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A STUDY ON USING DECISION TREE ANALYSIS TO ENHANCE CAPITAL BUDGETING DECISIONS IN CORPORATES

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Abstract

Capital budgeting is a critical financial decision-making process for corporations, as it involves substantial capital outlay and resource allocation. Capital budgeting methods like Net Present Value (NPV), Internal Rate of Return (IRR) and Payback Period are used to assess investment proposals. Yet, they do not account for uncertainty and different scenarios.

Decision Tree Analysis is a valuable technique that allows firms to make investment choices under uncertainty, by representing various possible outcomes and their probabilities. Decision trees graphically depict potential outcomes and assist managers in analysing risk and returns better. The current research explores the application of decision tree analysis in improving capital budgeting in firms. A survey of 120 finance and management professionals was conducted. Reliability analysis, chi-square test and regression analysis were applied to the data.

The study suggests that incorporating decision tree analysis into capital budgeting enhances investment analysis, risk analysis and decision making in corporate finance. The research concludes that using decision tree analysis in combination with conventional capital-budgeting tools can support financial decision-making.

Keywords: *Capital Budgeting, Decision Tree Analysis, Investment Decisions, Corporate Finance, Risk Analysis*

Introduction

Capital budgeting is an important financial decision-making process used to identify, prioritise and approve long-term investment opportunities. The investments can be in the form of a new machine, a new product, expansion of existing facilities, or new market. Given the vast amounts of capital outlays and long-term implications of such projects, organizations need to assess their feasibility before proceeding. Conventional capital budgeting methods like Net Present Value (NPV), Internal

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Rate of Return (IRR), Payback Period, and Accounting Rate of Return are commonly used to evaluate the viability of investment projects. Such methods assist managers in predicting the returns and determining whether a project should be taken on or not. But in today's business environment, uncertainty, market dynamism and risk are more prevalent. In these cases, these techniques may not account for the risk involved in investment decisions. The application of Decision Tree Analysis is a valuable technique that can assist managers when assessing alternative investments in uncertain environments. Decision trees graphically depict different decision alternatives, outcomes, probabilities and payments. Managers can explore various scenarios to determine expected returns, and finally choose the most profitable investment. Data-driven decision-making approaches have become increasingly popular in recent years to improve financial decisions and investment analysis. Decision tree analysis offers a structured method for modelling sequential decisions, calculating risks and considering different scenarios. This method enhances transparency, aides in strategic planning and improves financial decision-making. As such, this research explores the use of decision tree analysis in enhancing capital budgeting in business firms. It also examines how this technique can be used to assess risks, predict potential outcomes, and make optimal investment choices.

Literature Review (2020–2025)

Michelon (2020) implemented a systematic review of capital budgeting and analysed the issues facing managers when making long-term investment decisions. The research showed the importance of forecasting and risk management in capital budgeting to optimise financial resource allocation.

Groda, Anggraini, Norisnita, Waspada, and Rihidima (2023) explored the use of capital budgeting techniques in the private sector. It revealed that businesses are now leveraging sophisticated decision-making tools to enhance their investment decisions and financial outcomes.

Putri, Ramadanty and Mukhtaruddin (2024) clarified that the process of capital investment involves literature studies on capital budgeting techniques, and that in the modern business environment, financial analysis must be supported with strategies and environmental factors. It stressed the need for companies to use cutting-edge decision support systems to address uncertainties in investment.

Rad Cuc Croitoru, GomoiMazuru and Barbu (2025) studied decision tree models in investment decision-making. They indicated that decision tree regression can identify factors that affect financial performance and offers a structured nature for considering investment options.

Kadam and Singh (2025) explored capital budgeting techniques applied in investment decision-making, revealing that firms employ various evaluation methods to evaluate project feasibility and profitability. The need for sophisticated techniques to aid complex investment decision-making was identified.

Research Gap

Existing research has addressed capital budgeting techniques and tools for investment decisions. But there is a dearth of research on using decision tree analysis for corporate capital budgeting, from the viewpoint of financial managers and corporate professionals.

3. Research Methodology

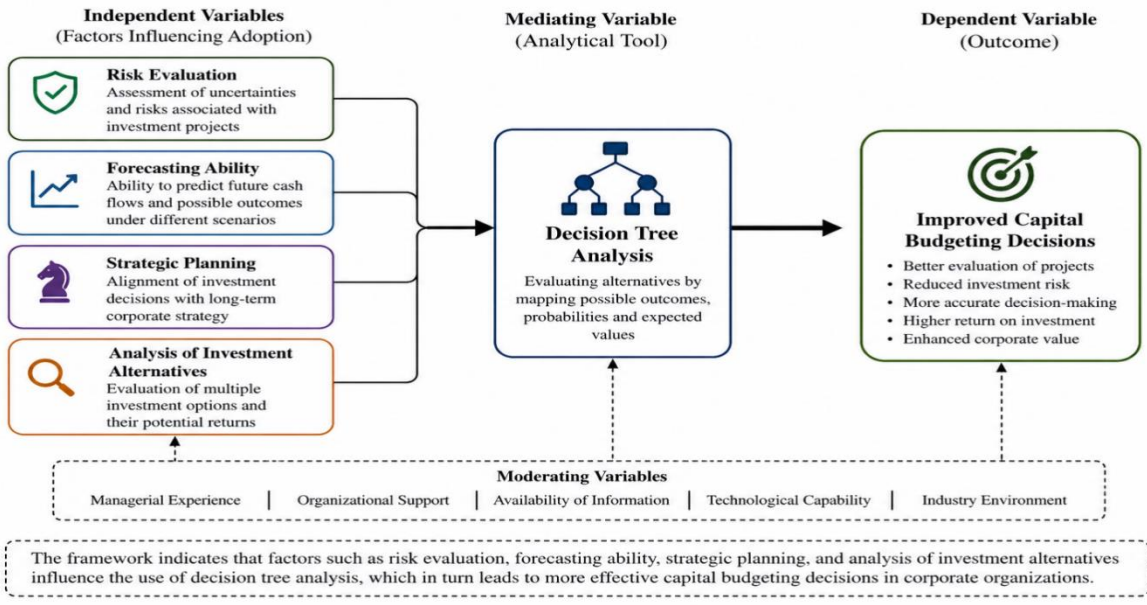
This study adopts a descriptive research design to examine the role of decision tree analysis in improving capital budgeting decisions in corporate organizations. Both primary and secondary data were used in the study. Primary data were collected through a structured questionnaire distributed to 120 respondents working in finance and managerial positions in corporate organizations, while secondary data were obtained from research papers, journals, books, and online sources.

A convenience sampling technique was used for selecting respondents. The questionnaire was designed using a five-point Likert scale to measure respondents' perceptions regarding the usefulness of decision tree analysis in investment decision-making.

The collected data were analyzed using SPSS statistical tools, including descriptive statistics (mean and standard deviation), reliability analysis (Cronbach's Alpha), correlation analysis, chi-square test, regression analysis, and factor analysis (KMO & Bartlett test) to examine relationships between variables and test the research hypotheses.

Conceptual Model

Figure 1: Conceptual Framework
Decision Tree Analysis and Capital Budgeting Decisions in Corporates



Objectives -

1. To examine the importance of decision tree analysis in capital budgeting decisions.
2. To analyze the factors influencing the adoption of decision tree techniques in corporate finance.

3. To evaluate the effectiveness of decision tree analysis in reducing investment risk.
4. To suggest strategies for improving capital budgeting decisions using analytical tools.

Hypotheses -

H1: Decision tree analysis significantly improves capital budgeting decision accuracy.

H2: Decision tree analysis helps reduce uncertainty in investment decisions.

H3: Use of decision tree analysis positively influences corporate financial performance.

Data Analysis & Interpretation-

Data analysis was conducted to examine how decision tree analysis influences capital budgeting decisions in corporate organizations. Statistical techniques such as descriptive statistics, reliability analysis, correlation, regression, and chi-square tests were applied to analyze the responses of 120 participants. These methods help in testing the hypotheses and understanding the impact of decision tree analysis on investment decision-making.

1. Demographic Profile of Respondents

Table 1: Respondent Profile (N = 120)

Category	Frequency	Percentage
Finance Managers	38	31.7%
Investment Analysts	29	24.2%
Corporate Executives	33	27.5%
Senior Accountants	20	16.6%
Total	**120**	**100%**

Interpretation- The majority of respondents were finance managers (31.7%), followed by corporate executives (27.5%) and investment analysts (24.2%). This indicates that responses were obtained from professionals directly involved in financial decision-making and capital budgeting activities, making the data suitable for analysis.

2. Descriptive Statistics-

Descriptive statistics are used to summarize and describe the main characteristics of the collected data. It provides information about the mean and standard deviation of respondents' perceptions regarding the use of decision tree analysis in capital budgeting decisions. This helps in understanding the general opinion of respondents toward the variables included in the study.

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Table 2 : Descriptive Statistics

Variables	N	Mean	Std. Deviation
Decision tree analysis improves investment decision quality	120	4.12	0.76
Decision tree helps evaluate project risk effectively	120	4.05	0.81
Decision tree improves financial forecasting	120	3.98	0.73
Decision tree supports strategic planning	120	4.18	0.69
Decision tree enhances capital budgeting accuracy	120	4.09	0.74

Interpretation- The mean values of all variables range between 3.98 and 4.18, which indicates that most respondents agree that decision tree analysis plays an important role in improving capital budgeting decisions. The relatively low standard deviation values show that the responses are fairly consistent among respondents.

3. Reliability Analysis (Cronbach's Alpha)

It is conducted to **measure the internal consistency of the questionnaire items** used in the study. The most commonly used method is **Cronbach's Alpha**, which evaluates whether the items used in the survey consistently measure the same concept. A Cronbach's Alpha value **above 0.70** indicates acceptable reliability.

Table3: Reliability Statistics

Cronbach's Alpha	Number of Items
0.873	5

Interpretation- The Cronbach's Alpha value of 0.873 indicates high internal consistency, confirming that the questionnaire items are reliable for measuring perceptions about decision tree analysis in capital budgeting.

H1: Decision tree analysis significantly improves capital budgeting decision accuracy.

Regression analysis is used to examine the **cause-and-effect relationship between**

an independent variable and a dependent variable. In this study, **Decision Tree Analysis** is considered the independent variable, while **Capital Budgeting Decision Accuracy** is the dependent variable. Regression helps determine how much decision tree techniques influence the accuracy of investment decisions.

Table 4: Regression Model

Model	R	R Square	Adjusted R Square	Std. Error
1	0.698	0.487	0.483	0.52

Interpretation - The **R value (0.698)** indicates a strong positive relationship between decision tree analysis and decision accuracy. The **R^2 value (0.487)** shows that **48.7% of the variation in capital budgeting decision accuracy is explained by decision tree analysis**.

Table 5: ANOVA Results

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	34.72	1	34.72	25.83	0.000
Residual	44.96	118	0.38		
Total	79.68	119			

Interpretation- The**p-value (0.000)** is less than **0.05**, which indicates that the regression model is statistically significant. This means decision tree analysis has a significant impact on capital budgeting decisions.

Table 6: Coefficients Table

Variable	Beta	t-value	Sig.
Constant	1.41	3.56	0.001
Decision Tree Analysis	**0.63**	**5.08**	**0.000**

Interpretation- regression coefficient (**$\beta = 0.63$**) indicates that decision tree analysis positively affects decision accuracy. Since the **significance value is less than 0.05**, the relationship is statistically significant. Therefore, **Hypothesis H1 is accepted**.

H2: Decision tree analysis helps reduce uncertainty in investment decisions.

In this study, it is used to determine the relationship between **use of decision tree analysis and reduction of investment uncertainty.**

Table 7: Chi-Square Test

Test	**Value**	**df**	**Sig.**
Pearson Chi-Square	22.46	8	**0.004**
Likelihood Ratio	20.12	8	0.010
N of Valid Cases	120		

Interpretation- The significance value **(0.004)** is less than the standard threshold**0.05**, which indicates a statistically significant association between decision tree analysis and risk reduction.
Therefore, **Hypothesis H2 is accepted**.

H3: Use of decision tree analysis positively influences corporate financial performance.

In this study, correlation analysis is applied to determine the relationship between **decision tree usage and corporate financial performance.**

Table 8: Correlation Analysis

Variables	**Decision Tree Usage**	**Financial Performance**
Decision Tree Usage	1	**0.613**
Financial Performance	**0.613**	1

Significance Level: $p < 0.01$

Interpretation- The correlation coefficient**(r = 0.613)**indicates a **moderately strong positive relationship** between decision tree analysis and corporate financial performance. This means that organizations adopting decision tree techniques tend to achieve better financial outcomes.
Therefore, **Hypothesis H3 is accepted**.

Factor Analysis

KMO and Bartlett's Test

Factor analysis is used to identify underlying factors that influence respondents' perceptions. Before applying factor analysis, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity are conducted to check whether the data is suitable for factor analysis.

- KMO value greater than 0.6 indicates sampling adequacy.
- Bartlett's test significance value less than 0.05 indicates that factor analysis can be applied.

Table 9: KMO and Bartlett's Test

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	**0.812**
Bartlett's Test of Sphericity (Chi-Square)	256.34
Df	10
Sig.	**0.000**

Interpretation- The KMO value of 0.812 indicates that the sample size is adequate for factor analysis. The significance value of Bartlett's test (0.000) is less than 0.05, which confirms that the variables are correlated and suitable for factor analysis.

Total Variance Explained

Table 10: Total Variance Explained

Factor	Eigenvalue	Variance Explained (%)
Risk Evaluation	2.45	41.2%
Decision Accuracy	1.38	22.6%
Strategic Planning Support	1.01	16.8%
Others	0.72	-

Interpretation

The factor analysis identified three major factors influencing the adoption of decision tree analysis in corporate organizations:

1. Risk Evaluation – Helps managers analyze uncertainty in investment decisions.
2. Decision Accuracy – Improves the accuracy of capital budgeting decisions.
3. Strategic Planning Support – Assists managers in making better long-term investment strategies.

These three factors together explain around 80.6% of the total variance, indicating that decision tree analysis plays a significant role in improving corporate financial decision-making.

Findings of the Study

- The majority of respondents agreed that decision tree analysis plays an important role in improving capital budgeting decisions in corporate organizations.
- Descriptive statistics showed that the mean values of all variables were

above 3.9, indicating a positive perception among respondents regarding the usefulness of decision tree techniques in investment decision-making.

- The reliability analysis indicated that the Cronbach's Alpha value was 0.873, which confirms that the questionnaire items used in the study were reliable and internally consistent.
- The correlation analysis revealed a positive relationship between decision tree analysis and corporate financial performance, indicating that firms adopting analytical tools tend to achieve better financial outcomes.
- Regression analysis showed that decision tree analysis significantly influences capital budgeting decision accuracy, with nearly 48% of the variation in decision accuracy explained by the use of decision tree techniques.
- The chi-square test results confirmed that decision tree analysis helps reduce uncertainty and risk in investment decisions, demonstrating a significant association between decision tree usage and risk evaluation.
- Factor analysis identifiedthree major factors influencing the adoption of decision tree analysis, namely risk evaluation, decision accuracy, and strategic planning support.
- Among these factors, risk evaluation emerged as the most significant factor, indicating that organizations primarily use decision tree techniques to analyze uncertainties in investment projects.
- The study found that decision tree analysis improves the ability of managers to evaluate different investment alternatives, which enhances the overall quality of financial decision-making.
- Decision tree techniques also help managers visualize multiple possible outcomes of an investment decision, making it easier to select the most beneficial project.
- The findings indicate that combining decision tree analysis with traditional capital budgeting methods such as Net Present Value (NPV) and Internal Rate of Return (IRR) improves investment evaluation.
- Organizations that adopt analytical decision-making tools are better able to allocate financial resources efficiently and achieve improved financial performance.
- The study confirms that modern corporate decision-making increasingly relies on data-driven analytical tools to handle uncertainty and complexity in financial decisions.

Managerial Implications

The findings of this study have several important implications for corporate managers and financial decision-makers.

- Decision tree analysis provides managers with a structured approach for evaluating complex investment decisions.
- The technique helps organizations analyze multiple investment alternatives and select the most profitable option.
- Corporate managers can use decision trees to assess potential risks associated with investment projects.
- Decision tree models support strategic planning by allowing managers to

evaluate long-term investment outcomes.

- The use of analytical tools improves transparency in financial decision-making and enhances managerial confidence.
- Decision tree analysis can complement traditional capital budgeting techniques such as NPV and IRR.
- Organizations adopting analytical decision-making tools are more likely to achieve improved financial performance.
- The graphical representation of decision trees helps managers understand different investment scenarios more easily.

Suggestions

Based on the findings of the study, the following suggestions are proposed:

- Corporate organizations should incorporate decision tree analysis into their capital budgeting process.
- Training programs should be conducted to improve managers' understanding of analytical decision-making tools.
- Companies should integrate decision tree analysis with financial software and decision-support systems.
- Organizations should encourage data-driven decision-making to improve investment evaluation.
- Future research should explore the use of advanced analytical techniques such as artificial intelligence and machine learning in capital budgeting.
- Firms should combine decision tree analysis with traditional financial evaluation methods to obtain more accurate results.

Conclusion

- Capital budgeting is one of the most important financial decisions faced by corporate organizations.
- Traditional evaluation techniques are useful but may not fully capture investment uncertainty.
- Decision tree analysis provides a systematic framework for evaluating different investment scenarios.
- The study confirms that decision tree analysis significantly improves capital budgeting decision accuracy.
- The use of decision tree techniques helps reduce investment risk and uncertainty.
- Organizations adopting decision tree analysis tend to achieve better financial performance.
- The integration of analytical tools into financial decision-making can enhance the efficiency and effectiveness of corporate investment decisions.
- Therefore, decision tree analysis should be considered an important tool for modern corporate financial management.

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