A Longitudinal Survey of Capita Budgeting Practices, *Journal of Business Finance and Accounting*, Vol. 23(1), 1996, pp. 82-83

The table traces the gradual progress in the practice of using DCF. While in 1975 only 44 percent firms used to apply IRR, in 1992 this percentage has risen to 81%. Despite of this phenomenal progress in application of DCF, the popularity of Payback Period did not decline at any occasion. Instead popularity of this method has risen to 94%, which is the highest among all methods used in the industry.

Chadwell-Hatfield, et al. (1997) conducted a study and revealed that firms were using more than one criterion in project choice. In their study more than 70% of firms considered high IRR important for accepting a project. Though 80% firms were found to apply NPV method for financial appraisal; however, in response to question regarding its importance, only 50% firms stated that high NPV seemed important for choosing an investment. They notice 67% firms to use shorter Payback Period for handling project risk. Firms were seen to apply project cost of capital for discounting of future pay-offs.

Kester G. W. and Chong Tsui Kai (1999) in their survey of Capital Budgeting Practices of listed 226 companies in Australia, Hong Kong, Indonesia, Malaysia, Philippines and Singapore found that multiple techniques were used by vast majority of respondent companies. NPV and IRR were ranked as the most important in Australia, Indonesia, Malaysia and Philippines. In Singapore IRR and Payback Period were ranked

equally as the most important techniques. In Hong Kong Payback period was ranked as the most important technique. Sensitivity Analysis and Scenario Analysis were found to be the most important tools for project risk assessment in all the countries.

Arnold and Hatzopoulous (2000) made a survey of 96 UK large companies drawn from the sampling frame of Times 1000 List of 1996. The authors undertook this study to examine the gap between theory and practice. This study may be regarded an extension of the work of Richard Pike (1996). The authors noticed considerable increase in the use of DCF methods in financial appraisal of investment projects. 68 percent companies indicated that they always used IRR as primary method; this percentage for NPV appeared to be 63 percent. Aggregate popularity of IRR, adding its usages as primary and secondary methods, increased to 97%; this measure for NPV was 84%. While studying the methodology of risk analysis the authors noticed that Sensitivity Analysis and Scenario Analysis were comparatively more popular than stochastic methods like decision tree analysis. For determining the rate of discounting the firms were seen to compute WACC, which according to the authors, was consistent with theory. Findings from the survey provided enough evidence to infer that the gap between theory and practice was gradually becoming very negligible.

Brealey and Myers (2000) observed maximum use of IRR method by respondent companies in evaluating their capital projects. To provide logic behind this trend they noted that IRR seemed easier to explain to non-financial managers. They argued that too much dependence on IRR may result in choosing up-front investments of shorter duration. They also observed that *some* large corporations used Payback Period or Accounting Rate of Return as their primary method of project choice.

Kaplan and Atkinson (2000) noted the mistakes committed in appraisal of new technology investments. They observed that as new technology is risky, the managers, at the time of appraisal, either set a very low payback period or discount the future cash inflows at an abnormally high rate of discounting, which renders future inflows redundant or unnecessary for evaluation purpose.

Graham and Harvey (2002) conducted a comprehensive survey on 392 big corporate houses in USA and analyzed the contemporary practice of Capital Budgeting as well as capital structure. They observed that in the USA the highest percentage of corporate

houses used IRR as primary method for evaluation of long-term investment in projects. However, use of IRR is marginally higher than NPV. Other than NPV and IRR the Payback Period was the most frequently used capital budgeting techniques.

Ryan and Ryan (2002) arrived at similar conclusions. Ryan and Ryan conducted a survey of CFOs of 1000 US companies and found the preference of discounted capital budgeting methods over non-discounted techniques. It was observed that NPV (50%) was the most frequently cited method of choosing capital investments followed closely by IRR (45%). This is in *consistent* with the theory and practice as suggested in the reputed text books of *Van Horne & Wachowicz (2003)* and *Brigham & Houston (2004)*.

Brounen (2004) conducted a study on 313 companies in the UK, Netherland, France and Germany. Compared to the findings of Graham and Harvey (2002) and Ryan and Ryan (2002), he noticed a strong preference for Payback Period method. Measures of popularity of this method in these countries were 69%, 65%, 50% and 51% respectively. The Payback method was more popular among private companies. The NPV and IRR technique ranked after Payback Period technique.

Kantudu (2004) conducted a survey on capital investment appraisal practices of quoted firms in Nigeria and observed that one-third of respondents firm favoured a combination of investment appraisal techniques but the Payback Period was ranked high among other techniques like ROCE, ARR and NPV. Simplicity, understandability and effectiveness were the reasons attributed in the choice of a particular project appraisal technique.

Verbeeten Frank H M (2006) noticed a positive relationship between uncertainty and use of Sophisticated Capital Budgeting Practices, which includes Real Option Reasoning, Game Theory, Simulation and Certainty equivalents. The results of his study were based on the responses 189 Dutch organizations, surveyed by him. The author linked some nonfinancial variables to project uncertainty and critically conducted statistical analysis to extract factors that contribute to uncertainty. Finally, he showed how those factors influence adoption of Sophisticated Capital Budgeting Practices. The author simultaneously noted the trend of using multiple tools and procedures in the evaluation of investment projects; this practice may be due managements' attention on different aspects of the investment decision (Millerand Waller, 2003). The research is

commendable. However, he totally avoided analyzing the financial factors such as wealth, value addition and rate of earning.

Hermes, Smid and Yao (2007) made a comparative study of capital budgeting techniques used by Dutch and Chinese companies. The study was based on a survey of 42 Dutch and 45 Chinese firms. The focus of the study was on checking the presence of the so-called “country effect” on choice of capital budgeting methods. The study revealed that Dutch CFOs used the NPV method significantly more often than their Chinese CFOs. Contrary to this, Chinese CFOs used the ARR method significantly more than Dutch CFOs did. CFOs of Chinese companies make cost of equity estimations less often as compared to Dutch CFOs. However, the authors noticed much similarity in respect of the use of CAPM and IRR. While the first one is used for estimating the cost of equity, the second one is used for financial appraisal. However, the authors abstained from drawing clear conclusions with respect to the importance of the “country effect” on choice of capital budgeting tools between two countries.

Miller, Peter & Ted, Leary O (2007) pointed to the empirical deficit in studies of capital budgeting practices, particularly in the area of capital budgeting process. They demonstrated that investment appraisal should not be confined to valuation techniques. In the era of technological innovations, there is a need for “technology roadmap”. According to the authors, in majority of the cases investment is an inter-firm and inter-agency process, where mediating instruments have a great role in defining a project and outlining the investment mechanism. For example, Health insurance can be looked upon as the mediating instrument in defining a project in between health industry and financial industry.

Leon et al. (2008) survey on capital budgeting practices of 108 listed Indonesian companies found that 61.4% of the respondent companies use DCF technique (i.e. NPV, IRR, PI) as the primary measure for making capital budgeting decisions. The remaining 38.6% use a non-discounted cash flow technique (i.e. Payback Period or ARR) as the primary measure.

From a survey of companies listed on Irish Stock Exchange George Kester and Geraldine Robbins (2011) found almost 100 percent companies to use economically justified DCF

methods, such as Net Present Value and Internal Rate of Return, in an isolated manner or in combination with non-DCF methods like ARR and Payback Period.

The contribution of this paper has been to encompass a wide range of acknowledged variables into a single overall contextual framework and to explore this framework's potentials for explaining differences in Strategic Investment Decision-making practices.

The empirical aspect of the research comprised an exploratory set of 14 matched field case studies from the U.K., U.S. and Japan; the selected firms were from industries in the areas of vehicle components and telecommunications sectors. Application of the four contextual categories (i.e. market creators, value creators, re-focusers and restructurers) in the framework provided a successful explanation for variation in overall Strategic Investment Decision-making practices of the companies. The findings indicate substantial differences in approach across the four firm typologies, particularly in terms of the emphasis on strategic versus financial considerations, the thoroughness and rigidity of financial analysis and the attitudes towards incorporating less easily quantifiable factors such as synergies into calculations.

Additionally, IRR target rates are higher in the most strategically orientated market creator category as compared to the most financially orientated restructurer category.

Choice of specific investment techniques exhibits more moderate systematic variation, but this can be explained by the near universal adoption of discounting techniques in large firms.

Kystyne Agne (2011) dealt with theoretical aspects of capital budgeting. According to the author capital budgeting is a process characterized by competition for scarce resource. Hence, project policy, project organization and reward system played dominant role on the final selection of a project. He pointed that capital budgeting is a complex multi-stage process in which managers at multiple level of a firm play distinct roles.

On the basis of study on Swedish companies **Hartwig (2012)** observes that use of sophisticated methods exhibited a trend of gradual rise, while use of unsophisticated methods decreased. This indicates that the theory-practice gap is closing. Hartwig's agenda is compliance of accounting standards in capital budgeting. He raises the issue

that if evaluation is made on the basis of managers' personal forecasts, it cannot be counted as reliable in terms of accounting standards.

Andor G., et al. (2015) organized a field study on a large sample of 70,000 firms (excluding micro firms) and collect response from 400 executives in ten countries in Central and Eastern Europe (CEE) to obtain the actual evidence of capital budgeting practices. Their survey results suggest that large and multinational firms are more likely to use DCF and other sophisticated techniques than small and medium firms. Large firms such as MNCs are more likely to have the skilled manpower, technical knowledge and expertise, financial resources, and a formal capital budgeting process in place than small-medium firms. Survey results also indicate that corporate finance practices in CEE countries are influenced mostly by firm size, management culture, and code of ethics.

Another interesting finding of the survey is that despite the use of advanced capital budgeting techniques, including DCF methods and sensitivity analysis or real option analysis, a good project that is selected based on DCF analysis can **be rejected by top management due** to several other factors such as ethical and moral considerations, lack of financial resources, lac of strategic fit, trust in the analysts or credible sources of data. The study also compare the results obtained with prior studies and find significant variations in capital budgeting practices across 35 countries, among high, upper middle, and lower middle income countries, and across seven geographic regions. The study is comprehensive, analytical and empirically sound. The authors examined inter-relationship between various methods and qualitative variables such as management culture, size of firm.

Kengatharan, L. (2016) in his research paper "Capital Budgeting Theory and Practice: A Review and Agenda for Future Research" made a longitudinal study on capital budgeting practices followed across the world during the last two decades i.e., from 1993-2013. He has done a detailed review and analysis of the studies published during the last two decades with regard to the capital budgeting theory and practice. This paper also throws light on the agenda for future research in the area.

He noted that some improvements have taken place in respect of the use sophisticated capital budgeting practices. However, still there is a gap between theory and practice. Actual capital budgeting practice is subject influence of many factors such as country effect, government control, technological developments, market structure, accounting and taxation system in the country, organizational structure and norms, political factors, qualification and attitude of the CFO, etc. The author expressed his observation that majority of the researcher are devoted in surveying the methods normative financial appraisal used in the industry, without taking care of many other factors that directly and indirectly affect capital budgeting practice in a firm.

Conclusion

Research study in capital budgeting is not totally an unknown area. A good number of researchers have made remarkable studies in India and abroad. More than 90% of the researchers surveying the methods and techniques of capital budgeting reveal that corporate houses are gradually shifting to the use of normative financial appraisal tools primarily based on different versions of DCF. In the process of assessing merit of a capital budgeting proposals, contemporary investment theories assign a great degree of emphasis on normative financial appraisal and neglect myriads of other important non-financial factors that predominantly add to the success of the investment projects. Only in western countries limited numbers of studies have been done for analyzing the role of non-financial factors in capital budgeting. In India, as per accessible literature available no record of study on non-financial factors could be noticed.

Literature Review: Indian Studies

Summary Table-2A: Popular Capital Budgeting Methods

No	Author/Authors	Year	Methods of Appraisal
1.	Chandra Prasanna	1975	PBP for small size projects ARR for large size projects
2.	Porwal L S	1976	IRR for new product lines ARR for existing products PBP
3.	Bansal	1986	ARR
4.	Pandey I M	1989	PBP, IRR
5.	Sahu P K	1989	PBP, ARR
6	Purohit B N , Lall G S and Panda J	1994	PBP, ARR
7.	Dhankar R S	1995	PBP, ARR
8.	Babu C P and Sharma A	1996	IRR, PBP
9.	Cheurukuri U Rao	1996	IRR, ARR
10.	Bhattacharya A K	1997	IRR
11.	Jain P K and Kumar M	1998	PBP, NPV
12.	Parashar S P	1999	IRR, PBP
13.	Bedi A	2000	IRR
13.	Anand Manoj	2002	IRR
14.	Gupta S, Batra R and Sharma S	2007	PBP, ARR
15.	Shah Kamini	2008	IRR, NPV
16.	Arora, P	2012	DPBP, PBP, IRR
16.	Batra R	2013	IRR, NPV
17.	Yadav Vinod Kumar	2013	PBP, ARR in small firms
18.	Yadav A	2015	IRR, NPV in large firms PBP, ARR in small firms

Abbreviations used:

DCF= Discounted Cash Flow, PBP =Payback Period, ARR=Accounting Rate of Return,
 IRR= Internal Rate of Return, NPV= Net Present Value & PI= Profitability Index,
 DPBP= Discounted Payback Period

Literature Review: Foreign Studies
Summary Table-2B: Popular Capital Budgeting Methods

Sl. No	Author/Authors	Year of Study	Popular Capital Budgeting Method/ Methods
1.	Klammer, Thomas P.	1972	DCF
2.	Fremgen James	1973	IRR
3.	Petty J William, Scott David P., and Bird M M	1975	IRR
4.	Gitman Lawrence G. and John R. Forrester Jr.	1977	IRR, PBP as secondary
5.	Kim Suk H and Farragher Edward	1981	IRR, NPV PBP as secondary approach
6.	Mark Ross	1986	PBP
7.	Wong Farragher and Leung	1987	PBP, ARR
8.	Stanley	1990	PBP
9.	Jog and Srivastava	1991	IRR, PBP
10.	Bierman Harold	1993	IRR, NPV PBP as secondary criterion
11.	Drury , Braund and Tayles'	1993	PBP, IRR
13.	Petry and Sprows'	1993	NPV, IRR, PBP
14.	Joe Walker, Richard Burns and Chad Denson	1993	PBP
15.	Pike Richard	1996	DCF, PBP
16.	John J Binder and J Scott Chaput	1996	DCF
17.	Colin Drury and Mike Tayles	1996	IRR, NPV, PBP
18.	Kester George W and Chong Tusi Kai	1996	IRR, PBP
19.	Kester and Chang	1999	NPV, IRR
20.	Arnold Glen C and Hatzopoulos P D	2000	NPV, IRR
21.	Graham and Harvey	2001	IRR, NPV, PBP
22.	Copper William D , <i>et al.</i>	2001	IRR
23.	Ryan Patrica A and Ryan Glen P	2002	NPV
24.	Akalu Mehari Mekonnen	2002	NPV, IRR
25.	Ioannis T Lazaridis	2004	PBP, NPV
26.	Vaikeskoski Mika and Liljeblom Eva	2004	PBP, IRR
27.	Hogaboam, Liliya S and Shook Steven R	2004	IRR
28.	Lord Beverley R and Boyd Jeniffer R	2004	NPV
29.	Hermes, N, Smid P and Yao L	2006	NPV by Chinese firms, IRR by Dutch firms
30.	Troung G, Partington and Peat M	2006	NPV, PBP
31.	Farah M. L, Mansor Isa and George W. Kester	2008	NPV, IRR, PI
32.	George Kester and Geraldine Robbins	2011	IRR, NPV
33.	Ramesh, S and Nimalathan, B	2011	NPV, IRR
34.	Hartwig	2012	DCF
35.	Vongai Maroyi and Huibrecht M. V.	2012	NPV, IRR
36.	Tomasz Wnuk-pel	2013	NPV, IRR
37.	Lakew, D M and Rao, Prabhakar D	2014	NPV
38.	Sadia F, Nelson A and Artur R	2015	NPV
39.	Pratheepknath, P , Hettihewa, S & Wright C S	2015	NPV, IRR
40.	Yashmin, Shakila	2015	NPV

Abbreviations used:

DCF= Discounted Cash Flow, PBP =Payback Period, ARR=Accounting Rate of Return,
IRR= Internal Rate of Return, NPV= Net Present Value, PI= Profitability Index,
DPBP= Discounted Payback Period

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