WELCOME

BRIEF DISCUSSION ON CAPITAL BUDGETING

A Pretrial Approach

Presented by

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রেক্টর, রেলওয়ে ট্রেনিং একাডেমি, বাংলাদেশ রেলওয়ে, চট্টগ্রাম

Capital Budgeting

Capital Budgeting is long term planning for commitment of funds to fixed assets. It involves the whole process of capital expenditure planning which includes:
(i) planning of capital expenditure(ii) evaluation of capital investment projects & (iii) Control of capital expenditures

Capital Expenditure: The term Expenditure refers to a payment or incurrence of an obligation to make a future payment for an asset.
Expenditure for the purchase or expansion of planned assets is called Capital expenditures and is recorded in the assets account.
Typically, capital expenditure related to plant assets is:

1. Initial acquisition and additions
2. Betterments
3. Extraordinary repairs

Any material expenditure that will benefit several accounting period is considerd as capital expenditure. (ie, a period of time greater than one year.)

Revenue Expenditure: Expenditure for ordinary repairs, maintenance, fuel, and other items necessary to maintain and operate plant & equipment is called revenue expenditure.
Any expenditure that will benefit only the current accounting period. (ie, a period within one year.)

- Key Motives for Making Capital Expenditure

  1. Expansion
  2. Replacement
  3. Renewal
  4. Other purposes

Replacement Decisions:

Replacement Decision involves determining whether to purchase capital assets to take the place of existing assets to maintain or improve existing operations.

Expansion Decisions :

Expansion Decision involves determining Whether to purchase capital projects and add them to existing assets to increase existing operations.

Six Steps to Capital Budgeting Process

#1 - To Identify Investment Opportunities

The first step is to explore the available investment opportunities. Next, the organization's capital budgeting committee must identify the expected sales shortly. After that, they recognize the investment opportunities keeping in mind the sales target set up by them. One must consider some points before searching for the best investment opportunities. It includes regularly monitoring the external environment to get an idea about new investment opportunities. Then, define the corporate strategy based on the organization's SWOT analysis, i.e., analysis of its strength, weakness, opportunity, and threat, and seek suggestions from its employees by discussing the strategies and objectives with them.

2 - Gathering of the Investment Proposals

After identifying the investment opportunities, the second process in capital budgeting is to collect investment proposals. Before reaching the committee of the capital budgeting process, these proposals are seen by various authorized persons in the organization to check whether the bids given are according to the requirements. Then the classification of the investment is done based on the different categories such as expansion, replacement, welfare investment, etc. This classification into the various types makes decision-making more comfortable and facilitates budgeting and control.

Six Steps to Capital Budgeting Process

#3 - Decision Making Process in Capital Budgeting

Decision-making is the third step. In the decision-making stage, the executives will have to decide which investment needs to be made from the available investment opportunities, keeping in mind the sanctioning power open to them.

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#4 - Capital Budget Preparations and Appropriations

After the decision-making step, the next step is to classify the investment outlays into higher and smaller value investments.

Six Steps to Capital Budgeting Process

#5 - Implementation
After completing all the above steps, it implements the investment proposal, i.e., put into a concrete project. Several challenges can be faced by the management personnel while executing the tasks as they can be time-consuming.

Network technique use: Several network techniques like the Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT) are available for project planning and control, which will help monitor the projects properly and efficiently.

Six Steps to Capital Budgeting Process

#6 - Review of Performance

A review of performance is the last step in capital budgeting. But, the management must first compare the actual results with the projected results. The correct time to make this comparison is when the operations get stabilized.

Example:

With this review, the capital budgeting committee concludes on the following points: -

To what extent the assumptions were realistic.

The efficiency of the decision-making.

Suppose there are any judgmental biases.

Either it fulfills the hopes of the sponsors of the project.

Selection of a project

- Any investment decision should be based on criteria fixed by the management and the criteria is different in different organizations.

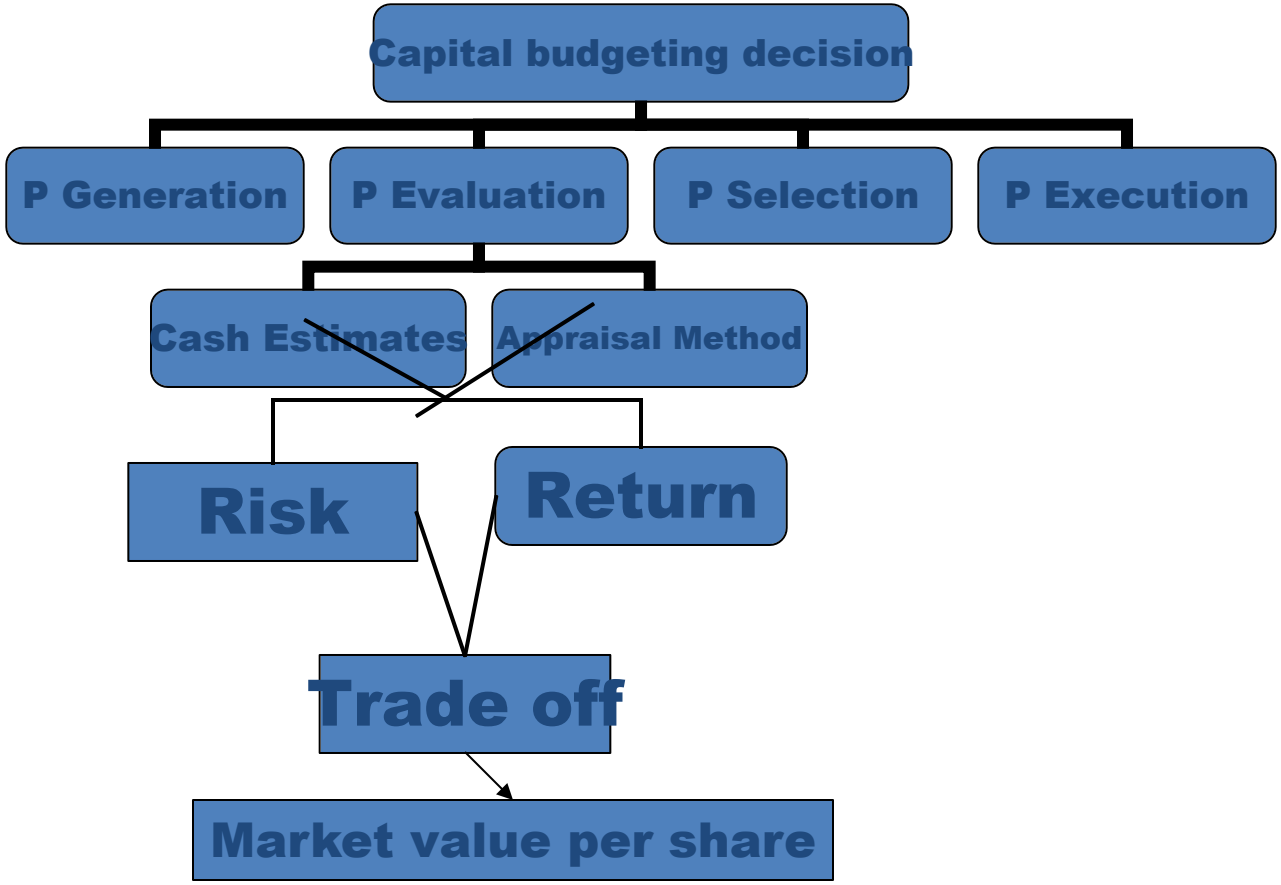
- The decision about the projects to be selected is taken on the basis of the following points

a. *Rate of Return on investments*
b. *Timing of return*
c. *The relative ranking of the project*
d. *Cost of investment*
e. *Relative cost of production*
f. *Opportunity cost*
g. *Possibilities of obsolescence*
h. *Relative technical competence required for the project*
i. *Relative contribution of the projects to the overall organizational objectives*
j. *How the projects fits in with other projects in hand*
k. *Relative analysis of risky investment*

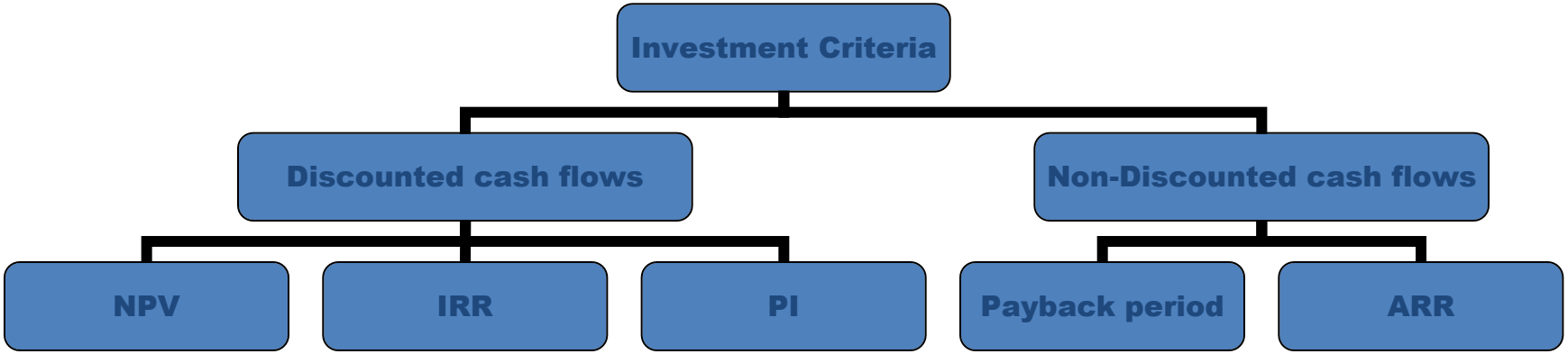
Important steps

- Project Generation
- Project Evaluation
- Projection selection
- Project execution

Capital budgeting decisions



Investment Criteria



Selection of the project:

- **Quantitative Factor: Capital budgeting techniques**

  Non-Discounted cash flow techniques

  1. Payback Period

  2. Accounting Rate of Return

  Discounted cash flow techniques

  3. Net Present Value

  4. Internal rate of return

  5. Profitability Index

- **Qualitative Factor: SWOT analysis**
  - **S = strengths**
  - **W = Weaknesses**
  - **O = Opportunities**
  - **T = Threats**

Capital Budgeting Techniques

1. Payback Period

- Payback Periods are a commonly used criterion for evaluating proposed investments.
- The Payback Period is the exact amount of time required for the firm to recover its initial investment in a project as calculated from cash inflows.
- In the case of an annuity, the Payback Period can be found by dividing the initial investment by the annual cash inflow.
- For a mixed stream, the yearly cash inflows must be accumulated until the initial investment is recovered.

Acceptance Rule:

Accept if PBP > Standard payback

Reject if PBP < Standard payback

$$\text{Payback} = [\text{YFR} - 1] \quad \frac{(\text{Original Investment} - \text{CCF YFR})}{\text{CF YFR}}$$

Where ,

YFR =Year of full recovery

CCF YFR = Cumulative CF at the start of year of full recovery

CF YFR = Cash flow during YFR

Payback Period is generally viewed as an unsophisticated capital budgeting technique, because it does not explicitly consider the time value of money by discounting cash flows to find the present value. Payback period also ignores cash flows beyond payback period.

Accounting Rate of Return:

- Accounting rate of return refers to the average rate of return on investment. So, ARR is found out by dividing return on investment by its investment and multiplying its result by 100.

$$ARR = (\text{Average Income(NPAT)}/ \text{Average Invesment}) \times 100$$

Where, NPAT = Net Profit After Tax

- Acceptance Rule:

- Accept if ARR > minimum rate
- Reject if ARR < minimum rate

2. Net Present Value (NPV)

A sophisticated capital budgeting technique; found by subtracting a project's initial investment from the present value of its cash inflows discounted at a rate equal to the firm's cost of capital. It is one of the discounted cash flow (DFR) techniques explicitly recognizing the time value of money

NPV= Present value of cash inflow – Initial Investment

$$NPV = CF0 + \frac{CF1}{(1+k)1} + \frac{CF2}{(1+k)2} + \frac{CF3}{(1+k)3} \ldots\ldots + \frac{CFN}{(1+k)n}$$

CF = Present Value of Cash Inflows

CF0 = Cash flow in zero year / Initial Investment

K = Discount Rate / Required Return/ Cost of Capital

- The Decision Criterion

  The decision criterion when NPV is used to make accept-reject decisions is as follows :

  Accept if NPV > 0
  Reject if NPV < 0
  Maybe Accept if NPV = 0

  A project may be accepted if NPV = 0. A zero NPV implies that the project generates cash flows at a rate just equal to the opportunity cost of capital.

3. Internal Rate of Return (IRR)

The internal Rate of Return (IRR) method is another discounted cash flow techniques which takes account of the magnitude and timing of cash flows. This technique is also known as yield on an investment, marginal efficiency of capital, marginal productivity of capital, rate of return, time-adjusted internal rate of return, rate of return over cost

IRR is defined as the discount rate that equates the present value of cash inflows with the initial investment associated with a project, thereby causing NPV = 0.

The IRR, in other words, the discount rate that equates the net present value of an investment opportunity with $0 .

$$0 = CFo + \frac{CF1}{(1+IRR)1} + \frac{CF2}{(1+IRR)2} + \ldots + \frac{CFN}{(1+IRR)n}$$

Where, CFo = Cash outflow at zero year

CFN = Present Value of Cash Inflows

The Decision Criterion

- If IRR is greater than the cost of capital, accept the project
- If IRR is less than the cost of capital, reject the project
- This criterion guarantees that the firm earns at least its required return. Such an outcome should enhance the market value of the firm & therefore the wealth of its owner.

Profitability Index/CB ratio

- It is the ratio of the present value of future cash benefits, at the required rate of return to the initial cash outflow of the investment.
- This method is generally used to choose between mutually exclusive projects by calculating the incremental benefit-cost ratio.

Problem – 1

A company is considering an investment proposal to install new milling controls. The project will cost Tk. 50,000. The facility has a life expectancy of 5 years and no salvage value. The company's tax rate is 55% and no investment allowance is allowed. The firm uses straight line depreciation. The estimated cash flows before tax (CBT) from the proposed investment proposal are as follows:

Year	CFBT(Tk.)
1	10,000
2	11,000
3	14,000
4	15,000
5	25,000

Calculate the following:

i) Payback period

ii) Average Rate of return

iii) Internal rate of return

iv) Net present value at 10% discount rate

v) Profitability index at 10% discount rate

Year	1	2	3	4	5
PV factor	0.909	0.826	0.751	0.683	0.621

Solution:

Table showing calculation of cash flow after tax (CFAT):

Year	CFBT	Dep.	NP	Tax	NPAT	CFAT
1	10,000	10,000	--	--	--	10,000
2	11,000	10,000	1,000	550	450	10,450
3	14,000	10,000	4,000	2,200	1,800	11,800
4	15,000	10,000	5,000	2,750	2,250	12,250
5	25,000	10,000	15,000	8,250	6,750	16,750

Depreciation = (Cost of Machine - Salvage Value)/Life of Machine

= (50,000-0)/5

= 10,000

i) Pay back period

Table showing calculation of payback period

Year	CFAT	Cumulative CFAT
1	10,000	10,000
2	10,450	20,450
3	11,800	32,250
4	12,250	44,500
5	16,750	61,250

PBP = No. of Year before + (Unrecovered cost at start of full recovery year/ Total CF during full recovery year)x Full recovery of OI

= 4 + (5,500/61,250) = 4.09 years

Since the PBP equal to 4.09 years is closer to projects last year, which is 5 years; hence, PBP of the project appears to be too high, signifying that the project would require much time to recover its original investment by the net cash flows.

ii) Average rate of return (ARR)

ARR = (Average Income(NPAT)/Average Invesment) x 100
= ((11250/5)/(50,000/2))x 100
= 9%
Comment: Since ARR of the project is less than the rate of opportunity cost, i.e., the rate of discount equal to 10%; hence, the project will not be profitable. Its return would not cover its cost of capital.

iii) IRR

We are required to determine the value of r in the following equation, as IRR is the rate of discount which equals PV of CFAT equal to PV of CO.

$O = \sum_{i=1}^{t} CFt/(1+r)^t$

$= 50{,}000 = 61250/(1+r)$

Now, you have to find out the discount factor(F) which is close to (50,000/12,250) = 4.082

We should look at to present value annuity table, which is close to this factor against 5 years. This factor lies between 6% and 7%. Therefore, IRR also lies between 6% and 7%.

Table showing the calculation of NPV at 6% and 7%

		PV Factor	PV Factor	NPV	NPV
year	CFAT	6%	7%	6%	7%
0	(50,000)	--	--	(50,000)	(50,000)
1	10,000	0.943	0.935	9430	9350
2	10,450	0.89	0.873	9300	9123
3	11,800	0.84	0.816	9912	9629
4	12,250	0.792	0.769	9702	9347
5	16,750	0.747	0.713	12512	11942
				856	(609)

The IRR is between 6% and 7%. The NPV is + tk.856 at 6% and the NPV is – Tk.609 at 7%. Thus, a 1% difference in the discount rate causes a difference in the present values of Tk. (Tk. 50,856 – Tk. 49, 391). Therefore, Tk. 609 would require adjustment for 0.41 (Tk. 609 + Tk. 1,465).
Subtracting 0.41 from 7%, we get 6.59% as the IRR.

Comment: IRR of the project comes to only 6.59%, which is much below the opportunity cost of capital equal to 10%; the project is not profitable. Since IRR does not cover cost of capital

Net Present Value (NPV)

Table showing the calculation of NPV

Year	CFAT	PV Factor at 10%	NPV	Cumulative DCF
0%	(50,000)	--	(50,000)	--
1	10,000		9,090	9,090
2	10,450	0.826	8632	17722
3	11,800	0.751	8862	26584
4	12,250	0.683	8367	34951
5	16,750	0.621	10401	45352
			(4,648)	

Comment: Since the NPV of the project is negative, equal to Tk. 4,648, so the project should be rejected.

V) Profitability index

PI = PV of cash inflows(CFAT) / PV of cash outflows(CO)

= Tk. 45,352 / Tk. 50,000 = 0.907

Comment: Since PI equal to .907 is less than 1, signifying negative NPV; hence, the project is not acceptable.

Problem and Solution:

- Problem – 2

The following information relates to the projects A and

Particulars	Project A (Tk.)	Project B (Tk.)
Initial Investment	10 lac	14 lac
Residual Value	50 lac	2.00 lac
Effective Life	5 years	5 years
Depreciation Method	Straight line	Straight line
Tax Rate	50%	50%
Expected Rate of Return	10%	10%
Income before depreciation and tax:		
1st year	2.5 lac	4.00 lac
2nd year	2.5 lac	4.00 lac
3rd year	2.00 lac	3.50 lac
4th year	2.00 lac	3.25 lac
5th year	1.80 lac	3.00 lac

Of the projects A and B , which one would be more profitable and why? Apply NPV technique & CBR (Cost benefit ratio).

Solution:

Calculation of Net Cash Benefit (CFAT):

Project A:

Year	CFBT (Tk.)	Dep. (Tk)	EBT (Tk.)	Tax (50%)	NI (Tk.)	CFAT (Tk.)
1	2,50,000	1,90,000	60000	30000	30000	2,20,000
2	2,50,000	1,90,000	60000	30000	30000	2,20,000
3	2,00,000	1,90,000	10000	5000	5000	1,95,000
4	2,00,000	1,90,000	10000	5000	5000	1,95,000
5	1,80,000	1,90,000	(10000)	--	(10000)	1,80,000
5	50000		50000	--	50000	50000

depreciation = (Investment – Residual Value)/Project life

= (10,00,000-50,000)/5 = 1,90,000

Table showing calculation of NPV of CFAT (NCB):

Year	**NCB**	**PV factor at 10%**	**NPV**
0	(10,00,000)	1	(10,00,000)
1	2,20,000	0.9091	2,00,000
2	2,20,000	0.8265	1,81,819
3	1,95,000	0.7513	1,46,505
4	1,95,000	0.683	1,33,187
5	1,80,000	0.6209	1,11,766
5	50,000	0.6209	31,046
			Tk.(1,95,677)

Solution:

Calculation of Net Cash Benefit (CFAT):

Project B:

Year	CFBT (Tk.)	Dep. (Tk)	EBT (Tk.)	Tax (50%)	NI (Tk.)	CFAT (Tk.)
1	4,00,000	2,40,000	1,60,000	80,000	80,000	3,20,000
2	4,00,000	2,40,000	1,60,000	80,000	80,000	3,20,000
3	3,30,000	2,40,000	1,10,000	55,000	55,000	2,95,000
4	3,25,000	2,40,000	85,000	42,500	42,500	2,82,500
5	3,00,000	2,40,000	60,000	30,000	30,000	2,70,000
5	2,00,000		2,00,000	--	2,00,000	2,00,000

depreciation = (Investment – Residual Value)/Project life

= (14,00,000-2,00,000)/5 = 2,40,000

Table showing calculation of NPV:

Year	NCB	PV factor at 100%	NPV
0	(14,00,0000)	1	(14,00,000)
1	3,20,000	0.9091	2,90,000
2	3,20,000	0.8265	2,64,464
3	2,95,000	0.7513	2,21,636
4	2,82,000	0.683	1,92,950
5	2,70,000	0.6209	1,67,648
5	2,00,000	0.6209	1,24,184
NPV			Tk. (1,38,209)

Comment: None of the project is acceptable, because both the projects have Negative NPV.

V) Profitability index/cost benefit analysis

Project A

PI = PV of cash inflows(CFAT) / PV of cash outflows(CO)

= Tk. 8,04,323 / Tk. 10,00,000 = 0.804

Comment: Since PI equal to 0.80 is less than 1, signifying negative NPV; hence, the project A is not acceptable.

Project B

PI = PV of cash inflows(CFAT) / PV of cash outflows(CO)

= Tk. 12,60,882 / Tk. 14,00,000 = 0.90

Comment: Since PI equal to 0.90 is less than 1, signifying negative NPV; hence, the project B is not acceptable.

Problem -3:

XYZ Company is considered the acquisition of one of the two machines. As a basis for selection of one of them, the following data were developed

Particulars	Machines A (Tk.)	Machines B (Tk.)
Initial Investment (Original Cost)	25,565	25,565
Estimated Residual Value	0	0
Effective Life	5 years	5 years
Depreciation Method	Straight line	Straight line
Tax Rate	40%	40%
Expected Rate of Return	16%	16%
Annual Income (After depreciation and income-taxes):		
1st year	687	4,687
2nd year	1,687	3,687
3rd year	2,687	2,687
4th year	3,687	1,687
5th year	4,687	687

year	1	2	3	4	5
PV factor	0.826	0.743	0.641	0.552	0.476

Assume yourself as the financial analyst of XYZ Company and compute the cash inflow on each machine, payback and the net present value. Also estimate your result and the final recommended ranking with proper justification for the same.

SWOT Analysis

Selection of the project Qualitative factor

SWOT analysis

- **S = strengths**
- **W = Weaknesses**
- **O = Opportunities**
- **T = Threads**

A strength can take the form of skill/expertise, valuable physical assets, valuable human assets, valuable intangible assets, and fruitful alliances.

Weakness is something a project lacks or does poorly, or a condition that puts the project at a disadvantage. A project's internal weakness can be related to

(a) deficiencies in competitively important skills

(b) A lack of competitively important physical or intangible assets.

An opportunity is something that a project may grab for growth and profitability. It's a favorable condition in a project's external environment. Opportunities offer important avenues for profitable growth and indicate potential for competitive advantage.

A threat is something a project may be exposed to in the external environment that may cause suffering in growth or profitability. It's an unfavourable trend in the external environment.

Matrix Analysis

HIGH		
S	SO	O
SW	ST WO	OT
W	WT	T
LOW		HIGH

WT = Impoverished management with low concern for both strengths and opportunities. This may be called laissez-faire management because the project director does not take a leadership role, ie, improved project threat and weakness.

SW = country club management having a high concern about strength and low concern of weakness.

ST, WO = Middle of the road management improved weakness and opportunity.

OT = Authoritarian management with high concern for opportunity but low concern for threat.

SO = Democratic management with high concern for both strength and opportunity, and satisfaction with the project in that situation project will be selected.

Matrix of SWOT Analysis

36	Project Selection Matrix							
37	Selection Criteria	Weighted Total	Degree of Impact	How low the Cost	Degree of Feasibility			
38	Project Name							
39	Weight (1 to 5)		5	3	4			
40	Project A	**49**	5	4	3			
41	Project B	**40**	3	3	4			
42	Project C	**28**	1	5	2			
43	Project D	**35**	5	2	1			
44	Project E	**41**	4	3	3			
45								
46								
47								
48								
49								
50								

With the example above, Project A has the highest priority. Of course, it's not like you have to select the highest-scoring project, but since you can compare objectively with numbers, it's very helpful for your decision.

Thank You