Economics Feasibility Study

Dr Muhammad Towfiqur Rahman

Assistant professor

Department of Computer Science & Engineering

University of Asia Pacific Bangladesh

1

Feasibility studies

Involve large amount of investment

Or requires huge capital to be invest on projects

❑ A study on the current and expected availability of human, physical and financial resources
❑ so as to ensure their optimum deployment, that can be measured according to specified criteria
❑ in the context of prevailing and predicted commercial and socio-economic requirements."

❑ The objectives of feasibility studies not only to maximize profit,

❑ but it is rather the economic study which provide information needed related

❑ due to the consequence of the project development.

Feasibility studies	Quantitative basis	For making decision
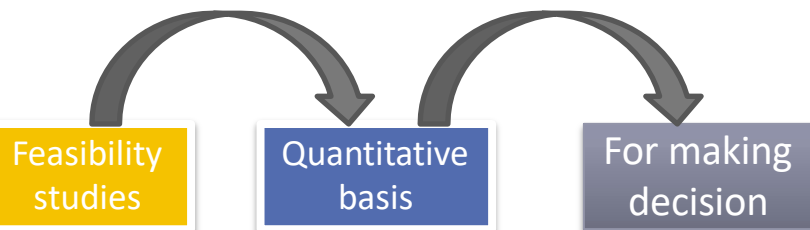
Feasibility process
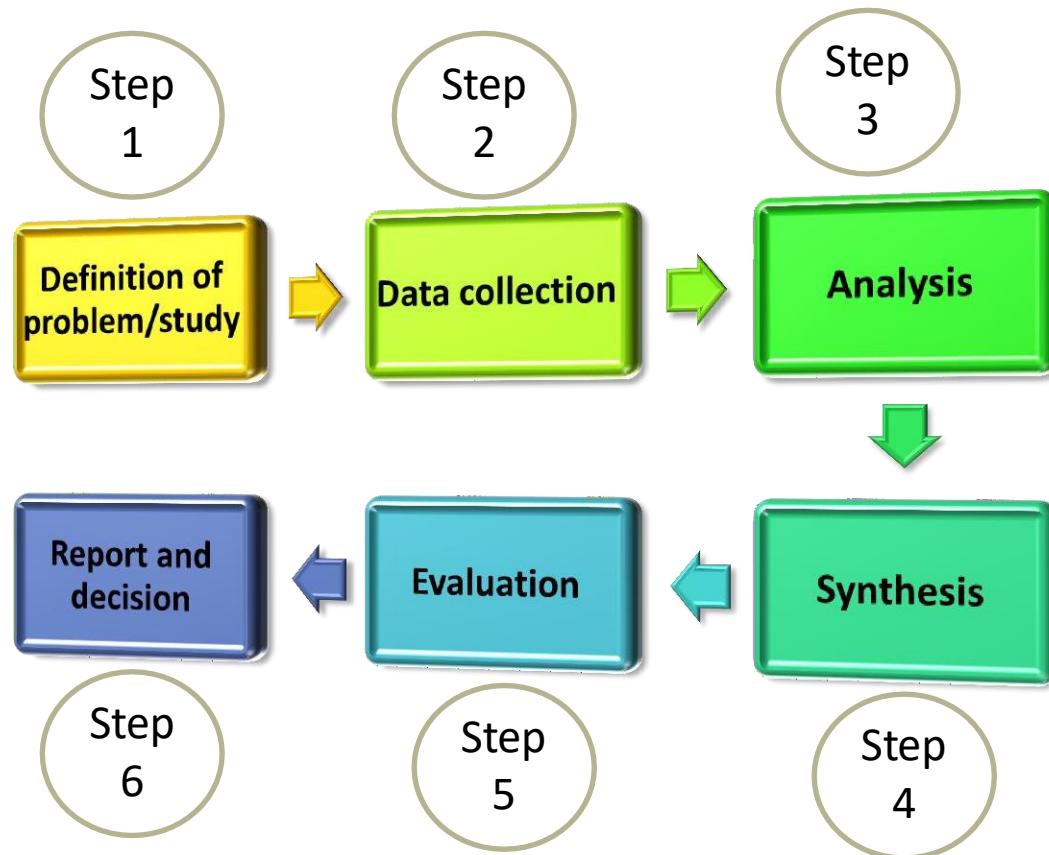
Feasibility studies

Evaluation

Several method for evaluation (investment techniques):

❑ Net Present Value (NPV)

❑ Accounting rate of return (ARR)

❑ Payback method (PB)

Capital investment appraisal

Firms have been found to use different methods when evaluating their capital investments, and may also be using multiple appraisal methods
(*APPRAISAL TECHNIQUES USED IN EVALUATING CAPITAL INVESTMENTS: CONVENTIONAL CAPITAL BUDGETING AND THE REAL OPTIONS APPROACH, 2005*)

Data Analysis: Descriptive Statistics and Interviews

Best Appraisal Technique

Appraisal Technique or Method	No. of Respondents	Percent
Personal Judgement	14	15.9
Net Present Value (NPV)	12	13.6
Internal Rate of Return (IRR)	25	28.4
Accounting Rate of Return (ARR)	4	4.5
Discounted Payback (DPB)	8	9.1
Payback (PB)	21	23.9
Real Option (RO)	0	0
Monte Carlo simulation	0	0
'What if' model or sensitivity analysis	1	1.1
Decision tree	1	1.1
Spreadsheet-based simulation tools	2	2.3
Stochastic project activity network (CPM)	0	0
Others	0	0
Total Number of Respondents	*88*	*100.0*

Time value of money

- The time value of money concept plays an important role in appraising capital projects because the time lag between the initial investment and payback can be quite long.

- $1 earned or spent sooner, is worth more than $1 earned or spent later.

- To evaluate any project taking into account the time value of money, the cash flows received in the future must be <u>reduced or discounted </u>to a present value, so that all relevant cash flows are denominated in todays value (present value).

- **Example: 1,** A person deposited $1,00,000 in a bank for one year and got $1,10,000 at the end of one year. Find out the total amount of interest and the rate of interest per year on the deposited money.

- **Solution:** The total amount of interest gained over one year =

- $1,10,000 – $1,00,000 = $10,000

- The rate of interest *i* per year is given by;

- **i% = <u>$10,000</u> x 100 = 10%**
  $1,00,000

Investment Appraisal

❑ A means of assessing whether an investment project is worthwhile or not

❑ Investment project could be the purchase of a new PC for a small firm, a new piece of equipment in a manufacturing plant, a whole new factory, etc.

❑ Used in both public and private sector

Why do companies invest?

❑ Importance of remembering investment as the purchase of productive capacity NOT buying stocks and shares or investing in a bank!

❑ Buy equipment/machinery or build new plant to:

– Increase capacity (amount that can be produced) which means:

– Demand can be met and this generates sales revenue

– Increased efficiency and productivity

METHOD 1 - Net present value (NPV)

– If we invest $ 100 at 20% interest, after one year it will be worth $ 120 and after 2 years it will be worth $ 144.

– NPV is the reverse of compound interest i.e if we were offered $120 one year from now and the inflation and interest rate was 20%, working backwards its value in today's term would be $ 100.

– This called the present value, and when the cash flow over a number of years is combined in this manner the total figure is called NPV

$$D_n = \frac{1}{(1 + i)^n}$$

Where D_n = discount factor

i = the forecast interest rate

n = number of years ahead

Net Cash Flow

Cash inflows:

- Receipts from sale of goods and services.
- Receipts from sale of physical assets.

Cash outflows:

- Expenditure on materials, labour and indirect expenses for manufacturing.
- Selling and administrative.
- Inventory and taxes.

NET CASH FLOW

Cash-Flow Method

O This model presents a more realistic and accurate assessment of development costs and income against the variable of time.

O It is the nature of property development that the timing of cash-flows is irregular and uneven.

O Some offices in high-rise buildings can be let or even sold off and allow the new owners to occupy the lower floors, even though the upper floors or other sections of the building are still under construction.

O The model enables the developer to adjust for changes in interest rates easily over the development period or for different sources of finance.

Net Cash Flow

Discounted Cash-Flow Method

⭕ A discounted cash-flow (DCF) can examine different cash-flow models; they are all discounted back (i.e. using a present value formula) to a common point in time to facilitate an even comparison or analysis.

⭕ The time periods can be modified to any time period, such as days or years depending on the intended complexity of the DCF.

⭕ The main advantage of this approach to the developer is that it allows a subsequent calculation of the 'internal rate of return' (IRR), which is the measure used by some developers to assess the profitability of a scheme since IRR considers both the timing of the cash-flows and the magnitude of each cash-flow.

⭕ IRR is also ideal for comparing different potential property developments with their own variations in the timing and size of the cash-flows.

Net present value (NPV)

- *If the NPV is positive*, it means that the cash inflows from the investment will yield a return in **excess** of the cost of capital and thus the project should be undertaken, as long as there are no other projects offering a higher NPV.

- *If the NPV is negative*, it means that the cash inflows from the investment yield a return **below** the cost of capital and so the project should not be undertaken.

- *If the NPV is exactly zero,* the cash inflows from the investment will yield a return which is exactly the same as the cost of capital and thus the project may or may not be worth undertaking depending on other investment opportunities available.

Example 1: Net present value

Newport Leisure Park Ltd. is considering investing €135,000 in a new flume ride. The Ride has an estimated life of six years ~~at the end of which it is estimated it will be sold for €10,000.~~ The projected operating net cash flows are as follows:

Discount factor
= 12%

Year	Net operating cash flow
1	14,000
2	25,000
3	35,000
4	36,000
5	30,000
6	25,000
	165,000

Using the net present value method, advise the company on whether or not they should invest in this flume ride.

Example 1: Net present value

The relevant cash flows are discounted to present year (year zero) values and a cumulative net present value is calculated as follows:

$$D_n = \frac{1}{(1+i)^n}$$

$D_0 = 1/(1+12\%)^0 = 1.0$

Present value interest factor (**PVIF**)

Year	Cash flow €	PVIF at 12%	Present value €	
0	(135,000)	1.0	(135,000)	(135,000)x 1.0 = (135,000)
1	14,000	0.893	12,502	
2	25,000	0.797	19,925	
3	35,000	0.712	24,920	
4	36,000	0.636	22,898	
5	30,000	0.567	17,010	
6	35,000	0.507	17,745	
Net present value			(20,000)	Total

The NPV is a negative figure of €20,000. Thus the investment does not give a return greater than the company's cost of capital (the ultimate accept criterion) and the project should be rejected based on the projections presented.

Accept or reject criteria for NPV method

Accept the project	Reject the project
NPV is positive. *In choosing between mutually exclusive projects, accept the project with the highest NPV.*	NPV is negative.

METHOD 2- Accounting rate of return (ARR)

- The accounting rate of return method calculates the estimated overall profit or loss on an investment project and relates that profit to the amount of capital invested and to the period for which it is required.

- A business will have a required minimum rate of return for any investment. This is related to the cost of capital of the business.

- If an investment yields a return greater than the cost of capital, then the investment would be considered suitable and profitable.

- The accounting rate of return is an average rate of return calculated by expressing average annual profit as a <u>percentage</u> of the average value of the investment.

- Choose higher ARR (%)

Newport Leisure Park Ltd. is considering investing €135,000 in a new flume ride. The ride has an estimated life of six years, ~~and the sale of which is given in which will be sold for €19,000~~. The following cash flows and profits have been estimated:

(135,000)/6
= (22,500)

6,666.7/
(135,000)
= 0.049

							Average	ARR
Year	1	2	3	4	5	6		
Net operating cash flow	14,000	25,000	35,000	36,000	30,000	35,000		
Depreciation	(22,500)	(22,500)	(22,500)	(22,500)	(22,500)	(22,500)		
Operating profit	(8,500)	2500	12,500	13,500	7,500	12,500	6,666.7	4.94%

*Accounting Profit $=14,000 - (22,500) = (8,500)$

Using the accounting rate of return appraisal method, advise the company on whether or not they should make this investment.

Accept or reject criteria for ARR method

Accept the project	Reject the project
Project ARR greater than the minimum required return.	Project ARR less than the minimum required return.

METHOD 3 - The payback method

- It is a simple method, widely used in industry and is based on management's concern to be reimbursed on the initial outlay as soon as possible.

- "how long before I get my money back?"

- The payback period (PB) is the period of time taken for the future net cash inflows to match the initial cash outlay.

- Many companies set payback requirement for capital projects.

- Definition - The length of time taken to repay the initial capital cost

Payback period

o Cash-flow of a same project will perform differently due to different labour, material and maintenance costs.

o Payback could occur during a year. Can take account of this by reducing the cash inflows from the investment to days, weeks or years

o The equation to calculate payback period of a project depends on whether the cash flow per period from the project is even or uneven. In case they are even, the formula to calculate payback period is:

Payback Period =   Initial Investment____

Cash Inflow per Period

Payback period

○ When cash inflows are uneven, we need to calculate the cumulative net cash flow for each period and then use the following formula for payback period:

$$\text{Payback Period} = A + \frac{B}{C}$$

○ In the above equation,

- A is the last period with a negative cumulative cash flow;

- B is the absolute value of cumulative cash flow at the end of the period A;

- C is the total cash flow during the period after A

Accept the project only if its payback period is LESS than the target payback period.

Newport Leisure Park Ltd is considering investing €135,000 in a new flume ride. The ride has an estimated life of six years ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮. The projected operating net cash flows are as follows:

Year	Net operating cash flow
1	14,000
2	25,000
3	35,000
4	36,000
5	30,000
6	25,000
	165,000

Establish the payback period for this investment.

Example 3: Payback

Year	Cash flow	Cumulative cash flow
	€	€
0	(135,000)	(135,000)
1	14,000	(121,000)
2	25,000	(96,000)
3	35,000	(61,000)
4	36,000	(25,000)
5	30,000	5,000
6	35,000 *	40,000

* Operating cash flow of €25,000, █████████
████████████████████

Cumulative calculation
Year 0 =(135,000)+14,000 = (121,000)

$$\text{The annual period} \times \frac{\text{Cash required to payback}}{\text{Total net cash flow for the period}}$$

$$12 \text{ months} \times €25,000 \div €30,000 = 10 \text{ months}$$

The payback period is 4 years 10 months

Accept or reject criteria for PB method

Accept the project	Reject the project
- Accept the project only if its payback period is shortest - Payback period is less than that required by owner.	- Longer payback period - Payback period is greater than that required by owner.

Appraisal methods

Newport Leisure Park Ltd investment appraisal summary

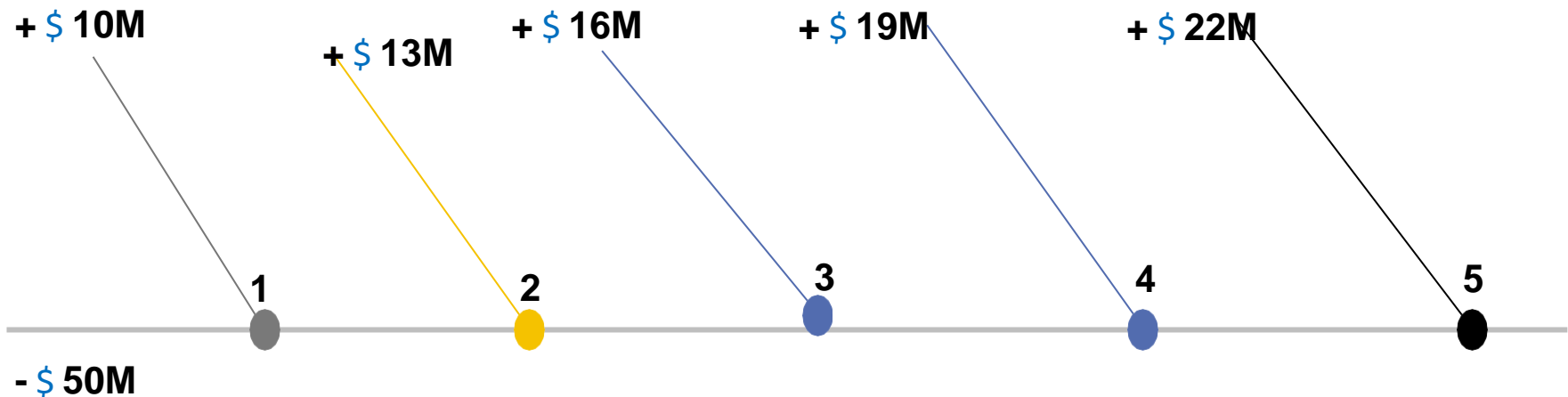| Appraisal technique	Result	Evaluation
Payback	4 years and 10 months	The full payback is estimated to occur 80 per cent into the project period. This is a long time to wait for payback.
ARR	9.2%	The ARR is 9.2 per cent and this is below the cost of capital of the business at 12 per cent. The project should be rejected.
NPV	(€20,000)	A NPV of (€20,000) implies the present value of cash outflows exceed the present value of cash inflows over the life of the project by €20,000. The project should be rejected.

Findings

o This research aims to investigate the appraisal techniques used by manufacturing firms in Malaysia to evaluate investment, particularly investments with embedded options and investment involving advanced manufacturing technology.

o **Most of those surveys have noted that payback is a popular technique for evaluating investment (Han, 1986; Kester and Tsui, 1998).**

o It is noted that most managers prefer to use <u>payback and personal judgement,</u> although there is awareness of discounted cash flow approaches, and some appreciation that these might be considered the best techniques by managers who use non-sophisticated approaches.

Exercise for today : Payback period

Green Limited is planning to undertake another project requiring initial investment of $ 50 million. The investment is expected to generate $ 10 million in Year 1, $ 13 million in Year 2, $ 16 million in year 3, $ 19 million in Year 4 and $ 22 million in Year 5.
Calculate the payback value of the project.

THANK YOU