COST/BENEFIT ANALYSIS

Time Value of Money

Probably the most influencing factor in commitment to systems development is ***cost***.

Cost will also influence the system design selection process – choosing from alternative solutions.

If the ***cost*** of an investment exceeds the ***benefits*** of implementing it, then the system is **not** cost effective.

The areas of analysing and assessing costs:

- Time value of money
- Payback Period
- Net Present Value

Time Value of Money

How much money would you need to invest in the bank **today** to have €2,500 in one year ?

- Obviously, an amount ***less*** than €2,500.

How much money would you need to invest in the bank **today** to have €2,500 in 5 years ?

- Even less again as investing for longer !

The value of €2,500 today is different to the value of €2,500 one year from now or two years from now and so on……..

The ***time value*** of money is often expressed in terms of ***interest***.

A formula can be used to compute the **future value** of an investment

(assuming compound interest)

$$F=P(1+i)^n$$

- F = the future value of the investment
- P = the present value of the investment
- i = the interest rate per compounding period
- n = the number of compounding periods (years)

For example…..

What is the future value of €5,000 deposited today for 3 years @ 2% interest?

$$F = P(1+i)^n$$

$$F = 5000(1+0.02)^3$$
$$= €5306.04$$

Example

A system has a development cost of €5,000.

Annual benefits are estimated to be €2,500 per annum.

Assuming a 5 year investment period and a current interest rate of 2 %, what are the present values of the benefits?

$F=P(1+i)^n$

This gives F, the future value of an investment in terms of its present value and interest rate.

We know the future value (F - €2500) and interest rate (I – 2%).

We need to find the present value, P

$P = F/(1+i)n$

These present values for each year of the investment should be shown in a table of ***benefits & present values***

Table of Benefits & Present values

Year	F	$(1+i)^n$	P
1			
2			
3			
4			
5			

How much will we need to invest today to get €2,500 in one year ?

Year	F	$(1+i)^n$	P
1	2,500	1.02	???
2			
3			
4			
5			

$$P = F/(1+i)^n$$

$$P = 2500/(1.02)^1 = €2,450.98$$

Record this figure in the table

Year	F	$(1+i)^n$	P
1	2,500	1.02	€2,450.98
2			
3			
4			
5			

How much will we need to invest today to get €2,500 in two years ?

$(1+i)^n \rightarrow (1.02)^2 = 1.0404 = 1.04$

$P = F/(1+i)^n$

$P = 2500/(1.02)^2 = 2403.85$

Year	F	$(1+i)^n$	P
1	2,500	1.02	2,450.98
2	2,500	1.04	**2,403.85**
3			
4			
5			

Do the same for years 3,4 & 5.
Record the results in the table.

Note: Round $(1 + i)^n$ to 2 decimal places

Table of Benefits & Present values

Year	F	$(1+i)^n$	P
1	2,500	1.02	2,450.98
2	2,500	1.04	2,403.85
3	2,500	1.06	2,358.49
4	2,500	1.08	2,314.81
5	2,500	1.10	2,272.73

The table shows decimal values rounded to 2 places of decimals.

We should expand the table to show the ***cumulative*** value of present values.

Year	F	$(1+i)^n$	P	Cum. P
1	2,500	1.02	2,450.98	2,450.98
2	2,500	1.04	2,403.85	4,854.83
3	2,500	1.06	2,358.49	7,213.32
4	2,500	1.08	2,314.81	9,528.13
5	2,500	1.10	2,272.73	11,800.86

Pay Back Period

This is used to measure the relative value of a an investment.

- When is the investment returned ?
- How long does it take for the cumulative present value to equal the investment ?

The shorter the pay back period the better the investment!

In our example, the development cost of the investment is €5000.

We can see from the figures in the table that the pay back period is some time into the third year, i.e. 2.? Years

Where (how far in) exactly in year 3 ?

2.5 years ? 2.2 years ? 2.8 years ?

This is what we must determine to determine the Pay Back period.

At the end of year 2 the cumulative present value is €4854.83

Therefore €145.17 is needed from year 3 benefits to reach €5000 (5000 – 4854.83 = 145.17).

Express this amount (€145.17) as a fraction of the present value of year 3 benefits (€2358.49).

(145.17/2358.49) = .0616

Pay back period = 2.06 years

If the Pay Back period falls within the investment period (i.e. 5 years) then it is a good investment.

If not, it is a bad investment.

Net Present Value

This is another means of measuring the worth of an investment.

NPV is the difference between

- Present value of all benefits
- Present value of the investment

In our example:

€11,800.86 - €5000 = €6,800.86

If the NPV = 0 → Risk free investment.
Not really worth while!

If NPV < 0 → bad investment!

If NPV > 0 → good investment.

Exercise

The cost of a proposed system change is €16,000.

The annual benefits are €7,000 per annum.

Assume an interest rate of 11% over 5 years.

- Show the table of benefits & present values
- Determine the Pay Back Period
- Determine the NPV
- Is the project a good investment