Software Project Management
Lecture-2

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Contents of Lecture-2

Project Evaluation

- Contents of Business Case
- Cost Benefit Analysis
- Cash Flow Forecasting
- Cost–benefit Evaluation Techniques
- Risk Analysis Using Decision Tree

Business Case

Business Case

- Feasibility Study
- Project Justification
- Its objective is to provide a rationale for the project by showing that the benefits of the project outcomes will exceed the costs of development, implementation and operation (or production).

Business Case

Typically a business case document might contain:

1) Introduction and background to the proposal
2) The proposed project
3) The market
4) Organizational and operational infrastructure
5) The benefits
6) Outline implementation plan
7) Costs
8) The financial case
9) Risks
10) Management plan

Business Case

1. Introduction and background to the proposal:

This is a description of the current environment of the proposed project. A problem to be solved or an opportunity to be exploited is identified.

2. The proposed project:

A brief outline of the proposed project is provided.

3. The market:

This is needed when the project is to create new product or a new service capability. This would contain information like the estimated demand for the product or service and any likely competitors.

Business Case

4. Organizational and operational infrastructure:

This describes how the structure of the organization will be affected by the implementation of the project.

5. The benefits:

- Where possible, a financial value should be put on the benefits of the implemented project. For commercial organizations this could be related to increased profits caused either by increasing income or by making savings on costs.

- For not-for-profit organizations we would try to quantify the benefits even if we cannot quote a precise financial value. In an example we used earlier relating to an IT system that improved the diagnosis of a particular disease, an increase in the rate of diagnosis might be quoted.

Business Case

6. Outline implementation plan

In addition to the ICT aspects of the project, activities such as marketing, promotion and operational and maintenance infrastructures need to be considered. One consideration will be which project activities can be outsourced, and which are best kept in-house.

7. Costs

Having outlined the steps needed to set up the operations needed by the proposal, a schedule of expected costs associated with the planned approach can now be presented.

There will clearly be some uncertainties about some of the costs, especially as the details of the requirements have not yet been worked out.

8. The financial case

9. Risks

10. Management plan

Project Portfolio Management

Project Portfolio Management

Portfolio project management provides an overview of all the projects that an organization is undertaking or is considering.

It prioritizes the allocation of resources to projects and decides which new projects should be accepted and which existing ones should be dropped.

Project Portfolio Management

The concerns of project portfolio management include:

- Identifying which project proposals are worth implementation.
- Assessing the amount of risk of failure that a potential project has.
- Deciding how to share limited resources, including staff time and finance, between projects – one problem can be that too many projects are started given the resources available so that inevitably some projects will miss planned completion dates.
- Being aware of the dependencies between projects, especially where several projects need to be completed for an organization to reap benefits;
- Ensuring that projects do not duplicate work;
- Ensuring that necessary developments have not been inadvertently been missed.

Evaluation of Projects

Technical Assesment

Technical assessment of a proposed system consists of evaluating whether the required functionality can be achieved with current affordable technologies.

Organizational policy, aimed at providing a consistent hardware/software infrastructure, is likely to limit the technical solutions considered.

The costs of the technology adopted must be taken into account in the cost–benefit analysis.

Cost Benefit Analysis

Even where the estimated benefits will exceed the estimated costs, it is often necessary to decide if the proposed project is the best of several options.

Not all projects can be undertaken at any one time and, in any case, the most valuable projects should get most resources.

Cost Benefit Analysis

Cost–benefit analysis comprises two steps:

1- Identifying all of the costs and benefits of carrying out the project and operating the delivered application.

These include

the development costs,

the operating costs,

benefits expected from the new system.

Cost Benefit Analysis

2- Expressing these costs and benefits in common units. We must express each cost and benefit – and the net benefit which is the difference between the two – in money.

The proposed system is a replacement, these estimates should reflect the change in costs and benefits due to the new system.

A new sales order processing system, for example, could only claim to benefit an organization by the increase in sales due to the use of the new system.

Cost Benefit Analysis

Most direct costs are easy to quantify in monetary terms and can be categorized as:

- **Development costs**, including development staff costs;
- **Setup costs,** consisting of the costs of putting the system into place, mainly of any new hardware but also including the costs of file conversion, recruitment and staff training;
- **Operational costs** relating to operating the system after installation.

Cost Benefit Analysis

Example:

XYZ university is considering the replacement of the existing payroll service, operated by a third party, with a tailored, off-the-shelf computer-based system.

List some of the costs it might consider under the headings of:

- Development costs
- Setup costs
- Operational costs

List some of the benefits under the headings:

- Quantified and valued benefits
- Quantified but not valued
- Identified but not easily valued

For each cost or benefit, explain how, in principle, it might be measured in monetary terms.

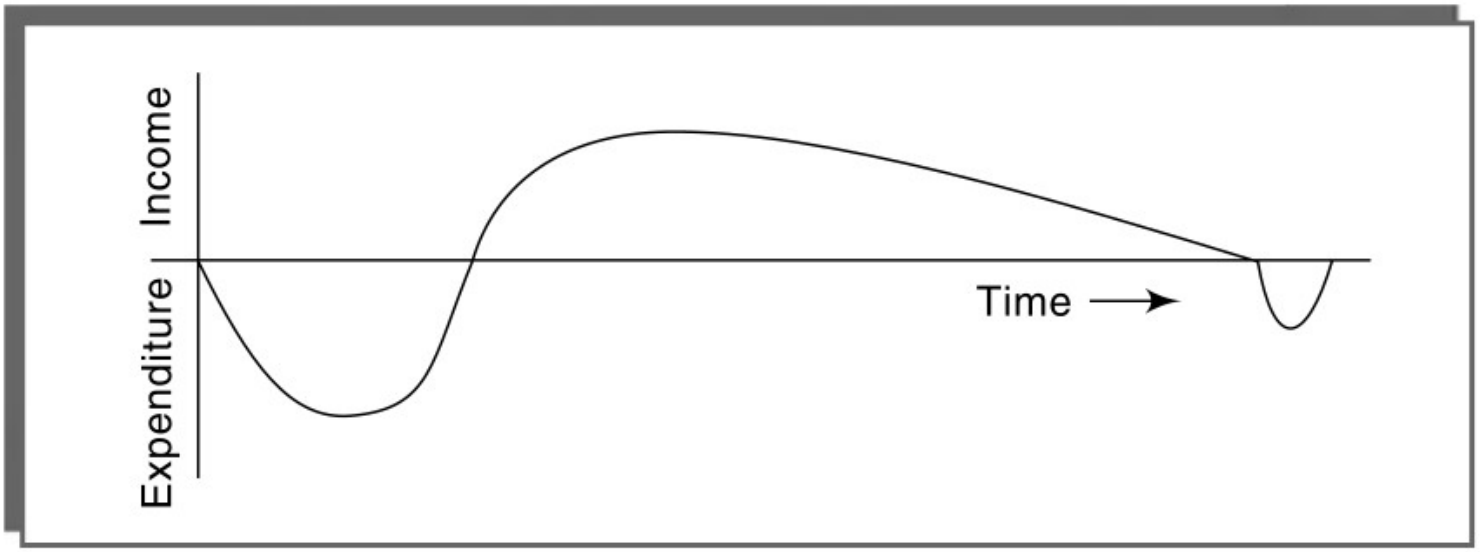
Cost Benefit Analysis

Category	Cost/benefit
Development costs	Software purchase – software cost plus selection and purchasing cost
	Project team employment costs
Setup costs	Training includes costs of trainers and operational staff time lost while training Staff recruitment
	Computer hardware and other equipment which might have a residual value at end of projected life
	Accommodation – any new/refurbished accommodation and furniture required to house new system
	Initial systems supplies – purchase of stationery, disks and other consumables
Operational costs	Operations staff – full employment costs
	Stationery – purchase and storage
	Maintenance and standby – contract or estimation of occurrence costs Accommodation, including heating, power, insurance, etc.
Quantified and valued	Saving on local authority fees
	Later payment – increase interest income through paying salaries later in the month
Quantified but not valued	Improved accuracy – the number of errors needing to be corrected each month
Identified but not easily valued	Improved management information – this should lead to improved decision making but it is very difficult to quantify the potential benefits

Cash Flow Forecasting

As important as estimating the overall costs and benefits of a project is producing a cash flow forecast which indicates when expenditure and income will take place.

Accurate cash flow forecasting is difficult, as it is done early in the project's life cycle (at least before any significant expenditure is committed) and many items to be estimated (particularly the benefits of using software) might be some years in the future.



Cost–benefit Evaluation Techniques

We now take a look at some methods for comparing projects on the basis of their cash flow forecasts.

Year	Project 1	Project 2	Project 3	Project 4
0	–100,000	–1,000,000	–100,000	–120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000
Net profit	50,000	100,000	50,000	75,000

Cost–benefit Evaluation Techniques

Observation:

- Projects 1 and 3 each have a net profit of 50,000 and therefore, according to this selection criterion, would be equally preferable.
- The bulk of the income occurs late in the life of project 1, whereas project 3 returns a steady income throughout its life.
- Having to wait for a return has the disadvantage that the investment must be funded for longer.
- Estimates in the more distant future are less reliable than short-term estimates and we can see that the two projects are not equally preferable.

Year	Project 1	Project 2	Project 3	Project 4
0	–100,000	–1,000,000	–100,000	–120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000
Net profit	50,000	100,000	50,000	75,000

Cost–benefit Evaluation Techniques

Payback Period

- The payback period is the time taken to pay back the initial investment.
- Normally, the project with the shortest payback period will be chosen on the basis that an organization will wish to minimize the time that a project is 'in debt'
- The ***advantage*** of the payback period is that it is simple to calculate.
- Its ***disadvantage*** as a selection technique is that it ignores the overall profitability of the project – in fact, it totally ignores any income (or expenditure) once the project has broken even. Thus the fact that projects 2 and 4 are, overall, more profitable than project 3 is ignored.

Year	Project 1	Project 2	Project 3	Project 4
0	–100,000	–1,000,000	–100,000	–120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000
Net profit	50,000	100,000	50,000	75,000

Cost–benefit Evaluation Techniques

Return on Investment:

- The return on investment (ROI), also known as the accounting rate of return (ARR), provides a way of comparing the net profitability to the investment required.

$$\text{ROI} = \frac{\textit{average annual profit}}{\textit{total investment}} \times 100$$

Cost–benefit Evaluation Techniques

Return on Investment:

Calculating the ROI for project 1, the net profit is £50,000 and the total investment is £100,000. The return on investment is therefore calculated as

$$ROI = \frac{average\ annual\ profit}{total\ investment} \times 100$$

$$= \frac{50,000/5}{100,000} \times 100 = 10\%$$

Year	Project 1	Project 2	Project 3	Project 4
0	–100,000	–1,000,000	–100,000	–120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000
Net profit	50,000	100,000	50,000	75,000

Cost–benefit Evaluation Techniques

Net Present Value:

- The calculation of net present value is a project evaluation technique that takes into account the profitability of a project and the timing of the cash flows that are produced.

- This is based on the view that receiving £100 today is better than having to wait until next year to receive it.

- The present value of £100 in a year's time is £91, we mean that £100 in a year's time is the equivalent of £91 now.

Cost–benefit Evaluation Techniques

Net Present Value:

The present value of any future cash flow may be obtained by applying the following formula.

$$Present\ value = \frac{value\ in\ year\ t}{(1+r)^t}$$

where ***r*** is the discount rate, expressed as a decimal value, and ***t*** is the number of years into the future that the cash flow occurs.

Cost–benefit Evaluation Techniques

Example

Year	Project 1 cash flow (£)	Discount factor @ 10%	Discounted cash flow (£)
0	–100,000	1.0000	–100,000
1	10,000	0.9091	9,091
2	10,000	0.8264	8,264
3	10,000	0.7513	7,513
4	20,000	0.6830	13,660
5	100,000	0.6209	62,090
Net Profit:	£50,000	NPV: £618	

Cost–benefit Evaluation Techniques

Internal rate of return:

One disadvantage of NPV as a measure of profitability is that, although it may be used to compare projects, it might not be directly comparable with earnings from other investments or the costs of borrowing capital. Such costs are usually quoted as a percentage interest rate.

The internal rate of return (IRR) attempts to provide a profitability measure as a percentage return that is directly comparable with interest rates.

A project that showed an estimated IRR of 10% would be worthwhile if the capital could be borrowed for less than 10%.

Cost–benefit Evaluation Techniques

Internal rate of return:

IRR is the actual rate of return from an investing activities.

The IRR is calculated as that percentage discount rate that would produce an NPV of zero.

If IRR > Cost of Capital, project is worthwhile

If IRR = Cost of Capital, project is neutral

If IRR < Cost of Capital, project is not good to invest at.

Example:

IRR is 15% > interest rate of 10% on loan from bank.

Cost–benefit Evaluation Techniques

Year	Value
0	-10000
1	12000

NPV = Future value $_{(0)}$ / $(1+r)^0$ + Future value $_{(1)}$ / $(1+r)^1$.

0= Future value $_{(0)}$ / $(1+r)^0$ + Future value $_{(1)}$ / $(1+r)^1$.

Risk Evaluation

In any project evaluation we should identify the risks and quantify their effects.

One approach is to construct a project risk matrix utilizing a checklist of possible risks and classifying risks according to their relative importance and likelihood.

Risk	Importance	Likelihood
Client rejects proposed look and feel of site	H	—
Competitors undercut prices	H	M
Warehouse unable to deal with increased demand	M	L
Online payment has security problems	M	M
Maintenance costs higher than estimated	L	L
Response times deter purchasers	M	M

Risk and Net Present Value

Where a project is relatively risky it is common practice to use a higher discount rate to calculate net present value.

This risk premium might, for example, be an additional 2% for a reasonably safe project or 5% for a fairly risky one.

Projects may be categorized as high, medium or low risk using a scoring method and risk premiums designated for each category. The premiums, even if arbitrary, provide a consistent method of taking risk into account.

Cost Benefit Analysis

A rather more sophisticated approach to the evaluation of risk is to consider each possible outcome and estimate the probability of its occurring and the corresponding value of the outcome.

Rather than a single cash flow forecast for a project, we will then have a set of cash flow forecasts, each with an associated probability of occurring.

The value of the project is then obtained by summing the cost or benefit for each possible outcome weighted by its corresponding probability.

Cost Benefit Analysis

Example:

BuyRight, a software house, is considering developing a payroll application for use in academic institutions and is currently engaged in a cost–benefit analysis.

Study of the market has shown that, if BuyRight can target it efficiently and no competing products become available, it will obtain a high level of sales generating an annual income of £800,000. It estimates that there is a 1 in 10 chances of this happening.

However, a competitor might launch a competing application before its own launch date and then sales might generate only £100,000 per year. It estimates that there is a 30% chance of this happening.

The most likely outcome, it believes, is somewhere in between these two extremes – it will gain a market lead by launching before any competing product becomes available and achieve an annual income of £650,000.

Cost Benefit Analysis

Sales	Annual sales income (£) i	Probability p	Expected value (£) $i \times p$
High	800,000	0.1	80,000
Medium	650,000	0.6	390,000
Low	100,000	0.3	30,000
Expected Income			500,000

Cost Benefit Analysis

Development costs are estimated at £750,000.

Sales levels are expected to be constant for at least four years.

Annual costs of marketing and product maintenance are estimated at £200,000, irrespective of the market share.

Would you advise going ahead with the project?

Cost Benefit Analysis

Expected sales of £500,000 per year over four years would generate an expected net income of £1.2m (after allowing for annual costs of £200,000), which, by almost any criteria, would provide a good return on an investment of £750,000.

However, if sales are low, and there is a 30% chance of this happening, the company will lose money – it is unlikely that any company would wish to take such a risk knowingly.

Risk Profile Analysis

An approach which attempts to overcome some of the objections to cost–benefit averaging is the construction of risk profiles using sensitivity analysis.

This involves varying each of the parameters that affect the project's cost or benefits to ascertain how sensitive the project's profitability is to each factor.

We might, for example, vary one of our original estimates by plus or minus 5% and recalculate the expected costs and benefits for the project.

Risk Profile Analysis

By repeating this exercise for each of our estimates in turn we can evaluate the sensitivity of the project to each factor.

By studying the results of a sensitivity analysis we can identify those factors that are most important to the success of the project.

We then need to decide whether we can exercise greater control over them or otherwise mitigate their effects. If neither is the case, then we must live with the risk or abandon the project.

Risk Profile Analysis Using Decision Trees

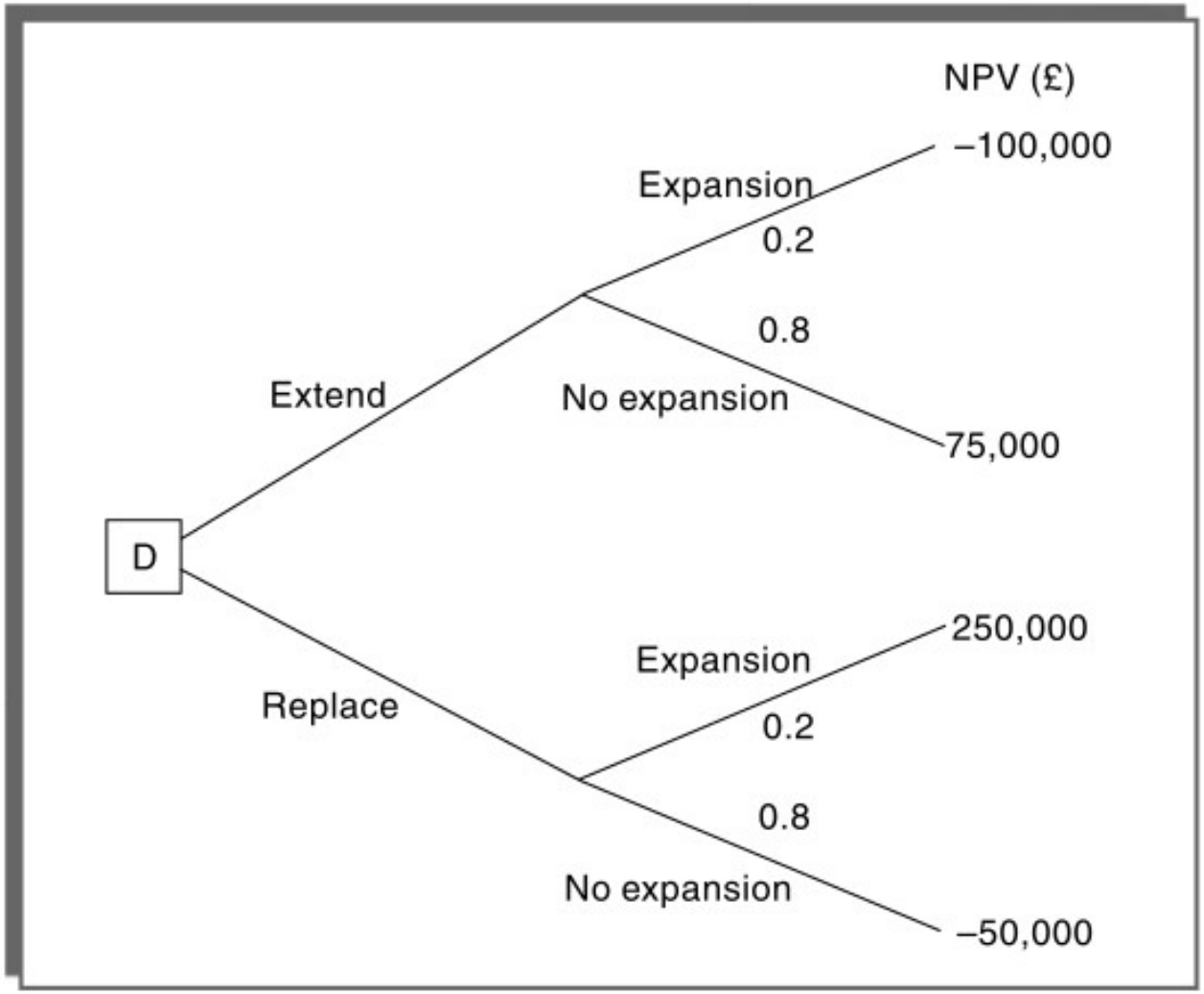
A company “xyz” is considering when to replace its sales order processing system.

The decision largely rests upon the rate at which its business expands – if its market share significantly increases (which it believes will happen if rumours of a competitor’s imminent bankruptcy are fulfilled) the existing system might need to be replaced within two years.

Not replacing the system in time could be an expensive option as it could lead to lost revenue if it cannot cope with increased sales.

Replacing the system immediately will, however, be expensive as it will mean deferring other projects already scheduled.

Risk Profile Analysis Using Decision Trees



Risk Profile Analysis Using Decision Trees

The expected value of each path is the sum of the value of each possible outcome multiplied by its probability of occurrence.

The expected value of extending the system is therefore £40,000 (75,000 * 0.8 – 100,000 * 0.2)

and the expected value of replacing the system £10,000 (250,000 * 0.2 – 50,000 * 0.8).

The company should therefore choose the option of extending the existing system.