PRACTICAL - 3

AIM: Study cost-benefit evaluation Techniques and apply for project Selection

Scenario: Assume you are a project manager in a technology company, and your organization is considering two potential projects: **Airbnb System** and **Farfetch E-commerce System**. Both projects have different scopes, costs, and expected benefits.

Task:

1. Study cost-benefit evaluation Techniques
2. Conduct a cost-benefit analysis for both projects by using techniques such as Return on Investment (ROI) and Net Present Value (NPV) to evaluate and compare the projects.
3. Make a recommendation on which project should be selected based on the analysis.

Solution :

Team Details :

Sr. No.	Name	Enrollment No.
Team Leader	Gati Shah	202203103510261
Team Member 1	Fenil Shilodre	202203103510041
Team Member 2	Angat Shah	202203103510097
Team Member 3	Yash Patel	202203103510228
Team Member 4	Sarth Chaudhari	202303103510106

Cost-Benefit Evaluation Techniques :

Cost-Benefit Evaluation Techniques are used to evaluate projects based on their expected benefits and associated costs. These techniques help in decision-making, especially when choosing between multiple potential projects. Below are the common techniques used in cost-benefit analysis:

1. Net Profit

Net Profit is the total benefit of a project after subtracting the total costs. This is used for a quick comparison of profitability but does not account for the timing of cash flows.

2. Payback Period

The Payback Period indicates the time taken for the initial investment to be recovered from the cash inflows. Shorter payback periods are generally more desirable.

3. Return on Investment (ROI)

ROI measures the profitability of a project relative to its cost. It is calculated as the ratio of the net profit to the total investment :

$$\textbf{ROI} = \frac{Average\ Annual\ Profit}{Total\ Investment} \times 100$$

A higher ROI indicates a more profitable project.

4. Net Present Value (NPV)

The NPV measures the profitability of a project by considering the time value of money. It discounts future cash flows to the present time and subtracts the initial investment. The formula is :

$$\text{NPV} = \sum_{t=0}^{n} \left(\frac{C_t}{(1+r)^t} \right) - I_0$$

Where :

- C_t = Cash flow in year t
- r = Discount rate
- t = Time period
- $\mathbf{I_0}$ = Initial investment

The project with a higher NPV is considered more beneficial.

5. Internal Rate of Return (IRR)

IRR is the discount rate that makes the NPV of a project equal to zero. It represents the expected rate of return from the project. A higher IRR compared to the required rate of return makes the project attractive.

$$\textbf{IRR} = L + \left(\frac{N_L}{N_L - N_H} \times (H - L) \right)$$

Cost-Benefit Analysis :

Project A : Airbnb System

Initial Cost : $1,500,000

Expected Annual Benefits : Varying yearly cash flows

Project Lifespan : 5 years

Table :

Year	Cash Flow (Project A)
0	-1,500,000
1	300,000
2	800,000
3	1,200,000
4	1,500,000
5	2,000,000
Net Profit	**4,300,000**

Project B : Farfetch E-commerce System

Initial Cost : $1,200,000

Expected Annual Benefits : Varying yearly cash flows

Project Lifespan : 5 years

Table :

Year	Cash Flow (Project A)
0	-1,200,000
1	500,000
2	1,200,000
3	2,000,000
4	3,500,000
5	4,500,000
Net Profit	**9,200,000**

ROI Calculation :

***Project A** : Airbnb System*

- **Net profit**
  = $300,000 + $800,000 + $1,200,000 + $1,500,000 + $2,000,000 - $1,500,000
  = $4,300,000

- **Total Investment** = $1,500,000 (Initial Investment)

- **Average Annual Profit** = $\frac{\$4,300,000}{5}$ = $860,000

- **ROI** = $\frac{Average\ Annual\ Profit}{Total\ Investment} \times 100$

  = $\frac{\$860,000}{\$1,500,000} \times 100$

  = **57.33%**

Project B *: **Farfetch E-commerce System***

- **Net profit**
  = $500,000 + $1,200,000 + $2,000,000 + $3,500,000 + $4,500,000 - $2,000,000
  = $9,200,000

- **Total Investment** = $2,000,000 (Initial Investment)
- **Average Annual Profit** = $\frac{\$9,200,000}{5}$ = $1,840,000

- **ROI** = $\frac{Average\ Annual\ Profit}{Total\ Investment} \times 100$

  = $\frac{\$1,840,000}{\$2,000,000} \times 100$

  = **92%**

Recommendation : **Project B** offers a significantly higher return on investment, making it the more favorable option for maximizing profits.

NPV Calculation:

Project A : Airbnb System

Year	Cash Flow	Discount Factor (10%)	Discounted Cash Flow
0	-1,500,000	1.0000	-1,500,000
1	300,000	0.9091	272,727
2	800,000	0.8264	661,120
3	1,200,000	0.7513	901,560
4	1,500,000	0.6830	1,024,500
5	2,000,000	0.6209	1,241,800

- **NPV =** (-1,500,000 + 272,727 + 661,120 + 901,560 + 1,024,500 + 1,241,800)
  = **$601,707**

<u>Project B</u> : Farfetch E-commerce System

Year	Cash Flow	Discount Factor (10%)	Discounted Cash Flow
0	-2,000,000	1.0000	-2,000,000
1	500,000	0.9091	454,545
2	1,200,000	0.8264	991,680
3	2,000,000	0.7513	1,502,600
4	3,500,000	0.6830	2,390,500
5	4,500,000	0.6209	2,795,050

- **NPV =** (-2,000,000 + 454,545 + 991,680 + 1,502,600 + 2,390,500 + 2,795,050)
  = **$4,134,375**

Recommendation : Since **Project B** has a much higher NPV, it indicates that this project will generate more value in today's terms. Therefore, **Project B** is the more favorable investment option.

IRR Calculation :

<u>Project A</u> : Airbnb System

Year	Cash Inflow	Discount Factor (10%)	Present Value (10%)	Discount Factor (12%)	Present Value (12%)
0	-1,500,000	1.0000	-1,500,000	1.0000	-1,500,000
1	300,000	0.9091	272,727	0.8929	267,870
2	800,000	0.8264	661,120	0.7972	637,760
3	1,200,000	0.7513	901,560	0.7118	854,160
4	1,500,000	0.6830	1,024,500	0.6355	953,250

5	2,000,000	0.6209	1,241,800	0.5674	1,134,800
NPV		**2,601,707**		**2,347,840**	

- **IRR** $= L + \left(\frac{N_L}{N_L - N_H} \times (H - L) \right)$

$= 10 + \left(\frac{2,601,707}{2,601,707 - 2,347,840} \times (12 - 10) \right)$

$= 10 + \left(\frac{2,601,707}{253,867} \times (2) \right)$

= **20.50 %**

<u>Project B</u> : Farfetch E-commerce System

Year	Cash Inflow	Discount Factor (10%)	Present Value (10%)	Discount Factor (12%)	Present Value (12%)
0	-2,000,000	1.0000	-2,000,000	1.0000	-2,000,000
1	500,000	0.9091	454,545	0.8929	446,450
2	1,200,000	0.8264	991,680	0.7972	956,640
3	2,000,000	0.7513	1,502,600	0.7118	1,423,600
4	3,500,000	0.6830	2,390,500	0.6355	2,224,250
5	4,500,000	0.6209	2,795,050	0.5674	2,535,300
NPV		**6,134,375**		**5,586,240**	

- **IRR** $= L + \left(\frac{N_L}{N_L - N_H} \times (H - L) \right)$

$= 10 + \left(\frac{6,134,375}{6,134,375 - 5,586,240} \times (12 - 10) \right)$

$= 10 + \left(\frac{6,134,375}{548,135} \times (2) \right)$

= **32.38 %**

Based on the **ROI** and **NPV** analysis, **Project B (Farfetch E-commerce System)** is the more profitable and valuable investment, with a significantly higher ROI of 92% and an NPV of $4,134,375. Therefore, **Project B** should be preferred over **Project A (Airbnb System)**, which has a lower ROI of 57.33% and an NPV of $601,707.