Software Project Management

Week – 8

Today's Lecture

- Financial Analysis of a Project

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We have…

- Let us consider an example
  - Your FYP
  - You have to prepare cost
  - Question arises, how?
  - Activities ->
    - SRS Dev, Design, Imp, Testing
      - (Hardware req, Inputs (M/S), Controller conf, Wifi Modules req, Sensors requirements, overall system, application, external req, …)
      - Screen scrapping req, best buy option module, …
- Up to now…
  - Net project cost

We have…

- Up to now…
  - Net project cost
- Price has component of Cost and a component of profit = P = C +Profit
- Cost has several heads
- One of the dimensions for project selection is financial aspect
- This means you are clear about the expense side of the project

Financial Analysis of Projects

- Financial considerations are often an important consideration in selecting projects
- Three primary methods for determining the projected financial value of projects:
  - Net present value (NPV) analysis
  - Return on investment (ROI)
  - Payback analysis

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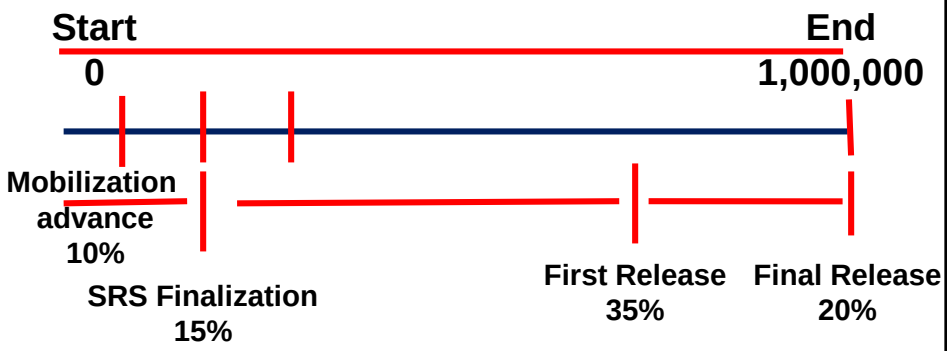
Project Execution

This is a 10 months project with expense of Rs. 85,000 / m



Remaining 20% shall be given upon expiry of maintenance period, usually 6 months to 1 year after final acceptable delivery is made

What should I calculate…

Month	Details	Transaction amount Inward	Expense	Balance
1	M/Adv	1,000,000*10%=100,000	85,000	15,000
2	Nil		85,000	(70,000)
3	SRS	1,000,000*15%=150,000	85,000	(5,000)
4			85,000	(90,000)
5			85,000	(175,000)
6			85,000	(260,000)
7	R1	1,000,000*35%=350,000	85,000	5,000
8			85,000	(80,000)
9			85,000	(165,000)
10	F R	1,000,000*20%=200,000	85,000	(50,000)
		1,000,000*20%=200,000	35,000	115,000
Total				

What should I calculate…

Month	Details	Transaction amount Inward	Expense	Balance
1	M/Adv	12000+12000/1	12000	15,000
2	Nil			(70,000)
3	SRS	1,000,000*15%=150,000		(5,000)
4				(90,000)
5				(175,000)
6				(260,000)
7	R1	1,000,000*35%=350,000		5,000
8				(80,000)
9				(165,000)
10	F R	1,000,000*20%=200,000		(50,000)
		1,000,000*20%=200,000	12,000	115,000
Total				

My analysis

- Investment from company = 1,000,000
- Profit = 115,000
- Time to profit = 1 years
- I went to National Bank of Pakistan (NBP)
- NPV
  - Let bank rate of return is 5%
  - 1,000,000/1.05 = 952,381 = 48,000
  - Current situation = 115,000 – 48,000 = 67,000
- 100,000 ->120,000
- 120,000/1.07 = 112,149;
- 112,149-100,000=12,149

What should I calculate…

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		1,000,000*20%=200,000	35,000	115,000
Total				

Net Present Value Analysis: NPV

- NPV: a method of calculating the expected net monetary gain or loss from a project by discounting all expected future cash inflows and outflows to the present point in time
- Projects with a positive NPV should be considered if financial value is a key criterion
- The higher the NPV, the better

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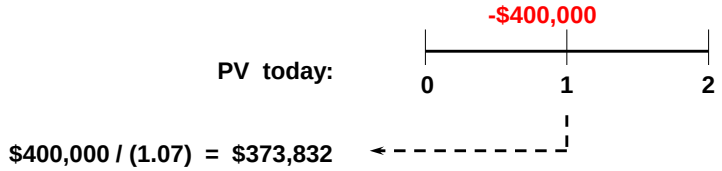
Net Present Value

- Capital Budgeting Decision
  - Suppose you had the opportunity to buy a Tbill (Treasury Bill) which would be worth $400,000 one year from today.
    - Interest rates on Tbills are a **risk free** 7%.
  - What would you be willing to pay for this investment?



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Net Present Value

- Capital Budgeting Decision
  - You would be willing to pay $373,382 for a risk free $400,000 a year from today.
  - Suppose this were, instead, an opportunity to construct a building, which you could sell in a year for $400,000 with certainty (That means the project is risk free.)
  - Since this investment has the same risk and promises the same cash flows as the Tbill, it is also worth the same amount to you:

$373,282

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Net Present Value

- Capital Budgeting Decision
  - Now, assume you could buy the land for $50,000 and construct the building for $300,000. Is this a good deal?
  - Sure! If you would be willing to pay $373,382 for this investment and can acquire it for only $350,000, you have found a very good deal!
  - You are better off by:

$373,382 - $350,000 = $23,832

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Net Present Value

- Capital Budgeting Decision
  - We have just developed a way of evaluating an investment decision which is known as **Net Present Value (NPV)**.
  - NPV is defined as the PV of the cash flows from an investment minus the initial investment.

NPV = PV – Required Investment (C0)
= [$400,000/(1+.07)] - $350,000
= $23,832

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Net Present Value

- Capital Budgeting Decision
  - This discount rate is known as the **opportunity cost of capital**.
    - It is called this because it is the return you give up by investing in the project.
    - In this case, you give up the money you could have used to buy a 7% tbill so that you can construct a building.
  - But, a Tbill is risk free! A construction project is not!
  - We should use a higher opportunity cost of capital.

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Net Present Value

- Risk and Net Present Value
  - Suppose instead you believe the building project is as risky as a stock which is yielding 12%.
  - Now your opportunity cost of capital would be 12% and the NPV of the project would be:

NPV = PV – IC0
= [$400,000/(1+.12)] - $350,000
= $357,143 - $350,000 = $7,142.86

  - The project is significantly less attractive once you take account of risk.
  - This leads to a basic financial principal: **A risky dollar is worth less than a safe one.**
  - **10,000,000 yields 14,000,000 -> 2,500,000 yield 3,500,000**
  - **3,500,000 / (1+0.11) = 3,153,153**

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Net Present Value

- Valuing long lived projects
  - The NPV rule works for projects of any duration:
    - Simply discount the cash flows at the appropriate opportunity cost of capital and then subtract the cost of the initial investment.

$$NPV = C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \ldots + \frac{C_n}{(1+r)^n}$$

Initial Investment negative cash flow

Discounted expected future cash flows

  - The critical problems in any NPV problem are to determine:
    - The amount and timing of the cash flows.
    - The appropriate discount rate.

NPV Rule: Accept Projects with Positive NPVs

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Return on Investment (ROI)

- ROI: income divided by investment

  ROI = (total discounted benefits - total discounted costs) / discounted costs
- The higher the ROI, the better
- Many organizations have a required rate of return or minimum acceptable rate of return on investment for projects

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Understanding ROI

$$\text{ROI} = \frac{\text{Net operating income}}{\text{Average operating assets}}$$

$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$

An ROI Example

•Year 1:	ABC Div	XYZ Div
•Sales	$30,000,000	$117,000,000
•Operating income	1,800,000	3,510,000
•Average operating assets	10,000,000	19,500,000
•Year 2:		
•Sales	$40,000,000	$117,000,000
•Operating income	2,000,000	2,925,000
•Average operating assets	10,000,000	19,500,000

•Minimum return of 10%

Margin and Turnover Comparisons

	ABC Div		XYZ Div	
	Year 1	Year 2	Year 1	Year 2
Margin	6.0%	5.0%	3.0%	2.5%
Turnover	x 3.0	x 4.0	x 6.0	x 6.0
ROI	18.0%	20.0%	18.0%	15.0%
	===	===	===	===

Increasing ROI – An Example

Ahmed Bilal's Company reports the following:

Net operating income	$ 30,000
Average operating assets	$ 200,000
Sales	$ 500,000
Operating expenses	$ 470,000

What is ABC Company's ROI?

$$\textbf{ROI} = \textbf{Margin} \times \textbf{Turnover}$$

$$\textbf{ROI} = \frac{\textbf{Net operating income}}{\textbf{Sales}} \times \frac{\textbf{Sales}}{\textbf{Average operating assets}}$$

Increasing ROI – An Example

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$

$$\textbf{ROI} = \frac{\textbf{Net operating income}}{\textbf{Sales}} \times \frac{\textbf{Sales}}{\textbf{Average operating assets}}$$

$$\textbf{ROI} = \frac{\$30{,}000}{\$500{,}000} \times \frac{\$500{,}000}{\$200{,}000}$$

$$\textbf{ROI} = 6\% \times 2.5 = 15\%$$

Investing in Operating Assets to Increase Sales

Suppose that Regal's manager invests in a $30,000 piece of equipment that increases sales by $35,000, while increasing operating expenses by $15,000.

Regal Company reports the following:

Net operating income	$ 50,000
Average operating assets	$ 230,000
Sales	$ 535,000
Operating expenses	$ 485,000

Let's calculate the new ROI.

Investing in Operating Assets to Increase Sales

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$

$$\text{ROI} = \frac{\text{Net operating income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Average operating assets}}$$

$$\text{ROI} = \frac{\$50{,}000}{\$535{,}000} \times \frac{\$535{,}000}{\$230{,}000}$$

$$\text{ROI} = 9.35\% \times 2.33 = 21.8\%$$

ROI increased from 15% to 21.8%.

Payback Analysis

- Another important financial consideration is payback analysis
- The "payback period" is the amount of time it will take to recoup, in the form of net cash inflows, the net dollars invested in a project
- Payback occurs when the cumulative discounted benefits and costs are greater than zero
- Many organizations want IT projects to have a fairly short payback period

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Payback Period

- How long does it take to recover the initial cost of a project?
- Computation
  - Estimate the cash flows
  - Subtract the future cash flows from the initial cost until initial investment is recovered
  - A "break-even" type measure
- Decision Rule – ***Accept if the payback period is <u>less</u> than some preset limit***

Calculate Payback Period

- If investment cost $100 and receive $50 a year for 3 years, what is payback period?
- What if investment cost $75?
- Same project as before
  - Year 0: CF = -165,000
  - Year 1: CF = 63,120
  - Year 2: CF = 70,800
  - Year 3: CF = 91,080

Computing Payback for the Project

Capital Budgeting Project

Year	CF	Cum. CFs
0	$ (165,000)	$ (165,000)
1	$ 63,120	$ (101,880)
2	$ 70,800	$ (31,080) ←
3	$ 91,080	$ 60,000

Payback = year 2 +
+ (31080/91080)

Payback = 2.34 years

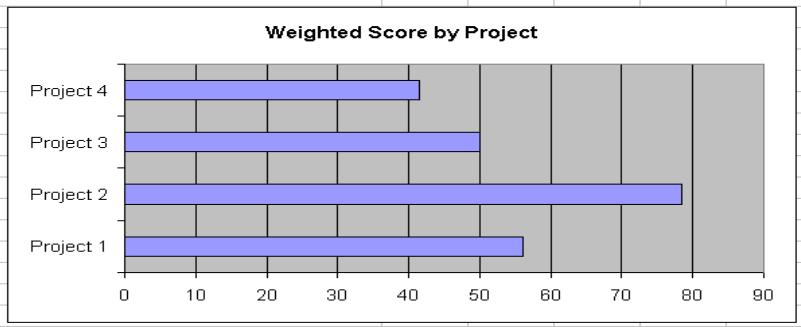
- ***Do we accept or reject the project?***

Advantages and Disadvantages of Payback

- Advantages
  - Easy to understand
  - Biased towards liquidity
- Disadvantages
  - Ignores the time value of money
  - Requires an arbitrary cutoff point
  - Ignores cash flows beyond the cutoff date

Sample Weighted Scoring Model

	A	B	C	D	E	F
1	**Criteria**	**Weight**	**Project 1**	**Project 2**	**Project 3**	**Project 4**
2	Supports key business objectives	25%	90	90	50	20
3	Has strong internal sponsor	15%	70	90	50	20
4	Has strong customer support	15%	50	90	50	20
5	Realistic level of technology	10%	25	90	50	70
6	Can be implemented in one year or less	5%	20	20	50	90
7	Provides positive NPV	20%	50	70	50	50
8	Has low risk in meeting scope, time, and cost goals	10%	20	50	50	90
9	**Weighted Project Scores**	**100%**	**56**	**78.5**	**50**	**41.5**



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Weighted Scoring Model

- A weighted scoring model is a tool that provides a systematic process for selecting projects based on many criteria
  - First identify criteria important to the project selection process
  - Then assign weights (percentages) to each criterion so they add up to 100%
  - Then assign scores to each criterion for each project
  - Multiply scores * weights = total weighted scores
- The higher the weighted score, the better

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