Factors Affecting Capital Budgeting Decisions: A Structural Equation Modeling Study

** Divya Gupta*
*** R. P. Mohanty*

ABSTRACT

The purpose of this paper is to validate the impact of various factors which influence the capital budgeting decisions taken by firms. Capital budgeting decisions use the structural equation modeling approach after undergoing factor analysis, which results in a better developed model after various rotations with different variables for arriving at the best fit structural model. This paper is based on primary data. Using a sample size of 75 companies, and by categorizing the variables into four factors - Size, Risk, Social Cost Benefit Analysis (SCBA) and Trait, a regression analysis was conducted, which found that the first three factors (Size, Risk and SCBA) are significant and influence the decision of acceptance of the Type of Capital Budgeting Technique (TCBT) used by the companies.

Keywords: Capital Budgeting, Trait, Size, Risk, Social Cost Benefit Analysis, DCF Techniques

INTRODUCTION

Capital Budgeting is the process by which the firm decides which long-term investments it has to make. Capital Budgeting projects, i.e., potential long-term investments, are expected to generate cash flows over several years. The decision to accept or reject a capital budgeting project depends on an analysis of the cash flows generated by the project and its cost. According to Gitman & Forrestor (1977), capital budgeting are those decisions which help to change a firm's future opportunities. Capital budgeting techniques are divided into two categories: Non- discounted cash flow techniques (traditional techniques) and Discounting Cash Flow techniques (DCF). A non-discount method of capital budgeting does not consider the time value of money. In other words, each rupee earned in the future is assumed to have the same value as each rupee that was invested many years earlier. The objective of the present paper is to find out the influence of various variables on the capital budgeting decisions of a firm. The researchers, for the present study, considered a total of eleven independent variables and one dependent variable. A Dependent variable is the Type of Capital Budgeting Technique (TCBT) and the applied factor analysis is used to extract factors from the independent variables. All variables were categorized into four factors name as Size, Risk, SCBA and Trait. After regressing those factors, the researchers found that variables such as Size, Risk and SCBA have a positive and significant relationship with the type of capital budgeting technique used by a firm. Though various research works have been conducted on capital budgeting techniques, but Structured Equation modeling is rarely used by the researchers. This paper contributes to the research area as it has tried to establish the influence of various variables on the Type of Capital Budgeting Technique (TCBT) by applying factor analysis. The factors were then regressed to develop a Structured Equation Model.

LITERATURE REVIEW

Capital budgeting helps a company to evaluate its capital investment projects and also to accept a project which will help the company to enhance its bottom line. However, many companies are still not using capital budgeting techniques because of various constraints like less number of qualified staff, small project size etc. Even the companies that are using capital budgeting techniques are either following cash flow discounting techniques or non cash flow discounting techniques. There are various factors which influence the decisions of the companies. The researchers have tried to explore the factors which influence the decisions of the firms.

According to Klammer (1972), Graham & Harvey (2001), Graham & Harvey (2002), Anand & Hermes (2002), Smid

* *Senior Assistant Professor in Finance,* Institute of Management and Information Science, Vivekanand Marg, Bhubaneswar-751002, Odisha. Email: divya83_g@yahoo.com

** *Vice - Chancellor,* Siksha O Anusandhan University, Khandagiri Square, Bhubaneswar - 751030, Odisha.
E-mail: rpmohanty@gmail.com

& Yao (2006), the size of the firm is a significant factor in influencing the decision of capital budgeting. According to Schall, Sundem & Geijsbeek (1980), firm size is the only environment variable which appears to be consistently related to capital budgeting methods. The researchers have also analyzed the same by taking various representatives of Size as asset size of the firm, turnover, project size and number of employees. Many studies have been conducted on large companies, but still, the area of small firms has not been explored completely because of many constraints. Klammer (1972), Gitman & Forrestor (1977), Schall, Sundem & Geijsbeek (1980), Oblak and Helm (1980), Cooper et al. (2002), Ryan & Ryan (2002), Apap & Masson (2004-05) worked on the capital budgeting techniques in large U.S. firms, but McInich and Kudla (1981) and Drury & Tayles (1996) worked and compared the capital budgeting techniques of large firms with small ones in US and UK respectively. The size of the firm definitely affects the decision about the acceptance of a particular project.

McInich and Kudla (1981) said that one of the most important differences between capital budgeting for large scale and small scale firms is that in large scale firms, decisions can be made independently of the stockholder's views, but in small scale and closely-held firms, involvement of owners is essential in the decision-making process. Danielson & Scott (2006) gave reasons for such behaviour - they opined that small firms' decisions are more compulsive than discretionary. Drury & Tayles (1996) said that though DCF techniques are increasingly being used for evaluating capital projects, however, non discounting methods continue to be used by small and large companies. They also concluded that theoretically, sound capital budgeting techniques like NPV and IRR are more likely to be used by larger organizations rather than by smaller organizations. This is consistent with US practices according to the survey done by Haka, Gordon & Pinches (1985).

According to Klammer (1972) , Oblak and Helm (1980), most of the U.S. MNCs were using DCF techniques for evaluation of capital projects which differed from the survey report of Pinches & Lander (1997). According to them, in developing countries like India, for multinationals, the calculation of cash flows is one of the main issues because of which DCF techniques are used less frequently.

The type of technique is not only based on the size of the firm; in fact, few large companies also apply techniques according to the size of the project. According to Andrews & Butler (1986), Ross (1986), and Ryan & Ryan (2002), the size of the capital budget is a significant factor in the choice of the capital budgeting methodology. It depends on the size of the project - that which type of capital budgeting techniques will be applied by the company and also, what would be the frequency of the techniques used by the companies for better evaluation of the project. Ryan & Ryan (2002) analyzed the positive relationship between size of the budget with the use of discounted capital budgeting techniques. Pollock said that social cost-benefit analysis refers to cases where the project has a broad impact across society and, as such, is usually carried out by the government. Social cost-benefit analysis is concerned with the theory and application of criteria for investment decision making in the public sector, whereas in the private sector, appraisal of investments, financial analysis of private costs and benefits takes place against a wealth-maximizing objectives function. Cost-benefit analysis focuses on social costs and benefits (including externalities and costs and benefits to third parties). This gives cost-benefit analysis a wider social or economic character with the objectives of maximizing the wealth of a country as a whole.

In the present paper, the researchers have also tried to find out the relationship between applications of social cost-benefit analysis with the use of capital budgeting techniques.

RESEARCH DESIGN

❖ **Research Design :** The research design is defined as : it is the plan for collecting and utilizing data so that desired information can be obtained.

❖ **Study Type :** This study is based on both Exploratory Factor Analysis (EFA) and conclusive research. In exploratory factor analysis, the researchers explored the factors by doing rotations since unrotated component matrix fails to extract the factors in absolute form, and the regression analysis was applied to find the causal relationship between dependent and independent variables.

❖ **Sample :** The research is based on primary data. The data was collected with the help of a structured questionnaire from different companies across industries. Data were collected using questionnaires from January 2011 to January 2012 from both the public sector and private sector companies.

❖ **Sample Size :** The study surveys a cross section of public sector and private sector firms. Questionnaires were sent to 250 companies through various means, and the firms responded to the survey with a response rate of 30%. So, this paper is based on the results of a sample size of 75 duly filled questionnaires. The survey was designed to know about the corporate practices related to capital budgeting decisions. The sample was selected across the country.

❖ **Sampling Method :** The questionnaire was sent to small sized, medium-sized and large sized companies. The researchers have used the random sampling approach, where questionnaires were sent to companies on a random basis. The researchers got the details of companies through a database of various banks and various financing companies. Most of the questionnaires were sent to the companies directly and some questionnaires were sent to firms through banks. The researchers selected the banks on the basis of convenience.

❖ **Statistical Tools For Analysis of Data :** The Questionnaire intended to explore various constructs based on the literature review. The researchers have used the Principal Component Analysis tool with varimax rotation. After finding various constructs, the researchers regressed all the four factors with the dependent variable TCBT (Type of Capital Budgeting Technique) using OLS Regression.

❖ **Definition of Variables :** On the basis of the literature review, the determinants affecting the use of capital budgeting techniques were identified. The researchers took ten independent variables and one dependent variable for the study. The dependent variable is Type of Capital Budgeting Technique (TCBT), where the types of techniques are divided into two categories: discounted techniques and non -discounted techniques. Both were taken in different coding systems. TCBT is converted into binary coding, where '0' is used for the companies using non- discounted techniques and '1' is used for the companies using discounted techniques. The independent variables are defined in the Table 1.

Table 1: Definition of Independent Variables

Variables	Description
TI (Type of Industry)	Industries are divided in three categories ; a) Manufacturing b) Services and c) Others.
TO (turnover)*	It describes the turnover scale of the company, measured on 5 scales on the size of the turnover.
AGE (Age of the firm)	It defines the age of the firm from the year of establishment. It is categorized in 5 sub categories.
TOC (type of company)	Type of company is divided into three categorizations ; a) Public Ltd., b) Private Ltd., c) Others, which include partnership firms, sole proprietorship etc.
EMP (Employees)	This variable defines the number of employees employed with a firm.
RISK	This defines whether a firm considers the risks while evaluating a project or not.
AS (Asset Size) *	This is the total asset base of the company, which is categorized into five sub- categories.
PS (Project Size) **	This is the total project size of the company, which is categorized into five sub - categories.
GAC (Green Accounting)	It is known as a management tool used for a variety of purposes, such as improving environmental performance, controlling costs, investing in "cleaner" technologies, developing "greener" processes and products, and forming decisions related to their business activities. GAC tells whether a company is using green accounting or not.
SCBA (Social Cost Benefit Analysis)	Social cost-benefit analysis refers to cases where the project has a broad impact across society. Responses regarding SCBA were answered in yes or no by the respondents.

* The TO and AS coding is done on 5 scale basis, where:"0" is for less than ₹ 1 Crore; "1" is for less than ₹ 10 Crore; "2" is for less than ₹ 100 Crore; "3" is for less than ₹ 1000 Crore, and "4" is for more than ₹1000 Crore.

** The PS coding is done on a 5 scale basis, where: "0" is for more than ₹ 50 lakhs; "1" is for more than ₹ 1 Crore; "2" is for more than ₹10 Crore; "3" is for more than ₹ 100 Crore; and "4" is for more than ₹ 500 Crore.

Source: Authors' Research

❖ **Descriptive Study of The Sample :** Out of the total sample of 75 companies, 45 are from the manufacturing sector, 20 are from the service sector, and the remaining 10 are from different sectors like oil, mining and the engineering sectors. 38 companies are Private Limited, 32 companies are Public Limited and the remaining 5 companies are in

Table 2 : Descriptions of The Sample			
Variables	**Characteristics**	**No. of companies**	**In (%)**
Type of company	Private limited	38	50.66%
	Public Limited	32	42.67%
	Others	5	6.66%
Type of Industry	Manufacturing	45	60%
	Services	20	26.7%
	Others	10	13.3%
Age	> 25 years	34	48%
	< 25 years	36	52%
Project Size	> ₹ 50 lakhs	14	18.67%
	> ₹ 1 Crore	23	30.67%
	> ₹ 10 Crore	16	21.33%
	> ₹ 100 Crore	13	17.33%
	> ₹ 500 Crore	8	10.67%
Asset Size	< ₹ 1 Crore	3	4%
	< ₹ 10 Crore	11	14.67%
	< ₹ 100 Crore	17	22.67%
	< ₹ 1000 Crore	15	20%
	> ₹ 1000 Crore	29	38.67%
Turnover	< ₹ 1 Crore	2	2.66%
	< ₹ 10 Crore	16	21.33%
	< ₹ 100 Crore	12	16%
	< ₹ 1000 Crore	19	25.33%
	> ₹ 1000 Crore	26	34.67%
Source: Authors' Research			

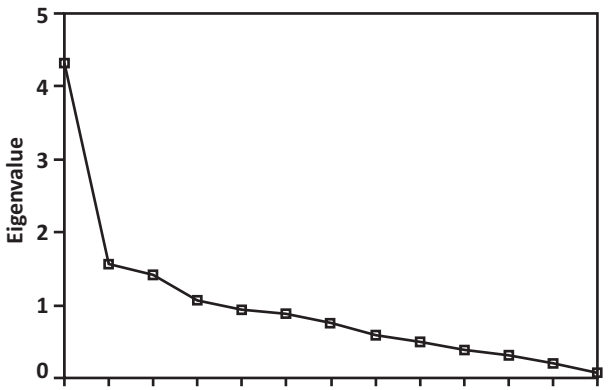
other categories. 38.67% of the companies were having an asset size of more than ₹ 1000 crore and only 4% of the total companies were having an asset size of less than ₹ 1 crore. The remaining 57% of the companies were having an asset size of more than ₹ 1 Crore but less than ₹ 1000 crore. Almost 35% of the companies had a turnover of more than ₹ 1000 crore and 24% of the companies had a turnover of less ₹10 crore. Majority of the companies (49.34%) were going for formal analysis of the project i.e. Is the project size more than ₹1 crore? Very few companies kept a high limit for formal analysis of the projects. Approximately 10% of the companies were going for formal analysis if the project size was more than ₹ 500 crore. 50% of the companies have a life of more than 25 years and the remaining 50% of the companies have a life of less than 25 years. 62 % of the companies considered the risks while evaluating a capital budgeting project. Almost 52% of the companies did not use green accounting and only 36% of the companies considered the social cost benefit analysis of projects (Table 2).

DATA INTERPRETATION AND RESULTS

In this section, the researchers have tried to analyze the collected data. First, they found out the factors from the eleven selected variables on the basis of literature review. They ran the factor analysis and in total, extracted four factors. First, the factor analysis was used to extract the factors and then, the researchers ran the OLS regression analysis to find the relationship between four factors and the dependent variable - Type of Capital Budgeting Techniques (TCBT). For sampling adequacy, the researchers ran KMO and Bartlett's Test having coefficient value of .693, which is highly significant at 99.9 % level of significance. It indicates that the sample is adequate for factor analysis. They used factor analysis for extracting the factors. The factor loadings are given in the Table 1. The researchers had taken eleven variables for the analysis, but they eliminated the fifth variable since the commonalities extraction value for that variable was less than 0.5. The commonalities extraction value for all the factors is above 0.6 (Table 3), which justifies the qualification of all the variables for extracting factors. By running factor analysis, the researchers extracted 4 factors, having Eigen value more than 1, variance explained is 73.8%, which sufficiently explains the variables. The above mentioned result is also supported by the Scree Plot (Figure 1). Since unrotated component

Table 3: Commonalities	
Scale	**Extraction value**
1) Turnover	.832
2) No. of Employees	.803
3) Asset size	.890
4) Project Size	.776
5) Age	.607
6) Risk	.647
7) Green Accounting	.700
8) Social Cost Benefit Analysis	.718
9) Type of Company	.711
10) Type of Industry	.698
Extraction Method: Principal Component Analysis	
Source: Authors' Research	

Figure 1: Scree Plot



Source: Authors' Research

Table 4: Rotated Component Matrix				
	Component			
	1	**2**	**3**	**4**
Asset size	.889			
Turnover	.864			
No. of Employees	.860			
Project Size	.816			
Green Accounting	-.640		.476	
Risk		-.766		
Age		.722		
Social Cost Benefit Analysis			.814	
Type of Company		.377	-.616	.431
Type of Industry				.813
Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization				
Source: Authors' Research				

matrix failed to extract the factors in absolute form, the researchers considered the rotation method. They tried the rotations three times to get the best result for extracting the factors, and also eliminated one variable which was not fitting in any of the factors. The rotated component matrix is given in the Table 4.

It can be inferred from the Table 4 that four factors were obtained through the rotated component matrix. The factors are named as Size, Risk, SCBA and Trait. Size consists of four variables like - Turnover of the company, Number of employees, Asset base of the company and Project size accepted for formal analysis. The second factor Risk includes two variables; Age of the firm and Whether the company considers risk while evaluating projects through capital budgeting techniques. The third factor is SCBA, which includes green accounting and social cost benefit analysis of a particular project. And the last factor was named as TRAIT, since it reveals the characteristics of a company - like type of company and type of industry. All these factors are shown in the tabular form in the Table 5.

After arriving at four factors, the researchers applied the regression analysis model for finding out the influence of these four factors on the Type of Capital Budgeting Techniques (TCBT) being selected by the firms. Here, extracted four factors are independent variables, and TCBT is a dependent variable. Through OLS regression, the researchers found that R square is 0.375, which means that independent variables explain the variations in dependent variable by

Table 5: Extracted Factors	
Factor 1: SIZE 1) Turnover 2) No. of Employees 3) Asset size 4) Project Size	Factor 2: Risk 1) Age 2) Risk
Factor 3: SCBA 1) Green Accounting 2) Social Cost Benefit Analysis	Factor 4: TRAIT 1) Type of the company 2) Type of Industry
Source: Authors' Research	

Table 6: Regression Results for Dependent Variable TCBT and Independent Variables - Size, SCBA, Risk and Trait

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	.533	.047		11.311	.000
SIZE	.237	.047	.471	4.984	.000
SCBA	.123	.047	.245	2.590	.012
RISK	.143	.047	.285	3.015	.004
TRAIT	.054	.047	.108	1.142	.258
Model Summary					
R Square	**.375**	**Durbin Watson**	**2.070**	**F Value**	**10.486**
Source: Authors' Research					

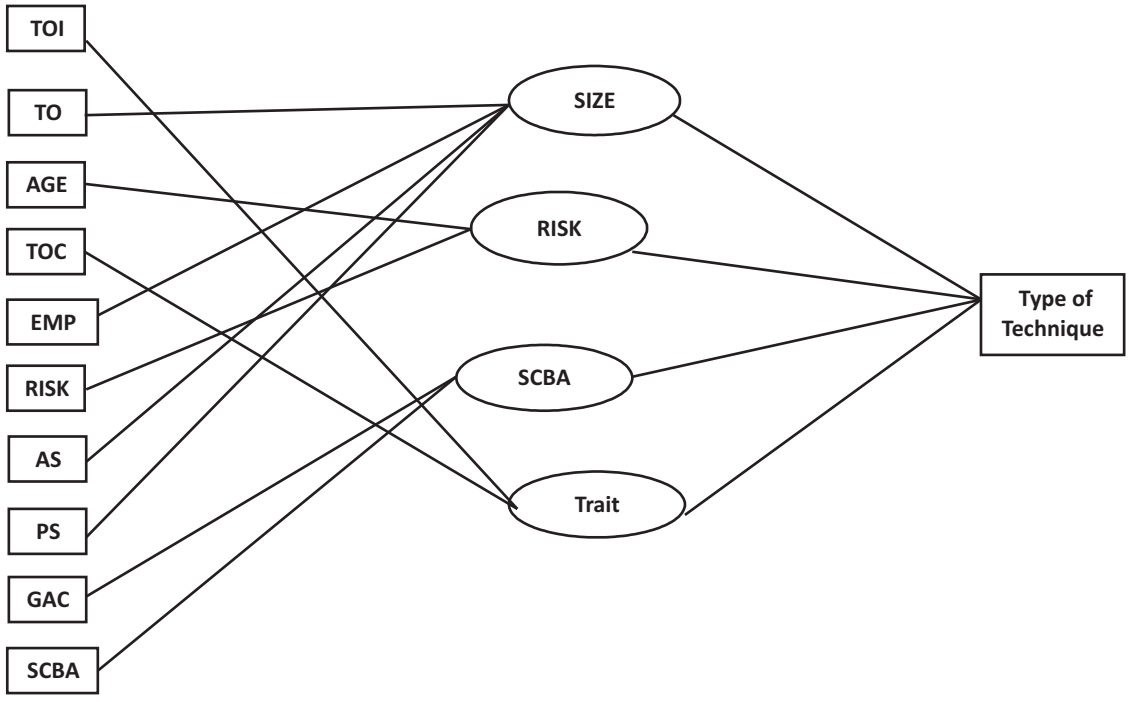
37.5%. TCBT can be explained by 37.5% by the independent variables. Durbin Watson is 2.070, which signifies that there is no auto correlation among the variables. F value is 10.486 and is highly significant as shown in the Table 6. Table 6 gives the results of the regression analysis. From the Table 6, it can be concluded that out of the four factors, the first three factors - Size, Risk and SCBA - are significant to the TCBT used by the firm. All the four factors have a positive relationship with Type of Capital Budgeting Techniques (TCBT). Among these three factors, Size is the most significant factor among all. Size is significant at 100% significance level. It indicates that larger the size of the firm, the more frequently such firms are using discounted cash flow capital budgeting techniques. Size is followed by SCBA, which is second most significantly associated with TCBT. SCBA sig value in the Table 6 shows that it is significant at the 99% level of significance. SCBA is also having a positive relationship with the discounted cash flow techniques, which explains that green accounting and social cost-benefit analysis are used during discounted capital budgeting techniques. The third significant factor is Risk, which indicates that high-risk firms or projects are going for discounted cash flow techniques, whatever the project size. If more companies are using discounted cash flow techniques, it also indicates that companies that have more risky projects are going for discounted capital budgeting techniques as compared to non discounted techniques. Risk sig value is 0.12, which is significant at the 95% level of significance. Trait as a factor, which consists of the type of industry and type of company, doesn't have a significant relationship with the type of capital budgeting technique used by a particular company.

The findings are consistent with that of Klammer (1972), Andrews & Butler (1986), Ross (1986), Graham & Harvey (2001), Graham & Harvey (2002), Anand (2002) , Ryan & Ryan (2002) and Hermes and Smid & Yao (2006). After relating the sophistication index with the growth, size and profitability, Andrews and Butler (1986) concluded that large firms used more sophisticated techniques and those which are using more sophisticated techniques are growing faster and are more profitable.The Structured Equation Model derived from the above data explains how various independent factors are related to the dependent variable TCBT in the Figure 2.

RESEARCH

The above equation is a result of factor analysis, which represents the significant factors which affect the decision of

Figure 2 : Structural Equation Model



Source: Authors' Research

the firm in relation to evaluation of investments through capital budgeting techniques. Four factors are SIZE, RISK, SCBA and TRAIT. SIZE consists of four variables - turnover of the firm, number of employees, asset size and project size. While RISK factor is derived with two variables - one is age of the firm and the second is the insertion of risk while evaluating the projects. The third factor SCBA comprises of green accounting, and social cost-benefit analysis also influences the decision of the firm. The fourth factor TRAIT includes the type of company and type of industry, which also signifies the type of technique used by the firms.

CONCLUSION

This paper focuses on Structural Equation Modeling (SEM), a statistical technique that combines elements of traditional multivariate models, regression analysis, factor analysis and Simultaneous Equation Modeling. In total, for the present study, the researchers considered ten variables with the help of a questionnaire survey and extracted four factors - Size, Risk, SCBA and Trait through factor analysis. They regressed all the four factors to analyze the relation of the four factors - Size, Risk, SCBA and Trait with the dependent variable Type of Capital Budgeting Technique (TCBT) used by the firms. They found that the first three factors are highly significant, but there is no significant relationship between TCBT and Trait. Among these three factors, Size is significant at 100% significance level, which signifies that larger the size of the firm, the more frequently the firm is using discounted cash flow capital budgeting techniques. Second most significant is SCBA, which is significant at 99% level of significance. It indicates that green accounting and social cost-benefit analysis are used more when discounted capital budgeting techniques are used by the firms. Risk, which indicates that high-risk firms or projects are going for discounted cash flow techniques, also indicates that companies which have riskier projects are going for discounted capital budgeting techniques as compared to non discounted techniques. Risk is significant at 95% level of significance. Trait which consists of type of industry (TOI) and type of company (TOC) doesn't have any significant relationship with the Type of Capital Budgeting Technique (TCBT) used by the organization.

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