

Capital Budgeting Theory and Practice: A Review and Agenda for Future Research

Lingesiya Kengatharan

Department of Financial Management, University of Jaffna, Sri Lanka

Abstract

Purpose - The main purpose of this research was to delineate unearthen lacunae in the extant capital budgeting theory and practice during the last two decades and ipso facto become springboard for future scholarships.

Design/methodology/approach - Web of science search and iCat search were used to locate research papers published during the last twenty years. Four criteria have been applied in selection of research papers: be an empirical study, published in English language, appeared in peer reviewed journal and full text research papers. These papers were collected from multiple databases including OneFile (GALE), SciVerse ScienceDirect (Elsevier), Informa - Taylor & Francis (CrossRef), Wiley (CrossRef), Business (JSTOR), Arts & Sciences (JSTOR), Proquest ,MEDLINE (NLM), and Wiley Online Library. Search parameters covered capital budgeting, capital budgeting decision, capital budgeting theory, capital budgeting practices, capital budgeting methods, capital budgeting models, capital budgeting tools, capital budgeting techniques, capital budgeting process and investment decision. Thematic text analyses have been explored to analyses them.

Findings - Recent studies lent credence on the use of more sophisticated capital budgeting methods along with many capital budgeting tools for incorporating risk. Notwithstanding, it drew a distinction between developed and developing countries. Moreover, factors impinging on choice of capital budgeting practice were identified, and bereft of behavioural finance and event study methodological approach were highlighted. More extensive studies are imperative to build robust knowledge of capital budgeting theory and practice in the chaotic environment.

Policy recommendation – This research was well thought out in its design and contributed by stating the known and unknown arena of capital budgeting during the last two decades. This scholarship facilitates to academics, practitioners, policy makers, and stakeholders of the company

Limitations - Limitations of this study were primarily concerned with Tower of Babel Bias and time constraint.

Keywords: Capital budgeting theory and practices, capital budgeting tools for incorporating risk, discount rate

Paper type: Literature review

Introduction

Predominantly, area of capital and capital budgeting of financial management have been attracted many researchers during the last five decades and the seminal studies culminated with presenting many theories (e.g., Portfolio Theory: Markowitz,1952,1959; Optimal Capital Structure: Modigliani and Miller,1958; Miller and Modigliani,1961; Myers,1977; Jensen,1986; Ritter, 1991; Graham and Harvey, 2001; Efficient Market Theory: Fama,1970; Roll,1977; Option Pricing Theory: Black and Scholes,1973; Arbitrage Pricing Theory : Ross, 1976; Agency Theory: Ross,1976; Myers, 2003; Atkeson and Cole,2005; Pecking Order Theory: Myers,1984; Halov and Heider,2004) and models (e.g., Mean-Variance model: Markowitz,1952; Capital Assets Pricing Model : Sharpe; 1964 Linter,1965; Roll;1977, Single Index Model: Sharpe,1963) time to time. Notwithstanding, due to the globalization, environmental changes and cutting edge advanced technological developments , theories and models developed in the past do not applicable today and many of them are criticized and their applicability in practice is intriguing (e.g., Malkiel,2003; Bornholt,2013). A curious instance illustrated by Brounen, de Jong and Koedijk (2004) is that ‘Nobel Prize winning concepts like the capital asset pricing model and capital structure theorems have been praised and taught in class rooms, but to what the extent to these celebrated notions have also found their way into corporate board rooms remains somewhat opaque’ (p. 72). ‘Traditional capital budgeting methods have been heavily criticized of discouraging the adoption of advanced manufacturing technology and thus undermining the competitiveness of Western firms’ (Slagmulder, Bruggeman and Wassenhove, 1995, p.121). In a similar vein, many research scholars on their seminal scholarships argued that there are gaps in theory of capital budgeting and its applicability (e.g., Mukhejee and Henderson, 1987; Arnold and Hatzopoulos, 2000; Graham and Harvey, 2001; Cooper et al., 2002; Brounen, de Jong and Koedijk , 2004; Kersyte, 2011).

Firms operating in a dynamic environment must respond to changes to beat competitors and to sustain, survive and grow in markets (Ghahremani, Aghaie and Abedzadeh, 2012). Most changes impinge on *capital investment decisions*, which can invariably involve large sums of money over the long period (e.g.,Peterson and Fabozzi, 2002, Cooper et al.,2002; Dayananda et al,2002) and these decisions are critical in managing strategic change and sustaining long term corporate performance (Emmanuel, Harris and Komakech, 2010). Capital investment decision can be acquisitions, investing new facilities, new product development, employing new

technology and adoption of new business processes or some combination of these (Emmanuel, Harris and Komakech, 2010). Capital budgeting investment decisions are critical to survival and long term success for firms due to many factors and those factors are commonly named as uncertainty. The global financial crisis is epitomized this truth. One of the most intractable issues confronted by researchers is how to identify, capture, and evaluate uncertainties associated with long term projects (Haka, 2006). Sources of uncertainty range from the mundane (cash flow estimation, number and sources of estimation error, etc.) to the more esoteric (complementarities among investments, options presented by investment opportunities, opportunity cost of investments, etc.) (Haka, 2006). Since capital investment decision deals with large sum of fund, scrupulous attention has been given in making decision. ‘Capital budgeting is as the procedures, routines, methods and techniques used to identify investment opportunities, to develop initial ideas into specific investment proposals, to evaluate and select a project and to control the investment project to assess forecast accuracy’ (Segelod, 1997). Albeit there are number of capital budgeting methods assist in making decision, number of other uncertainty factors have deleterious penetration into making capital budgeting decision.

Nowadays, complex methods are used for making capital budgeting decision rather purely depends on theories of capital budgeting because of uncertainty and other contingency factors (Singh, Jain and Yadav, 2012, Zhang, Huang and Tang, 2011; Kersyte, 2011; Bock and Truck, 2011; Byrne and Davis, 2005; Cooper et al, 2002; Arnold and Hatzopoulos, 2000; Mao, 1970; and Dickerson, 1963). After the advent of full-fledged globalization and in the era of cutthroat competition (Verma, Gupta and Batra, 2009), advanced developments in technologies, other macro environmental factors and demographic factors are intruding into capital budgeting practices (Verbeeten, 2006). In a world of geo-political, social as well as economic uncertainty, strategic financial management is of process of change, in turn requiring a re- examination of the fundamental assumption (e.g. efficient market hypothesis, Fama, 1970) that cut across traditional boundaries of the financial management (Hill, 2008). With limited credit and other sources of financing in today’s uncertain and challenging economic environment, also required to be scrupulously evaluated the profitability and successfulness of proposed capital investments and allocate limited capital is more vital than ever (Kester and Robbins, 2011).

Over the last 20 years, there have been many changes and challenges in making financial decision due to the global financial crisis, fluctuations in value of money, advanced technology, interest rate, exchange rate and inflation rates’ risks and dramatic changes in economic and business environment both in national as well as in global markets. Thus, there is need to re- examine and re- study for re-building capital budgeting practices since it has considerable impact on investment decision making. The investment decision making is not a simple or straightforward approach, the risk is an important element in making investment decision. There are number of risk techniques employed by companies for evaluating investment projects. However, there is problem in setting up theoretical model and applying that model into practice (e.g. Arnold and Hatzopoulos, 2000; Dickerson, 1963). Thus, the theory is not purely able to apply at all times. Sometimes theories developed in the past do not applicable today. There is no doubt, over the last two decades corporate practices regarding capital budgeting practices have not been static, diverged from the theories.

This study presents systematic review on capital budgeting practices literature published in the last two decades. The systematic review of literature is referred to as “principally justified by the manner in which the reviewer proceeds, stage by stage, with full transparency and explicitness about what is (and what is not) done, typically using a protocol to guide the process” (Young et al., 2002, p.220). Through this review, updating information about the capital budgeting techniques which being used by firms and to compare the current usage of various techniques, methods with those found in previous studies. This study is thus accumulatively builds a robust knowledge in the area of capital budgeting practices and identifying unearth gaps will become springboard for future research. Therefore, this research guides the researchers to reflect on and assess where they are in an area of capital budgeting practices and guide future research directions.

Objective of the study

Examining empirical research on capital budgeting practices to date has been very useful in explaining importance of capital budgeting practices for the long time success of the business organization. Nowadays, complex methods are used for making capital budgeting decision rather purely depends on theories of capital budgeting. Advanced developments in technologies, other macro environmental factors and demographic factors are intruding into capital budgeting practices and thus some of the theories become out of use in well developed countries (e.g. payback period) . Thus, ***the main aim of this research is to demonstrate unearth gaps in the existing capital budgeting practices literature and to suggest the directions for the future research*** .It will further attempt to

- Explain the capital budgeting theories and practices in different countries and demonstrate the disparities between theories and practices of capital budgeting
- Identify the factors that determine use of capital budgeting practices of a country or firm

Problem Statement

*During the past twenty years (1993-2013), the theory of capital budgeting has been characterized by the many increased applications on the basis of risk and uncertainty resulting from global economic, technological and advanced educational changes e.g: inflation risk, interest rate and exchange rate risk. Capital budgeting is the backbone of the financial management. Modern financial management theory generally assumes that the primary objective of a firm is to maximize the wealth of its owners (Atrill, 2009). Uncertainty and risk are the major influence in making investment decision and thus Mao (1970) says ‘a central aspect of any theory of capital budgeting is the concept of risk’ (p.352). In order to implement the objective of modern financial management theory, ‘financial executives need criteria for choosing between alternative time patterns of project evaluations within his planning horizon (Mao, 1970).’ There are complexities in making investment decision and the theory could not always applicable in all situations. **Problem statement of this study is how far capital budgeting theory differentiates with practice and to demonstrate the nature of the gaps in existing capital budgeting literature.***

Research Questions

On the basis of background of research, the following research questions have been developed as the way to attain research objectives.

- i. What are the capital budgeting theories and practices used by firms? Are there any disparities between the capital budgeting theories and practices? If so how?
- ii. What are the factors determines the use of capital budgeting practices? Are there different across countries? If so how?
- iii. What are the gaps in the existing capital budgeting literature?

Methodology

The main objective of this study is to find out gaps in extant capital budgeting literature during the past 20 years of study. The methodology covers research philosophy, research approach, research strategy, methods of data collection and data analysis. These entire methodological spheres used throughout the research have been below discussed in details.

Research Philosophy

One of the dominant philosophical concepts is the ‘ontological assumption’ that enquires about nature of reality, and any study absence of this assumption would be treated as “blinded” (Easterby-Smith, Thorpe and Lowe, 2002, p. 27). This research assumes that capital budgeting practices are different across firms/ nations and the ways of looking at capital budgeting practices are not same at all the time. It can be further articulated that even when there are number of capital budgeting theories, we cannot expect similar application at all situations and thus it is subject to changes. Thus, the ontological assumption is of constructionism. Constructionist ontology’s view that world is being internally constructed and both individually and collectively generate meaning where we are not sure about what is real! Consequently, people guess reality of the world with the experience of external indicators.

Another important philosophical assumption is the epistemological assumption. It enquires about what should be taken as acceptable knowledge in a particular field (Easterby-Smith, Thorpe and Lowe, 2002). The traditional practices do not applicable in the contemporary borderless global businesses and thus try to understand the factors determine the use of capital budgeting practices. It guides how can we understand and determine capital budgeting practices in different context and in different geographical location. The knowledge can be attainable by text analysis with subject methods. Thus, it offers what is already known about capital budgeting practices and captures the gaps in extant literature by systematically reviewing literature.

This research takes interpretive approach on epistemology for answering research questions. The reality is not independent of individual thought and thus all the research findings are not similar with one another (Blaikie , 2007). Thus, this multiple reality is called ‘subjectivism’. Findings could vary in different context such as nature of measurement tools, geographical location, company’s size, organizational practices, types of sectors and form of methodology used. Thus, this research is organized by collecting relevant literature review and interpreting concepts of relationship between researchers and research. Inductive approach is thus suited by exploring thematic text analysis.

Research approach

The research strategy leads to design qualitative research approach. This research covered sufficient researches carried out during the past two decades in the area of capital budgeting. This research analyzed past literature by identifying relevant themes and then thematic text analysis was employed. Thus, this research is ‘subjective’ and adopts inductive approach in order to answering research questions.

Research strategy

Research strategy tells about how research should be designed for answering a set of developed research questions and consequently research aims are attained. As this research covers last twenty years of research papers carried out in the area of capital budgeting from 1993 to 2013, this study adapts research strategy of longitudinal research design. However, the collection of literature covers broad areas including different sectors, different locations/countries and different size of firms. Thus, the systematic literature review sometimes takes comparative research design as well.

Data collection methods

Web of science search and iCat search were used to locate research papers published during the last twenty years. Web of science is a mass search engine linking with mass database covering more than 10000 journals and 110 000 conference proceedings. However, all most all the databases (online the full text of electronic resources) have been covered by iCat search which is subscribed and launched by Kingston University, London. Kingston University library's access service was exploited for collecting all the research papers. Search parameters includes capital budgeting, capital budgeting decision, capital budgeting theory, capital budgeting practices, capital budgeting methods, capital budgeting models, capital budgeting tools, capital budgeting techniques, capital budgeting process and investment decision.

Initially, there are 363 research papers identified during the last 20 years. Of them, 201 research papers were screened and considered for this research to be reviewed based on the following criteria.

- **An empirical study** (i.e., sampling process, measurement , analysis): 363 papers were identified
- **Published in English language:** Of 363, 264 were published in English.
- **Should be published in peer reviewed journal** : Of 264, 239 were published in a peer reviewed journals
- **Full text research papers:** Of 239, 201 papers were full text journal

These papers were collected from following databases: OneFile (GALE), SciVerse ScienceDirect (Elsevier), Informa - Taylor & Francis (CrossRef), Wiley (CrossRef), Business (JSTOR), Arts & Sciences (JSTOR), MEDLINE (NLM), SpringerLink, Wiley Online Library , Inderscience Journals , ERIC (U.S. Dept. of Education), Sage Publications (CrossRef), INFORMS Journals, Health Reference Center Academic (Gale), University of Chicago Press Journals, Emerald Management eJournals, Directory of Open Access Journals (DOAJ), IngentaConnect, IEEE (CrossRef). All these papers were spread over across many journals including Journal of Banking and Finance, The Journal of Finance, Journal of Accounting and Economics, Management Decision, Journal of Cleaner Production, Journal of Financial Economics, Management Science, European Journal of Operational Research, Accounting Review, Journal of Economic Behavior and Organization, Long Range Planning, Energy Policy, Accounting, Organizations and Society, Computers and Mathematics with Applications.

Data analysis

As discussed, at the outset, Miles and Huberman's (1984) proposed strategy was carried out that involves collection, reduction, displays and conclusions. Based on the set criteria, 363 research papers were reduced to 201 and they analyzed using a coding procedure. Initially, collected research papers were grouped into themes or topics. Theme represents the focused area of research and it is selective coding on grounded theory (Corbin and Strauss, 1990). Themes were in terms of current theory and practices of capital budgeting, factors influencing on capital budgeting practices/ determinants of capital budgeting practices, capital budgeting methods/ models, supplementary tools for the capital budgeting methods, influences of capital budgeting practices on investment decisions, component of capital budgeting process, capital budgeting stages, and global capital budgeting practices.

A thematic analysis was employed to capture key themes and concepts in chosen research papers. In doing so, open coding, as suggested by Strauss and Corbin (1998), was adopted. The analysis was focused on the concepts related to capital budgeting practices and theories, research design, research sampling techniques, research approach, year of publication, nature of industry and so on. The results of this analysis were presented below.

Results

Multi-disciplinary concepts of capital budgeting

During the past twenty years, a total of 202 research papers appeared in peer reviewed indexed journals were identified across many academic journals. Majority of the papers appeared in Engineering Economist ($N= 32$) yielding 15.92% followed by Managerial Finance (27), Public Budgeting & Finance (16), Financial Management(9), Journal of Banking and Finance (8), Journal of Business Finance & Accounting (6), Accounting

Education(5), Management Accounting Research(5), The Journal of Finance(5), Journal of Corporate Accounting & Finance (4), Management Decision (4) and The Review of Financial Studies. All of these journals represented 62.20 % of research papers in capital budgeting in the last two decades. The reminder of the research papers appeared in many journals. Capital budgeting is thus multi-disciplinary aspects and applied across many discipline. The table 1 below summarizes entire list of journals contained capital budgeting research papers.

Table 1: **Name of the journals: Capital budgeting research papers appeared during the past twenty years**

Name of the Journal	Number of paper published	Percentage
Engineering Economist	32	15.92%
Managerial Finance	27	13.43%
Public Budgeting & Finance	16	7.96%
Financial Management	9	4.48%
Journal of Banking and Finance	8	3.98%
Journal of Business Finance & Accounting	6	2.99%
Accounting Education	5	2.49%
Management Accounting Research	5	2.49%
The Journal of Finance	5	2.49%
Journal of Corporate Accounting & Finance	4	1.99%
Management Decision	4	1.99%
The Review of Financial Studies	4	1.99%
Three papers in each journal: Healthcare Financial Management, Information Sciences, International Journal of Energy Research, International Journal of Production Economics, Journal of Financial Economics, Management Science, Operations Research, The Journal of Business, Theoretical and Applied Economics.	3	1.49%
Two papers in each journal: Accounting & Finance, Accounting and Business Research, Accounting, Organizations and Society, Computers & Industrial Engineering, Computers and Mathematics with Applications, Contemporary Accounting Research, European Financial Management, European Journal of Operational Research, Health care strategic management, Industrial Management & Data Systems, International Journal of Business and Management, Journal of Accounting and Economics, Journal of Computational and Applied Mathematics, Journal of Information Technology, Journal of Marketing Management, Journal of Small Business Management, Journal of the International Academy for Case Studies, Journal of the Operational Research Society, Long Range Planning, Managerial and Decision Economics, The Bond Buyer, The Financial Review.	2	1.00%
One paper in each journal: Academy of Marketing Studies Journal, Accounting Review, Agricultural Finance Review. Applied Financial Economics, Australasian Radiology, Australian Journal of Management, BuR : Business Research, Business Forum, Wntr-Spring, Business Process Management Journal, Canadian Journal of Anesthesia/Journal canadien d'anesthésie, Computational Management Science, Computers and Chemical Engineering, Cornell Hotel and Restaurant Administration Quarterly, Energy Policy, European Management Journal, Expert Systems With Applications, Forest Products Journal, Fuzzy Sets and Systems, Healthcare financial management. IEEE Transactions on Engineering Management, Industrial Management, International Journal of Commerce and Management, International Journal of Information Technology & Decision Making, International Journal of Project Management, International Journal of Quality & Reliability Management, International Transactions in Operational Research, Journal of Accounting Research , Journal of Cleaner Production, Journal of Economic Behavior and Organization, Journal of Empirical Finance, Journal of Hospitality & Tourism Research, Journal of International Financial Management & Accounting, Journal of International Money and Finance, Journal of Management Accounting Research, Journal of Managerial Issues, Journal of Property Investment & Finance, Journal of Public Health Dentistry, Journal of Retail Banking, Journal of Risk and Insurance, Journal of Teaching in International Business, journal of the Healthcare Financial Management, Knowledge-Based Systems, Management Accounting Quarterly, Mid-Atlantic Journal of Business, Naval Research Logistics (NRL), New Directions for Higher Education, Operations-Research-Spektrum, Quarterly Review of Economics and Finance, Real Estate Economics, Review of Agricultural Economics, Review of Business, Review of Finance and Banking, Review of Quantitative Finance and Accounting, Scandinavian Journal of Management, South East European Journal of Economics and Business, Strategic Finance, The Accounting Review, The European Journal of Finance, The Financier, Spring-Winter, The McKinsey Quarterly, Tsinghua Science & Technology, UTMS Journal of Economics, Vision: The Journal of Business Perspective, Journal of advances in management research.	1	0.50%

Percentages calculated in terms of number of papers appeared in each journal ($N = 202$).

Major themes identified in Capital budgeting research

A total of 201 research papers in capital budgeting have been meticulously reviewed and consequently following major themes have been identified: capital budgeting theory and practices, capital budgeting theory and practices in developed countries, capital budgeting theory and practices in developing countries and factor affecting capital budgeting decision. Findings discusses under identified themes.

Capital budgeting theory and practices

Capital budgeting decisions are crucial and complex and have attracted many research scholars in this field. According to Dayananda et al. (2002), capital budgeting is the process of deciding investment projects which create in maximization of shareholder value. Capital budgeting is mostly dealt with sizable investments in long term assets. Assets can be either tangible such as building, plant, or equipment or intangible assets such as patents, new technology or trade mark (Brealey and Myers, 2003). Capital budgeting is not a short term aspects, generally prepared a year in advance and extendable to five, ten or even fifteen years in future (Brickley, 2006). And thus, Peterson and Fabozzi (2002) define capital budgeting is the process of analyzing and selecting investment opportunities in long term assets where its benefits last for more than one year.

Capital budgeting is a fundamental and used everywhere as a tool for planning, control, and allocation of scarce resources among competing demands. Capital budgeting is a vital part in financial planning and decision making since capital budgeting tools leads better decision making and be able to justify selection of specific capital investments among competing alternatives (Sekwat,1999).Decision to choose the best investment project among competing projects is of critical and being taken by top management (Bowman and Hurry, 1993; McGrath, Ferrier and Mendelow , 2004), and considerable attention is thus to be given to investigating the methods used in evaluating and selecting investment projects (Sangster, 1993; Segelod, 1998).

The most prevalent capital budgeting techniques in the public finance literature include payback period (PB), accounting rate of return (ARR), net present value (NPV), internal rate of return (IRR), benefit-cost ratio (BCR), and profitability index (PI) (e.g., Sekwat,1999;Cooper et al.,2002). Among these methods, four methods .viz., NPV, IRR, PB and ARR, have been identified as a predominant method and used in many studies (e.g., Pike,1996; Kester et al., 1999; Hermes, Smid, and Yao , 2007).

The PB model determines the length of time required to recover exactly the invested cash outlay. On the other hand, the ARR is calculated as the ratio of the investment's average after tax income to its average book value (Cooper et al., 2002). The PB period has been criticized for failing to make accurate assessments of project value as it does not consider use of cash flows, time value of money, risk in a systematic manner and further it does not identify investment projects that will maximize profits, therefore PB does not have theoretical justification (Pike, 1988; Lefley,1996). Research scholars and practitioners criticized the ARR due to the ignorance of the time value of money (e.g., Cooper et al., 2002; Ross et al., 2005). And PB methods failed to consider return from the capital investment after the initial outlay recovered, yet it is also oft- used methods (e.g., Graham and Harvey, 2001; Brounen, De Jong and Koedijk, 2004; Bennouna, Meredith and Marchant, 2010). Researchers argued that the reasons behind widespread use of PB method are of its easiness and of providing information about recovery of initial investment.

Thus, in the next generation, the NPV model came into practice where it measures the difference between present value of the money in and present value of the money out (Cooper et al., 2002). If the NPV is positive, the capital investment is accepted and vice versa. Alternatively, the IRR determines the rate at which capital investment can be acceptable and thus equates the cost of the capital investment to the present value of that project (Cooper et al., 2002). In finance, the methods of assessing capital budgeting using the concepts of the time value of money is called discounted cash flow (DCF) analysis. The NPV and IRR methods are called discounted cash flow (DCF) methods. The PB and ARR methods are considered to be non-DCF methods. 'Capital budgeting theory assumes that projects are evaluated based on economic merit. Building upon certain economic assumptions, including the time value of money, risk aversion, and an assumed goal of value maximization, sophisticated investment appraisal techniques such as NPV and IRR, have been advocated in the literature' (Slagmulder, Bruggeman and Wassenhove, 1995,p.123).Notwithstanding, several researchers criticized that requisite necessary information for NPV and IRR is commonly not known with certainty owing to longer periods, uncertainty in future, higher degree of risk, ignore the size of the investment and absence of logical comparison on time value of money (e.g., Sekwat,1999;Cooper et al.,2002; Hermes, Smid and Yao, 2007).Thus, in order to overcome both the time value of money and the size of the investment, the profitability index model has been emerged. It is the ratio of the capital investment to its outlay and the decision being made in terms of the highest profitability index (PI) (Cooper et al., 2002). If this method used carelessly with constrained investment resources, it generates bad results (Brealey and Myers, 2003).

However, Graham and Harvey (2001) reported that twelve capital budgeting methods were in practice: NPV, IRR, Annuity, Earning multiple(P/E), Adjusted present value (APV), PB, Discounted payback, PI, ARR, Sensitivity analysis, Value at risk and real options. However, all of them are not in usable at all situations in

capital budgeting practices. For example, IRR should not be the best method if investments are mutually exclusive or have multiple rates of return, however, IRR is oft-exploited methods in practice (Graham and Harvey, 2001; Brounen, De Jong and Koedijk, 2004; Bennouna, Meredith and Marchant, 2010).

Of these methods, discounted payback considers time value of money but it still ignores cash flows after initial outlay recovered. Value-at-risk (VAR) is to measure “the worst expected loss over a given horizon under normal market conditions at a given confidence level” (Jorion, 2006; p.12), is a relatively new method. The adjusted present value (APV) additionally covers the value of financial side-effects of an investment to NPV, and treated as having no drawbacks principally (Ross et al., 2005).

The greatest problems of the traditional present value models are that its complete reliance on quantifiable cash flows. However, in a contemporary high tech world, many new projects entail complete redesign of the manufacturing environment and computerized design is of paramount important to be innovative, higher qualities and speedier response (Cooper et al., 2002). And thus, the theory of capital budgeting is diverged from its practices.

The complex nature of the capital investment in today’s world incubates many new models into practices including multi-attribute decision model, and analytical hierarchy process that are more subjective (Cooper et al., 2002). Modern theoretical developments in finance views that DCF methods are not the best methods to select capital investment projects: they have severe drawbacks in the analysis of investment projects if the information about future investment decision is not available (Brennan and Schwartz, 1992; Trigeorgis, 1993; Dixit and Pindyck, 1994). In such a situation, Real Options Reasoning (ROR) and Game Theory (GT) serves as better analytical tools to evaluate such investment projects (Smit and Ankum, 1993). GT stresses that firm is having an incentive to invest early in the case of fear of pre-emption (Smit, 2003)

Real option theory: Real option is closely related to corporate capital investment decision-making and has been introduced as an alternative approach for investment appraisal under uncertainty. The starting point for real options research was the criticism of traditional strategic investment decision-making and capital budgeting methods. In general, a real option represents or reflects the option or options that a company has when it comes to deciding whether to invest in a project, delay, put it on hold, expand or reduce an investment, or any other flexibility that it may have (Rigopoulos, 2014). ROT involves the use of investment evaluation tools and processes that properly account for both uncertainty and the company’s ability to react to new information (Verbeeten, 2006). ROT has operating flexibility (which enables the management to make or revise decisions at a future time, such as expansion or abandonment of the project) and the strategic option value (resulting from interdependence with future and follow-up investments, such as implementation in phases and the postponement of investments) (Verbeeten, 2006). Many researchers have argued that the use of real options analysis has an advantage over NPV, since NPV is not able to capture the value of managerial flexibility (e.g., Ingersoll and Ross, 1992; Trigeorgis, 1993; Dixit and Pindyck, 1994). For example, the management could delay, expand, abandon, temporarily close or alter the operation during the project’ life. Ross et al. (2005) argued that most capital investment projects have options (i.e., the option to expand, the option to modify, the option to abandon), which have value per se. Although this method has not been applied on a large scale in practice (Hermes, Smid and Yao, 2007), it is mostly applicable in specific industries or situations. DCF techniques are used concurrently with real options in order to determine the true NPV (Amram and Howe, 2002). Many research scholars have found that only a few firms have employed real options (Graham and Harvey, 2001; Ryan and Ryan, 2002; Brounen, de Jong and Koedijk, 2004; Block, 2007; Truong, Partington and Peat, 2008; Verma, Gupta and Batra, 2009; Bennouna, Meredith and Marchant, 2010; Shinoda, 2010, Singh, Jain and Yadav, 2012; Andres, Fuente and Martin, 2015).

It is obvious that widespread use of sophisticated capital budgeting during the last two decades. Many earliest studies investigated about capital budgeting decision rule, in contrast, recent researches attempted to focus on the use of sophisticated capital budgeting practices (e.g., Miller and Waller, 2003; Chatterjee et al., 2003). Application of sophisticated capital budgeting is more complex, and required the firms to be able to expend cost, time and effort (Busby and Pitts, 1997; Miller and Waller, 2003). Thus, it is important to think about the appropriate level use of sophisticated capital budgeting practices to the net benefits against costs. Anyhow, theory, in contrast, suggests that if uncertainty exists, use of sophisticated capital budgeting practices is valuable and the costs would be offset by the gains from successful investments (Verbeeten, 2006). If uncertainty exists, additional information needed to solve the problem of investment dilemma (Miller and Waller, 2003). It was identified that Canadian firms seem to be increasingly using sophisticated methods when dealing with risk (for example, sensitivity analysis, decision-tree analysis, Monte Carlo simulation, ROR, GT) (Bennouna, Meredith and Marchant, 2010). Nowadays, there are number of other methods including the project-dependent (risk-adjusted) cost of capital (PDCC), the weighted average cost of capital (WACC), the cost of debt (CD) used in capital budgeting practices. Among them PDCC and WACC are said to be sophisticated method and CD is the least sophisticated method (Hermes, Smid, and Yao, 2007).

Capital budgeting tools for incorporating risk

Overall, uncertainty affects future cash flows and causes estimation difficulties. Therefore, various risk analysis and management science techniques have been developed to supplement the traditional present value based decision models. Scholarship on the practice of capital budgeting in many countries has found that firms are increasingly employing more sophisticated capital budgeting techniques in order to make investment decisions over several years (Klammer, 1973; Klammer and Walker, 1984; Pike, 1988; Jog and Srivastava, 1995; Gilbert and Reichart, 1995; Farragher, Kleiman and Sahu, 1999; Arnold and Hatzopoulos, 2000; Brounen, de Jong and Koedijk, 2004; Truong, Partington and Peat, 2008; Baker, Dutta and Saadi, 2011). In the contemporary world, there are a number of sophisticated capital budgeting methods including the oft-cited: Monte Carlo Simulations, Game theory decision rules, Real option pricing, Using certainty equivalents, Decision trees, CAPM analysis / β analysis, Adjusting expected values, Sensitivity analysis/break-even analysis, Scenario analysis, Adaptation of required return/discount rate, IRR, NPV, uncertainty absorption in cash flows, and PB (e.g., Arnold and Hatzopoulos, 2000; Hall, 2000; Graham and Harvey, 2001; Ryan and Ryan, 2002; Murto and Keppo, 2002; Cooper et al., 2002; Smit, 2003; Sandahl and Sjogren, 2003; Brounen, de Jong, and Koedijk 2004; Lazaridis, 2004; Lord, Shanahan and Bogd, 2004; du Toit and Pienaar, 2005; Verbeeten, 2006; Elumilade, Asaolu and Ologunde, 2006; Hermes, Smid, and Yao, 2007; Leon, Isa and Kester, 2008; Correia and Cramer, 2008; Verma, Gupta and Batra, 2009; Bennouna, Meredith and Marchant, 2010; Shinoda, 2010; Hall and Millard, 2010; Dragota et al, 2010; Poudel et al., 2009; Kester and Robbins, 2011; Maroyi and Poll, 2012; Singh, Jain and Yadav, 2012; Andres, Fuente and Martin, 2015). Thus, the complex models of capital budgeting practices are dependent on not only the use of DCF techniques, but also proper cash flows, discount rates and the risk analysis (Brigham and Ehrhardt, 2002).

Classification of Capital budgeting Practices

Capital budgeting practices help managers to select n out of N investment projects with the highest profits and an acceptable 'risk of ruin' (Verbeeten, 2006, p.108). By and large, all capital budgeting practices can be subsumed into the categories of sophisticated, advanced and naive (e.g., Haka, 1987; Haka, Gordon and Pinches, 1985; Verbeeten, 2006; Wolffsen, 2012). Naive practices includes PB, the adaptation of required payback and ARR, and the advanced /NPV based, including Sensitivity analysis/break-even analysis, scenario analysis, the adaptation of required return/discount rate, IRR, NPV, uncertainty absorption in cash flows, MIRR and PI. Farragher, Kleiman and Sahu (2001) suggested that a degree of sophistication is represented by the use of DCF techniques and incorporating risk into the analysis. Sophisticated capital budgeting methods generally include Monte Carlo simulations, GT, RO, using certainty equivalents, decision trees, CAPM analysis / β analysis, and adjusting expected values (Verbeeten, 2006; Wolffsen, 2012).

Capital budgeting theory and practices in developed countries

This section clearly discusses the capital budgeting theory and practices especially in developed countries. As aforementioned, the capital budgeting practices are the investment decision taken for increasing shareholders value (Dayananda et al., 2002).

Many studies have been conducted about capital budgeting practices in U.S. and Europe (e.g., Pike, 1996; Sangster, 1993; Block, 2007; Hermes, Smid and Yao, 2007). Chadwell-Hatfield et al., (1997) conducted a survey among 118 manufacturing firms in the U.S. Results showed that NPV (84%) and IRR (70%) were preferred primary methods. However, it was clearly observed that two thirds of firms relied on shorter PB periods rather IRR or NPV. A seminal study carried out by Graham and Harvey (2001) about 'the theory and practice of corporate finance: evidence from the field' and the sample consisted of 392 CFOs in the USA. In larger firms with high debt ratio, CFOs with MBA were more likely to use DCF (75% NPV and IRR) than their counterparts. Larger firms applied risk-adjusted discount rate whereas small firms opted for Monte Carlo simulation for adjusting risk. In addition, their findings further argued that PB method has not used as a primary tool, however, it kept as a vital secondary tool. Very similar results were reported in Ryan and Ryan's (2002) study where sample consisted of Fortune 1000 companies. Results were found that NPV was most popular technique, followed by IRR. Most of the firms used sensitivity analysis, scenario analysis, inflation adjusted cash flows, economic value added, and incremental IRR along with NPV and IRR. Block (1997) studied about capital budgeting techniques across small business firms operating in the United States. The most popular method was the PB (42.7%), followed by ARR (22.4%). Notwithstanding, researchers connotes that small business owners seemed to be increasingly using DCF as the primary method for evaluating.

Cooper et al., (2002) studied capital budgeting practices in fortune 500 companies in America. Sample consisted of 102 chief financial officers reported that commonly used primary capital budgeting model is the IRR and the second is the payback. Ken and Cherukuri (1991) found that IRR was mostly preferred method in larger companies operating in the U.S. NPV was the next preferred method. The widely used discount rate was the WACC (78%) and the risk was commonly measured by sensitivity analysis (80%). Almost similar results

were reported in the survey of Fortune 100 firms by Bierman in 1993.

Arnold and Hatzopoulos (2000) conducted a study on "The gap between theory and practice in Capital Budgeting: Evidence from the UK for 300 UK companies (comprising 100 large, 100 medium and small 100). Results of study indicate that UK companies have increasingly adopted the analysis of financial textbooks prescribed. Stage has been reached in which only a small minority do not make use of discounted cash flows, formal risk analysis, adjustment corresponding inflation and post-audit in their study. Study reported however, managers still using simple rules of thumb techniques in UK

Jog and Srivastava (1995) conducted a survey of capital budgeting practices in Corporate Canada and the results showed that the most preferred method was the PB. Similar results were found in the UK in Pike's (1996) study. Further results indicated that decreased use of ARR in Canada and the United Kingdom, respectively. It was identified that Canadian firms seem to be increasingly using sophisticated methods when dealing with risk (for example, sensitivity analysis, decision-tree analysis, Monte Carlo simulation, ROR, GT) (Bennouna, Meredith and Marchant, 2010).

Drury, Braund and Tayles (1993) surveyed 300 manufacturing companies in the UK about their capital budgeting practices. Results showed that PB (86%) and IRR (80%) were mostly preferred methods across the sample. The widely used risk analysis was the sensitivity analysis. In a seminal study of Brounen, DeJong and Koedijk (2004), four European countries viz., U.K., France, Germany and the Netherlands consisting of 313 companies during 2002 and 2003 were examined. Their result showed that 47% and 67% of the UK companies were used NPV and PB respectively as a primary tool for evaluating capital budgeting decision whereas companies in Netherlands were used 70% of NPV and 65% of PB methods. However, companies in France and Germany reported lower usages of both methods (42% for NPV, 50 % for PB and 44% for NPV, 51 % for PB respectively). Previous studies have mainly conducted in the U.S. and the UK and limited number of studies are also available for the Netherlands (e.g., Herst, Poirters and Spekrijse, 1997; Brounen, De Jong and Koedijk, 2004).

Many researches recognized that DCF is the dominant in capital budgeting evaluation methods in the UK (e.g., Arnold and Hatzopoulos, 2000), the USA (e.g., Ryan and Ryan, 2002) and in Canada (e.g., Payne et al., 1999). However, most of the US firms use DCF techniques in comparison with firms in European countries (e.g., Brounen, DeJong and Koedijk, 2004). There is still some reluctance in this field due to the technical aspects of DCF (e.g., Cary, 2008; Magni, 2009). In 1993, Bierman and Smidt opined that the DCF methods are the pre-eminent investment decision tool and thus, it is imperative to manager to learn about its uses. Anyhow, NPV, IRR and PB are the most popular methods among North American and Western European companies (Graham and Harvey, 2001; Brounen, DeJong and Koedijk, 2004).

Sekwat (1999) studied capital budgeting practices among 321 Tennessee municipal governments. His results showed that most of the municipal government's organizations are using benefit cost ratio (62.5 %) and payback methods (61.5%), and financial officers were in reluctant using IRR, ARR and even NPV methods. Holmen (2005) conducted a survey of capital budgeting techniques, used for FDI's by Swedish firms and found that larger firms were preferred to use NPV and IRR methods. However, the most preferred method was the PB (79%). In a survey of capital budgeting practices of Australian listed companies, Truong, Partington and Peat, 2008 found that NPV, IRR and PB were the most popular capital budgeting evaluation methods. Researchers were also identified the use of real option across the sample but not yet part of the mainstream.

In 2009, Kester and Robbins surveyed about capital budgeting techniques used by Irish listed companies. Results revealed that they use DCF methods and reported that most prevalent method was NPV, followed by PB, and IRR. Scenario analysis and sensitivity analyses were found to be most important tools for incorporating risk. WACC was the most important widespread method employed for calculating discount rate. On the other hand, Lazaridis (2004) studied capital budgeting practices in Cyprus. The PB was found as the most preferred method and not NPV.

Shinoda (2010) carried out a survey of capital budgeting in Japan. Questionnaire has been administered to collect data from a sample of 225 companies listed on Tokyo Stock Exchange. Results showed that firms were using combination of PB and NPV for evaluating capital investment projects.

In summary, many studies have found that increasing use of sophisticated capital budgeting techniques among many developed countries: US, UK, European and Australian companies (Freeman and Hobbes, 1991; Shao and Shao, 1996; Pike, 1996; Herst, Poirters and Spekrijse, 1997; Brounen, DeJong and Koedijk, 2004; Truong, Partington and Peat, 2008). However, US companies seem to be using more DCF methods as compared to European countries.

Capital budgeting theory and practices in developing countries

There is dearth of studies carried out on capital budgeting practices in developing countries during the last two decades. In comparison with developed countries, the results of the most studies show a different picture. In most of the developing countries, PB method was the dominant methods in evaluating capital investment.

Kester et al. (1999) surveyed a total of 226 companies across six countries: Australia, Hong Kong, Indonesia, Malaysia, Philippines and Singapore. Results showed that PB is still important method and the DCF methods have become increasingly important. In five Asian countries, 95% of firms used PB method and 88% of them use NPV in evaluating projects. However, both methods were treated as equally important. Kester, et al. (1999) noted that sophistication of capital budgeting techniques within the developing countries in Asia has been increased very rapidly during the last decade.

Babu and Sharma (1996) studied Indian industries' capital budgeting practices and the findings showed that 90% of the companies were using capital budgeting methods. Of them 75% of companies reported that they were adopting DCF methods in evaluating capital budgeting, among them IRR was most popular. Sensitivity analysis was found to be popular in assessing risk. In 1998, Jain and Kumar studied about comparative capital budgeting practices: the Indian context and sampled 96 nongovernment companies where listed in Bombay Stock Exchange and five companies of South East Asia. They observed that most preferred capital budgeting techniques was the PB (80% companies), followed by NPV and IRR. Sensitivity analysis was the preferred risk assessment method.

Cherukuri (1996) surveyed about capital budgeting practices: a comparative study of India and select South East Asian countries," with those of Hong Kong, Malaysia and Singapore and a sample consisted of top 300 non-government companies. This study found that of DCF methods, 51% of companies used IRR, followed by NPV (30%). Of non DCF methods, PB (38%) is the dominant method and the next widely used method was ARR (19%). The non DCF methods were used as supplement to DCF methods. WACC is the widely used discount rate and Sensitivity analysis was mainly used for risk assessment. A recent survey of capital budgeting Practices in corporate India, conducted by Verma, Gupta and Batra (2009), took a sample of 30 manufacturing companies in India. The results confirmed findings of Cherukuri (1996). This study showed that most preferred method is IRR (56.7%), followed by NPV (50%) and PB (36.7%). WACC (43.3%) is the widely used discount rate and Sensitivity analysis (36.7%) was mainly used for risk assessment. Researchers further observed that increasing adoption of DCF rather traditional use of non-discounted techniques. In 2012, Singh, Jain and Yadav studied on capital budgeting decision sampling from 31 listed companies in India. Albeit capital budgeting decision continued in India, all sampled firms reported that they are using discounted cash flow (DCF) techniques in combining with non-DCF techniques. Of discounted cash flow techniques, more than three quarters of the sampled companies use Internal rate of return (IRR) which more preferred than net present value (NPV) that used by half of the sampled companies. Further it has been reported that half of the companies use real option techniques in selecting their capital investment projects. Long term capital is of financing source to finance fixed assets (net) and working capital (net) in India. Most of the variables are country specific, researchers call for further detailed research considering sectorial analysis of the constituent sectors of the sample companies would be shed new light on this area.

Hermes, Smid, and Yao (2007) carried out a comparative study of the Dutch and Chinese firms about capital budgeting practices. 66.7% of the Dutch CFOs stated that they used WACC and only 9.5 % of them used PDCC. Small firms use CD most often (22.7%) in comparison with larger firms (5.0%). In the Dutch firms, 89% of CFOs reported that they used NPV methods however, 2% of CFOs stated that they used the ARR which is the least popular method. In contrast, 53.3% of Chinese firms indicated that they use WACC, and just 15.7% of CFOs of Chinese firms use PDCC. However, 28.9% of CFOs reported that they use CD which is higher than that of the Dutch counterparts. Chinese CFOs stated that they more likely to use NPV and PB methods (89% and 84% respectively) in evaluating capital budgeting projects. Thus, on average, Dutch Chief Financial Officers (CFOs) use more sophisticated capital budgeting techniques than Chinese CFOs do.

In 2008, Leon, Isa and Kester conducted a survey of capital budgeting practices of listed companies in Indonesia. DCF was mainly adopted methods in those companies as primary evaluation tool for capital investment projects. . The most prevalent risk assessment tools were Scenario and sensitivity analysis. Results supported that CAPM was not so popular

Recently, a survey of capital budgeting practices have been conducted by Khamees, Al-Fayoumi, and Al-Thuneibat (2010) in Jordan. Results reported that both DCF and non DCF method were still popular in evaluating capital budgeting investment. Surprisingly, the most popular method was PI, followed by PB.

Most recently, Maroyi and Poll (2012) conducted a survey of capital budgeting practices in listed mining companies in South Africa. Results showed that NPV, IRR and PB were the most prevalent methods in evaluating larger investment projects. Results further indicated that PB was found to be continual use of method. Following table summarizes the key findings on capital budgeting literature

Table 1: Key findings on capital budgeting studies during last two decades (from 1993 to 2013)

Author/s	Title of the Study	Population	Most popular capital budgeting method	Methods for evaluating risk in Capital Budgeting
Drury, Braund & Tayles (1993)	A survey of Management Accounting Practices in UK Manufacturing Companies	300 UK Manufacturing companies	PBP and IRR	Sensitivity analysis.
Babu & Sharma(1995)	Capital budgeting practices in Indian Industry–An Empirical Study	73 Indian companies	DCF Methods: IRR and PBP.	Sensitivity analysis and adjustment of discount rate methods
Jog & Srivastava(1995)	Capital Budgeting Practices in Corporate Canada	582 Canadian companies	IRR and PBP	Sensitivity analysis
Pike (1996)	A Longitudinal Survey on Capital Budgeting Practices	Large UK companies	PBP	
Kester& Chang (1996)	Capital budgeting practices of listed firms in Singapore	54 companies	IRR and PBP	Scenario and sensitivity analysis
Farragher, Kleiman & Sahu(1999)	Current Capital Investment Practices	379 US companies in the Standard & Poor's industrial index	DCF Methods : NPV	Capital Assets Pricing Model
Sekwat(1999)	Capital Budgeting Practices Among Tennessee Municipal Governments	166 Finance Officers of Municipal Governments (Tennessee)	Cost-Benefit Ratio and PBP	
Kester , Chang, Echanis, Haikal, . Isa, Skully, Tsui, & , Wang(1999)	Capital Budgeting Practices in the Asia Pacific Region: Australia, Hong Kong, Indonesia, Malaysia, Philippines, and Singapore.	226 companies in Australia, Hong Kong, Indonesia, Malaysia, The Philippines and Singapore in 1996-1997	Equal importance to discounted and non-discounted cash flow techniques in evaluating projects	Scenario analysis and Sensitivity analysis
Arnold & Hatzopoulos(2000)	The theory-practice gap in capital budgeting: Evidence from the United Kingdom	300 UK Companies	DCF is widely using by the selected UK firms. The theory-practice gap revealed in deriving the discount rate to appraise the major capital investment, method of calculating the WACC and defining weights when using WACC	
Hall (2000)	Investigating Aspects of the Capital Budgeting Process Used in the Evaluation of Investment Projects	65 Respondents (South Africa)	IRR	
Graham & Harvey(2001)	The theory and practice of corporate finance: evidence from the field	392 Chief Financial Officers (CFOs) of companies in the U.S.	NPV and IRR	Large firms- risk adjusted discount rate Small firms- Monte Carlo Simulation
Ryan& Ryan(2002)	Capital Budgeting Practices of the Fortune 1000: How Have Things Changed?	205 Companies (US)	NPV and IRR	Sensitivity analysis, Scenario analysis, inflation adjusted cash flows, economic value added, and incremental IRR

Sandahl & Sjogren.(2003)	Capital budgeting methods among Sweden's largest groups of companies. The state of the art and a comparison with earlier studies	129 Swedish Corporations	PBP	Annuity
Lord, Shanahan & Boyd (2004)	Capital Budgeting In New Zealand Local Authorities:An Examination Of Practice	29 Local authorities of New Zealand Local Government	Cost Benefit Ratio	
Brounen, deJong & Koedijk (2004)	Corporate finance in Europe: confronting theory with practice	Four European countries viz., U.K., France, Germany and the Netherlands consisting of 313 companies during 2002 and 2003	Primary tools were in UK – NPV and PBP, in Netherland – NPV and PBP , France and Germany reported lower usages of both methods (42% for NPV, 50 % for PB and 44% for NPV, 51 % for PB respectively).	
Lazaridis(2004)	Capital Budgeting Practices: A Survey in the Firms in Cyprus	Small Medium Sized Companies (Cyprus)	PBP	Statistical Risk Analysis, Scenario Analysis
Elumilade, Asaolu & Ologunde(2006)	Capital Budgeting and Economic Development in the Third World: The Case of Nigeria	94 firms from Nigerian stock exchange (Nigeria)	PBP, ARR , and NPV	Linear programming
Lam, Wang & Lam(2007)	The capital budgeting evaluation practices (2004) of building contractors in Hong Kong	157 Hong Kong Building Contractors	PBP and Average Accounting Rate of Return (AARR)	Shortening Payback Period, Raising Required Rate of Return
Dedi & Orsag(2007)	Capital Budgeting Practices: A Survey of Croatian Firms	200 firms selected from 400 of the best Croatian firms & 34 banks from a ranking of Croatian banks	IRR, PBP (cost of capital is calculated by WACC)	Risk-adjusted discount rate, Certainty equivalents for cash flows
Truong, Partington & Peat(2008)	Cost-of-Capital Estimation and Capital- Budgeting Practice in Australia	87 Australian companies	NPV, IRR and PBP	Real options techniques have gained a foothold in capital budgeting but are not yet part of the mainstream. Capital Assets Pricing Model is found to be the most popular method used in the estimation of the cost of equity capital
Leon, Isa & Kester(2008)	Capital Budgeting Practices of Listed Indonesian Companies	229 Listed Companies (Indonesia)	DCF Techniques	Scenario and Sensitivity Analysis

Zubairi (2008)	Capital Budgeting - Decision Making Practices in Pakistan	35 firms listed on KSE (Pakistan)	Bigger size companies give greater preference to IRR, while smaller firms rely more on NPV. Also smaller firms are keener in estimating the PBP as compared to larger companies.	
Verma, Gupta & Batra (2009)	A Survey of Capital Budgeting Practices in Corporate India	100 manufacturing companies (India)	NPV and IRR	Weighted Average Cost of Capital (WACC) was to calculate the Cost of Capital. Sensitivity' analysis
Hall & Millard(2010)	Capital budgeting practices used by selected listed South African firms	South African industrial companies listed on the JSE Securities Exchange for at Least ten years.	IRR	
Dragota, Tatu, ,Pele, Vintila, & Semenescu(2010)	Capital Budgeting: The Romanian University Professors' Points of View	Professors in the economic field, having competences in Corporate Finance and teaching in Romania.	NPV, IRR or PI, Discount Rate used for the investment projects analysis is the weighted average cost of capital.	Sensitivity Analysis , Monte Carlo Method and the Scenarios Technique
Shinoda(2010)	Economics Journal of Hokkaido University	225 firms listed on the Tokyo Stock Exchange	PBP and NPV	
Poudel, Sugimoto, Yamamoto, Nishiwaki , & Kano (2010)	Capital Budgeting Analysis of Organic Coffee Production in Gulmi District of Nepal	50 Farms (Nepal)	Benefit-Cost ratio (B/C), NPV, IRR, and PBP	Sensitivity Analysis
Bennouna,Meredith & Marchant (2010)	Improved capital budgeting decision making: evidence from Canada	88 Large Firms	Trends towards sophisticated techniques (DCF) have continued. Of those which did, the majority favored NPV and IRR.	The majority of Canadian firms use risk analysis tools mainly sensitivity analysis followed by scenario analysis and risk-adjusted discount rate. Use of real options is limited (8%).
Kester & Robbins (2011)	The Capital Budgeting Practices of Listed Irish Companies Insights from CFOs on their Investment Appraisal Techniques	18 Chief Financial Officers of companies listed on the Irish Stock Exchange	More Sophisticated Discounted Cash Flow Techniques. (Weighted Average Cost of Capital is to evaluate all proposed capital investments).	Scenario Analysis and Sensitivity Analysis
Singh, Jain & Yadav(2012)	Capital budgeting decisions: evidence from India	31 listed Companies (India)	More sophisticated DCF techniques.	Sensitivity analysis
Maroyi & Poll(2012)	A survey of capital budgeting techniques used by listed mining companies in South Africa	13 Companies Listed in the Mining Sector of the Johannesburg Securities Exchange (JSE).	NPV	Real option

Source: Survey data

Factor affecting capital budgeting

In practice, there are numerous factors that heavily influence on capital budgeting decision. Behavioral finance become increasingly important and intrudes into capital budgeting theory, and the knowledge on behavioral finance derived from sociology and psychology. The behavioral finance states that capital investment decision is not solely dependent on quantitative data, but the decision is also strongly influenced by qualitative data including institution and personal values, tolerance to risk, situational context and so on. More recently, Ben-David, Graham, and Harvey's (2008) study of CFOs (Chief Financial Officers) found that overconfidence was a key driver of investment, however optimism found to be more marginal effect on investment. Larrick, Burson, and Soll (2007) found that the degree of individuals overconfident is strongly associated with their thinking that make them to feel that they are better than average. Overconfident managers generally prefer to overinvest and the overconfident tends to attract more mergers, starting new firms and initiate more investment. Similarly, Brown and Sarma (2007) stated that CEO (Chief Executive Officers) overconfidence affect the frequency of corporate acquisitions of a firm. If past returns on investment are high, CFOs would become more confident on their estimate of future returns. A group of 55 managers working in small firms of computer industry have been studied by Simon and Houghton (2003). Findings showed that managers with greater overconfidence would prefer to introduce more risky products and seem to fail many times. In early 1990s, some studies found that managerial overconfidence tends to innovation (Staw, 1991) and to plant expansion (Nutt, 1993). Glaser, Schafers, and Weber (2008) surveyed senior managers behavior and they observed that when managers are optimistic, they increase their exposure to firm specific risk when transaction on invest more and in turn increase investment cash flow sensitivity.

Size of the firm is one of the major determinants in capital budgeting practices (e.g., Ho and Pike, 1992; Graham and Harvey, 2001; Farragher, Kleiman and Sahu, 2001; Brounen, De Jong and Koedijk., 2004; Verbeeten, 2006). Researches supported that large firms adopts more innovative capital budgeting methods, say, sophisticated capital budgeting practices, to a large extent than smaller firms do (e.g., Rogers, 1995; Williams and Seaman, 2001) since the larger firms have the capacity and resources to use sophisticated capital budgeting practices (Ho and Pike, 1992). Payne, Heath and Gale (1999) and Ryan and Ryan (2002) documented that large firms were more inclined to use more sophisticated capital budgeting practices. This is due to the larger firms involves larger projects and the use of sophisticated capital budgeting practices become less costly (Payne, Heath and Gale, 1999; Hermes, Smid, and Yao 2007). There was a positive relationship between firm size and the use of DCF methods. Findings have also been confirmed in Hermes, Smid, and Yao's (2007) studies. Trahan and Gitman (1995) connotes that large companies exploited DCF methods (88 % for NPV and 91 % IRR) than small companies (65% for NPV and 54% for IRR). It was further confirmed in Segelod's (1998) study and he found that major firms uses PB model for evaluating small investments, however, for the large investment decision at least of the DCF methods is in practice. In 2001, Graham and Harvey studied about capital budgeting methods and firm size in the U.S. and results showed that there is a significant negative relationship between size and PB. Brounen, De Jong and Koedijk (2004) found that company size was positively correlated with the use of capital budgeting methods, large companies use NPV, IRR, and sensitivity analysis more than small companies.

Generally, *ownership structure* has greater influence on any managerial decision making and resultant effect on firm's performance (Warfield, Wild and Wild, 1995; Klassen, 1997). Greater managerial ownership has been identified to be increased use of recommended capital budgeting methods and thus less likely to experience financial distress (Donker, Santen and Zahir, 2009). It is oft-reported that what managers actually do they ignore profitability investment (even if it offers positive NPV), if accounting rate of return is too low, and thus top management willed to sacrifice long term value to meet accounting targets (Graham, Harvey and Rajgopal, 2005). The ownership sometime classify as listed at the stock exchange or non listed (Hermes, Smid, and Yao , 2007). Listed firms were used accurate estimation of cost of equity ,and cost of capital and more likely to NPV or IRR than non listed (Hermes, Smid, and Yao , 2007).

Nature of the industries were also identified as the determinant of capital budgeting practices, for example financial services industry and the building, construction and utilities industries, have been interest of using more sophisticated capital budgeting practices than other industries (Verbeeten, 2006). Further, many empirical researches in the past showed that capital budgeting practices are different across industries (e.g., Ho and Pike, 1998). For example, widespread use of real option or game theory are more prevalent in the pharmaceutical industry (e.g., Bowman and Moskowitz, 2001; McGrath and Nerkar, 2004), the extraction industry (e.g., Trigeorgis, 1993), and the financial services industry and the high-tech industry (e.g., Billington, Johnson and Triantis, 2003).

Education of CFOs was recognized as the determinant of capital budgeting. There was a general argument that CFO with higher education has fewer problems in understanding more sophisticated capital budgeting techniques and they thus have the capacity to use them. For example, in Chinese firms, CFOs with higher level of education use cost of debt less often in comparison with less educated CFOs. Thus, a positive relationship identified between educational background of CFOs and the use of sophisticated methods (Hermes,

Smid, and Yao , 2007) . Among the U.S. sample, there was a positive association has been found between CEO education and use of IRR (Graham and Harvey, 2001) and the findings has been confirmed in the Netherlands, Germany and France, but not in the UK (Brounen, DeJong and Koedijk, 2004). The reasons for more widespread use of DCF are the availability of computer software that used in computation (e.g., Pike, 1996) and increased level of formal education of managers (e.g., Pike, 1996; Sangster, 1993).

A few studies found that *age of the CFOs* was also a determinant of capital budgeting methods. For example, older CFOs could be reluctant to adopt new techniques, and instead prefer to relaying on older methods (e.g., Hermes, Smid, and Yao , 2007).

Since capital investment involves in long term, *uncertainty /risk* would play a vital role in capital investment decision making. Generally, uncertainty refers to as the gap between information available and information required to make any decision. Complete information is unavailable in long run and thus, uncertainty is the dominant factor in capital investment (Simerly and Li, 2000; Zhu and Weyant, 2003). Nature and type of uncertainty could be, including raw material uncertainties, input market uncertainties, labor uncertainties, political uncertainties, production uncertainties, output market uncertainties, liability uncertainties , interest uncertainties, inflation uncertainties, policy uncertainties, exchange rate uncertainties, competitive uncertainties and society uncertainties. Uncertainties have been treated with adopting sophisticated capital budgeting practices, for example, use of ROR and/or GT tools (e.g., Bowman and Hurry, 1993; Zhu and Weyant, 2003). The main concepts of the ROR demonstrates that specific uncertainties (rather than in general) that would affect capital budgeting practices (Dixit and Pindyck, 1994). Game theory specifies that the optimal investment criterion can also be changed by specific uncertainties (Smit, 2003). Thus, specific uncertainties need to be tackled with using different capital budgeting methods. The research findings supported that sophisticated capital budgeting practices are crucial and useful if financial uncertainties i.e., exchange rate, interest exist. However, social uncertainties, market uncertainties, and input uncertainties have not sufficiently supported to influence on use of sophisticated capital budgeting practices. Rather, theoretical background, many experts in capital budgeting area is expected to offer the capacity and willingness to adopt contemporary capital budgeting practices (e.g., Libby and Waterhouse, 1996, Williams and Seaman, 2001). Theory and a few empirical research states that specific uncertainties affect capital budgeting practices, for example, Ho and Pike (1998) found that there is a positive relationship between socioeconomic uncertainty (i.e., governmental regulations, trade unions actions) and the application of risk analysis techniques, however, the empirical evidence on these relationship with sophisticated capital budgeting practices are scarce (Verbeeten, 2006).

Recognition, assessment and reflection of the risk/uncertainty are intriguing. Nowadays, there are number of risk analysis method available such as sensitivity analysis, scenario analysis, decision trees, computer simulation and Monte Carlo analysis. In Graham and Harvey's (2001) study, participants recognised market risk and they also reported other risk factors including interest rate, inflation, size, foreign exchange rate. Surprisingly, they found that at least half of the firm did nothing to adjust WACC (firm's average risk) to incorporate project risk. However, in 1996, Shao and Shao reported that firms employed more on risk adjusted cash flows than risk-adjusted discount rates. Across their sample, they found that sensitivity analysis was the principal assessment technique. In contrast, Gitman and Vandenberg (2000) found in their study that 39 % of firms were adjusting their rates against adjusting risk for cash flows. Through there are number of sophisticated risk analysis models available, the applicability of those models were prone to barriers. The reasons for their reluctant have been reported as; it is not practical, depending on unrealistic assumption, difficulties in explaining to the top management and the difficulties in applying (Trahan and Gitman, 1995). Notwithstanding progress in risk identification, assessment and adjustment has been reported, none of the studies have not been looked at actual risk analysis, its process and management inputs to improve or usage of existing risk assessment and adjustment models. Sophisticated capital budgeting practices would help to identify many different types of investment projects in terms of uncertainty. A range of risk across the many investment projects would create diversification. *Diversification* generally helps to maximize the income from investments at minimum risk. A positive relationship has been found between diversification and use of sophisticated capital budgeting practices (Verbeeten, 2006). Recently, Holmen and Pramborg (2009) reported that the use of payback method has been positively combined with political risk.

Klammer (1993), and Shank and Govindarajan (1992) suggested that *nonfinancial consideration* have been integrated into capital budgeting practices. For example, corporate management integrated into capital budgeting and thus the decision depends on some of the strategic management tools such as value chain analysis, cost drivers analysis, and complete advantage analysis. According to Carr and Tomkins (1996), the most successful companies were found to be using nonfinancial strategic information in making investment decision among their sample of 51 case studies in the UK, the U.S., and the German companies. However, it is argued that nonfinancial methods were prevalence when the firms did not adequately implement DCF methods (Carr and Tomkins 1996). However, any studies have not been carried out the use of non financial methods linking to DCF analysis. It has been argued that increasing acceptance of DCF analysis ignores the use of nonfinancial

methods (e.g., Graham and Harvey 2001; Ryan and Ryan, 2002).

Capital budgeting practices are different and may have “country effect” influence. This can be attributed to the some level of economic factors that determine choice of capital budgeting practices. It is recommend furthering research in indentifying country effect on capital budgeting practices with respect to the level of economic, human, financial and technological improvement. Shahrokh (2002) argued that capital budgeting is very complex, determined by many factors including: *terminal values, foreign currency fluctuations, long-term inflation rates, subsidized financing, and Political risk*. In Sekwat’s (1999) study of capital budgeting practices in Tennessee municipal governments, the decision in using capital budgeting techniques are based on simple, versatile and flexibility of those techniques. Notwithstanding, he further argued that the usage of techniques in practices is in conjunction with qualitative factors such as *ethical, legal, or political considerations*. He concluded that since government funds the capital projects, political factors plays a critical role in making capital investment decisions.

Disparities between capital budgeting theory and practices

Capital budgeting theory recommends in using DCF methods (NPV, IRR, MIRR, PI and DPB) and non DFC methods (PB and ARR) for making capital budgeting decision. However, all most all the firms in developed and developing countries inclined to use sophisticated capital budgeting methods along with many capital budgeting tools for incorporating risk (i.e., sensitivity analysis, real options) and sophisticated discounted rate (i.e., Weighted Average Cost of Capital, Cost of Debt, CAPM) (e.g., Arnold and Hatzopoulos, 2000; Graham and Harvey, 2001; Ryan and Ryan, 2002; Cooper et al., 2002; Brounen ,deJong and Koedijk, 2004; Hermes, Smid, and Yao, 2007; Bennouna, Meredith and Marchant, 2010; Maquieira , Preve and Allende, 2012).

Nemours factors have been identified as the determinant of capital budgeting during the last two decades including size of the firm, ownership structure, nature of industries, educational qualification of CFOs, experience of CFOs, age of CFOs, uncertainty(for example, interest rate, inflation, foreign exchange rate), nonfinancial consideration and other factors (i.e, economic, human, technology, finance, ethical and political). Among them, some factors (for example, size of the firm, educational qualification of CFOs, experience of CFOs, age of CFOs) were positively associated with the use of sophisticated capital budgeting practices. However, in some cases, economic, political and technological factors directly and indirectly affect choice of the capital budgeting practices. (e.g., Bowman and Moskowitz, 2001; Zhu and Weyant, 2003; McGrath and Nerkar, 2004; Verbeeten, 2006; Donker, Santen and Zahir, 2009). Moreover, the factors determining capital budgeting practice connotes that to certain extent capital budgeting practice prone to ‘country effect influence’, for example economic factor, cutting edge technology (i.e., decision support system), political factors, accounting policies, accounting standards and other infrastructure facilities. Although capital budgeting theory was applicable regardless of countries, to certain extent the actual practices of capital budgeting (for example selection of capital investment) vary (e.g., Graham and Harvey, 2001; Shahrokh , 2002). ‘In practice uncertainty, information asymmetry, multiple (conflicting) objectives, real options and multi -period multi project considerations greatly complicate capital budgeting beyond the focus of the theory’ (Arnold and Hatzopoulos, 2000, p.609). A consideration of the impact of information asymmetry, real options and other complications on the capital budgeting exercise gives one the view that there is no unique correct technique and that there is a need for multiple methods (Arnold and Hatzopoulos, 2000). Thus, all these factors impinge on choice of the capital budgeting practices, and consequently, there are disparities between theory and practices.

Studies on the practice of capital budgeting in many countries have found that firms increasingly employ more sophisticated capital budgeting techniques to make investment decisions over several years (Klammer, 1973; Klammer and Walker, 1984; Pike, 1988; Klammer, Koch and Wilner, 1991; Jog and Srivastava, 1995; Gilbert and Reichart, 1995; Farragher, Kleiman and Sahu, 1999;Arnold and Hatzopoulos, 2000; Graham and Harvey, 2001; Mustapha and Mooi, 2001; Ryan and Ryan, 2002; Brounen, de Jong and Koedijk, 2004; Hermes, Smid, and Yao, 2007; Truong, Partington and Peat, 2008; Baker, Dutta and Saadi, 2011; Singh, Jain and Yadav, 2012). When comparing a developed economy with an emerging economy, the developed economy has highly developed capital markets with high levels of liquidity, meaningful regulatory bodies, large market capitalisation, and high levels of per capita income (Geary, 2012). An emerging market, is in the process of rapid growth and development with lower per capita income, less mature capital markets and very small capital projects, compared with developed countries. Therefore, obviously, emerging market economies pose challenges in applying capital budgeting techniques, owing to less developed capital markets and the difficulty of setting key parameters.

Answering to the research questions: Summary of the findings

It is crucial to answer the research questions in order to attain research aims. The first question enquired about “what are the capital budgeting theories and practices used by firms? Are there any disparities between the capital budgeting theories and practices? If so how?” The answers for these questions have been well

documented during the last twenty years of studies. Capital budgeting theory recommends in using DCF methods (NPV, IRR, MIRR, and DPB) and non DFC methods (PB and ARR) for making capital budgeting decision. However, all most all the firms in developed and developing countries inclined to use sophisticated capital budgeting methods along with many capital budgeting tools for incorporating risk (i.e., sensitivity analysis, real options) and sophisticated discounted rate (i.e., WACC, CD, CAPM) (e.g., Arnold and Hatzopoulos, 2000; Graham and Harvey, 2001; Ryan and Ryan, 2002; Cooper et al., 2002; Brounen, DeJong and Koedijk, 2004; Hermes, Smid, and Yao, 2007; Bennouna, Meredith and Marchant, 2010; Maquieira, Preve and Allende, 2012). Thus it can be concluded that there are some disparities between capital budgeting theory and practice. The next research's question further backs up to this question.

The second question asked about "what are the factors determines the use of capital budgeting practices? Are there different across countries? If so how?" Nemours factors have been identified as the determinant of capital budgeting during the last two decades including size of the firm, ownership structure, nature of industries, educational qualification of CFOs, experience of CFOs, age of CFOs, uncertainty (for example, interest rate, inflation, foreign exchange rate), nonfinancial consideration and other factors (i.e., economic, human, technology, finance, ethical and political). Among them, some factors (for example, size of the firm, educational qualification of CFOs, experience of CFOs, age of CFOs) were positively associated with the use of sophisticated capital budgeting practices. However, in some cases, economic, political and technological factors directly and indirectly affect choice of the capital budgeting practices. (e.g., Bowman and Moskowitz, 2001; Zhu and Weyant, 2003; McGrath and Nerkar, 2004; Verbeeten, 2006; Donker, Santen and Zahir, 2009). Moreover, the factors determining capital budgeting practice connotes that to certain extent capital budgeting practice prone to "country effect influence", for example economic factor, cutting edge technology (i.e., decision support system), political factors, accounting policies, accounting standards and other infrastructure facilities. Although capital budgeting theory was applicable regardless of countries, to certain extent the actual practices of capital budgeting (for example selection of capital investment) vary (e.g., Graham and Harvey, 2001; Shahrokh, 2002). Thus, all these factors impinge on choice of the capital budgeting practices, and consequently, there are disparities between theory and practices.

The last question asked about "what are the gaps in the existing capital budgeting literature?" Traditional financial theory suggests that the decision makers are rational, however, modern theory suggests that decision have influenced by many cognitive illusions (Leon, Isa and Kester, 2008; Tayib and Hussin, 2011). Thus behavioral finance came into play in capital budgeting decision making. Capital budgeting research connected with behavioral finance have not been studied any developing countries during the last twenty years. Literature says behavioral finance is a dominant theory determining capital budgeting decision, confirmed in many studies carried out in developed countries. Thus, there is a complete dearth of research in Asian studies in case of behavioral finance penetration on capital budgeting practices.

No studies have been attempted to identify relationship between supportive capital information system (software products to make the required analysis easier in comparison with manual system) and capital budgeting decision making. Thus it has been identified as a gap between information system and choice and practice of capital budgeting (Bennouna, Meredith and Marchant, 2010). Similarly, the environment in which organization are working impact on quality decision. Thus, researcher should concentrate on scanning organizational environment to make good investment decision rather purely depends on financial theory. Thus it is paramount important in the current context.

Almost all the research carried out during the last two decades adopted limited methodological aspects. For example, cross sectional research design, case study and some form of qualitative study were more popular (e.g., Butler et al., 1993; Verbeeten, 2006; Hermes, Smid and Yao, 2007; Maquieira, Preve and Allende, 2012). However, in modern world, some form of event study methodology would be seminal for providing greater insights into capital budgeting practices. Thus, a gap has been identified in use of methodological concepts.

Renowned researchers found that nowadays most of the large companies are inclined to use sophisticated capital budgeting practices. However, it is intriguing question whether SCBP are important to all types of investment (e.g. expansion, replacements, mergers and takeovers) and all type of industries, and those techniques outperform than non SCBP. Thus, these conundrums need to be well investigated.

Many research scholars have argued that capital budgeting influenced by "country effect influence" (e.g., Graham and Harvey, 2001; Shahrokh, 2002; Hermes, Smid and Yao, 2007), for example, economic policies, taxation system, accounting policies, conducive social climate, culture of people, technological factor (i.e., decision support system), government control, political factors, infrastructure facilities. Therefore, more extensive studies are imperative from unsearched countries to build robust knowledge.

Many studies conducted in developed counties have found that firms use more sophisticated capital budgeting practices (Graham and Harvey, 2001; Brounen, de Jong and Koedijk, 2004). Nonetheless, when comparing with developed countries, more sophisticated capital budgeting practices are not prevalent in developing countries. Thus, future research scholars need to consider the challenges faced by CFOs with regard

to the use of sophisticated capital budgeting practices (i.e. organisational barriers/knowledge gap of CFOs, technological challenges) as they lead to increased performance.

Another opportunity for future research is the investigation of other organisational characteristics (e.g. business unit strategies, reward and incentive structures, distribution of decision rights and financial structure) that have been shown to affect capital budgeting practices. Renowned researchers have found that nowadays, most large companies are inclined to use sophisticated capital budgeting practices (SCBP).

Policy recommendation

Many research scholars criticized that many researches on capital budgeting were opt-testing the methods of capital budgeting and its practices. They were purely finding that actual what methods were in practice. However, in practice, there are enormous factors affecting the capital budgeting practice and it has “country effect” too. In line up with this argument, this research was well thought out in its design and become springboard for future research. This study contributed by stating the known and unknown arena of capital budgeting during the last two decades.

In the cutting edge technology world, the way of doing things have been changed and challenging. For example, decision support system become more prevent in making decision and more advanced technological sphere penetrates into assessing capital budgeting practices than ever before. Thus, this research would make awareness to top management, policy makers, practitioners and stakeholders of the company.

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