B2 Project Finance

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These slides are based on the slides originally developed by Profs Nowell & Howey
Course Objectives

- The course is designed to give a brief introduction to some of the basic concepts of finance as applied in engineering organisations, projects, and teams.
- At the end of the course you should have a basic appreciation of the financial background to engineering decisions, what is required to finance an engineering organisation, and how to appraise the financial implications of investment decisions.
- There will (as the title suggests) be a particular focus on financial considerations in engineering projects, but we will start with a wider overview
  - The course should be seen as complementary to the B2 project management lectures
Learning outcomes

By the end of the lecture course, you should:

1. Understand the **importance of financial considerations** in engineering projects.
2. Understand the **sources of finance** available to organisations and the implications of different financing routes.
3. Be familiar with the basic elements of a **business plan**.
4. Understand the importance of **cash flow**.
5. Understand basic means of reporting financial information, including the depreciation of assets.
6. Be able to **appraise the financial implications of projects** using net present value and internal rate of return approaches.
7. Understand the importance of the **discount rate** used in project financial appraisal and its implications.
8. Understand how to **cost** a project, including both direct and indirect costs.
Course overview

1. Introduction
   - The value of money – inflation
   - Interest

2. Financing organisations
   - Business plans
   - Sources of capital
   - Financial reporting

3. Financing projects and appraising investments
   - Net present value, internal rate of return

4. Pricing products and contracts
   - Direct and indirect costs
   - Relationship between costs and price
   - Competitive tendering
References


Engineers create wealth by producing products and solutions which address real world needs.

They do so by making cost effective use of resources (which are measured in financial terms).

The best engineering solution to a problem meets the specification at least cost — Subject to external constraints.

Ultimately, society will benefit from engineering innovation, but in order for this to happen there must generally be a financial incentive for the innovation to occur.
1. Introduction – Money and engineering

- Money is a convenient measure of resources used in a project or business
  - In some respects it is not a very good measure, but it is often the only one that we have

- Engineering activity cannot take place without resources (people’s time, materials, energy, premises, equipment etc.)

- In general it will be necessary to obtain at least some of the resources by purchasing them using money

- Most engineering activity will therefore require financial resources
  - Somebody (usually the customer) has to be prepared to pay

- In projects, there is almost always a defined project budget (i.e. a limit to the amount of money that can be spent to complete the task).
1.1 The history of money

- Until relatively recently in human history people traded by direct barter
- This trading included metals and people started to find that this was a convenient bartering exchange if there was nothing direct that they required from someone wishing to ‘purchase’ their produce
- Metals were
  - **Valuable** and relatively **scarce** (easily traded again)
  - **Compact** and easy to transport
  - **Not perishable**
- Initially, the value was the inherent value of the metal itself, and it was traded by weight, but it became useful to have a set of standard sizes (marked to indicate their value) - **coins**
People started storing coins in the safekeeping of ‘banks’

These banks issued credit notes or ‘bank notes’ when the deposit was made

It became clear that these had the same value as the coins themselves

In a similar way, the coins themselves became ‘tokens’ rather than having any intrinsic value

Nowadays we are happy to accept ‘electronic’ as well as physical tokens
The origins of inflation

- Banks issuing notes originally had an equivalent amount of **gold** ‘on deposit’
- This ceased to be true, but the value of coins and notes was ‘tied’ to that of gold (The Gold Standard)
- This system **broke down after the First World War**
  - Governments stopped claiming that currencies were convertible into gold
- There was now **no clear limit to how much money could be made available for circulation**
1.2 Inflation

- In engineering we are used to constants or parameters which do not change
  - E.g., the density of copper is 8960 kg/m³
- Unfortunately the same is not true of money
  - E.g. the price of copper will vary
- There are two underlying (related) reasons for this
  - The value of money changes
  - Copper may be come more or less valuable relative to other commodities
- Inflation reflects a deduction in the purchasing power of money
Measuring inflation

- The **real value of money** can only be measured relative to something which has **physical value**
- Because commodities can change in **relative** value against each other, it is common to use a ‘basket’ of goods and services to measure inflation
- Various different measures are in common use (either general or specific)
Some comments on inflation

- Inflation is a bit of a **nuisance** as far as **financial planning** is concerned
  - There may be uncertainty over how fast costs and prices will rise
  - It is therefore difficult to assess the possible outcomes of investment decisions

- As long as inflation is reasonably low and stable, we can take it into account

- Inflation does have some **interesting effects**
  - E.g. it can make borrowers richer and savers poorer
  - The precise effect **depends on the difference between inflation rates and interest rates** *(i.e. real interest rates)*
    - We will return to this later
1.3 Interest

- Hiring something (e.g. a house or car) means paying rent to the owner

- Borrowing money is effectively the same as ‘hiring’ it
  - Borrowing money is useful (e.g. we could buy a house or car with it)

- Therefore, to borrow money, we need to pay a hire charge (‘interest’)
  - This is usually calculated as a proportion of the outstanding loan (e.g. 5% per annum)
A lender (such as a bank) will need to decide on the level of interest to charge on a loan.

The precise level will depend on:
- **Inflation**: The capital will be worth less at the end of the loan period, and the lender will need to protect against this.
- **Risk**: There will be some risk that the borrower will not repay and the lender will need to charge extra to cover this eventuality.
- **Administration**: It will cost money to set up the loan, collect the repayments, etc.
- **Profit**: There’s no real incentive for the lender to lend the money unless he/she will be better off at the end of the loan period.
  - Although it could be argued that, if the money is available, they have to do something to prevent its value being eroded by inflation.

So we will not expect interest rates to be independent of the type of loan (some are more risky than others).

Interest rates will also vary with time due to macroeconomic factors (inflation, money supply, trade balance etc).
‘Base rates’ – set by the Bank of England

These tend to act as a ‘reference point’ for other interest rates (e.g. bank loans, mortgages)

Since the 2008 banking crisis, base rates have been kept deliberately low. A better reference point might therefore be ‘LIBOR’ the inter-bank lending rate

Available interest rates tend to be much higher than base rates – reflecting lender’s risk and administration charges
Money - summary

- Money is a measure of value
  - Because of inflation it is not a fixed measure
- Borrowing money generally entails paying interest
- Interest rates are set to take account of *inflation*, *risk*, *admin* costs, and lender’s *profit*
- Interest rates will be higher if there is a higher amount of *risk*
- It may be rather difficult to borrow if there is a significant amount of *risk*
  - Sometimes putting up *security* for the loan can reduce the risk to the lender (e.g. borrowing against assets)