

ENGR 310

Lecture 22

14 April 2008



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Announcements

- Assignment 7 due this week
- Journal check the week
- Exams nearly graded



**“Every engineering decision
is a business decision.”**

- Jean Sweeney,
VP, 3M Corp.



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Engineering and Economics are inextricably linked

- Can the user afford to buy it?
- Can the builder afford to make it?
- Can the client afford the product?

- Engineering is supposed to benefit society
 - by increasing our well-being
 - by fueling the economic engine



“Engineering is the art of doing that well with one dollar than any bungler can do with two.”

- Arthur Wellington



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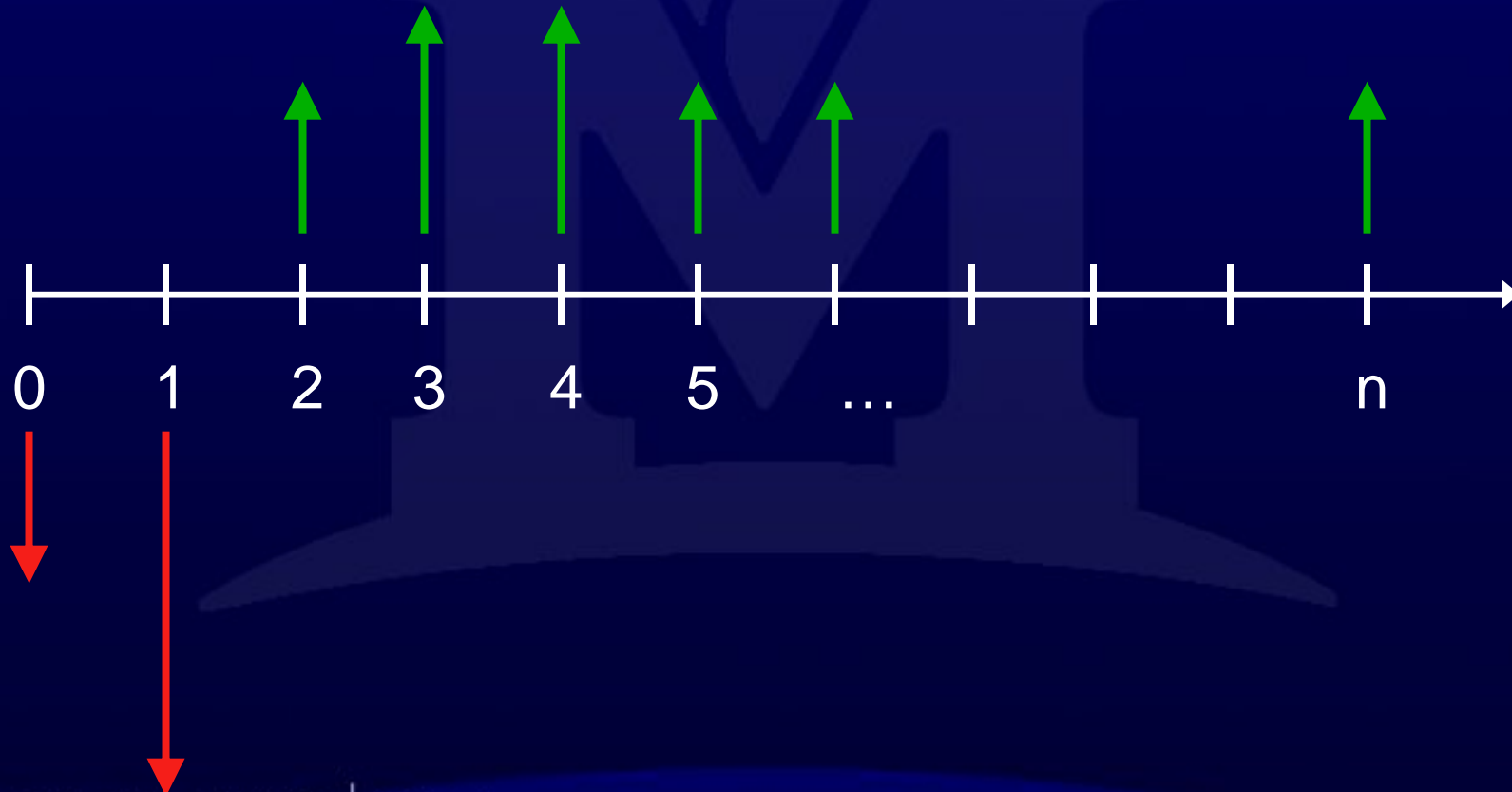
Key Economic Concepts

- Fixed versus variable costs
- Time value of money
- Cost estimation
- Costing versus pricing



Invest now for future benefit

Most engineering projects have upfront costs with expected later benefits.



Fixed Costs

- Costs not proportional to amount of product made. Examples:
 - facilities construction
 - purchased equipment
 - equipment installation
 - engineering costs
 - working capital



Variable costs

- Costs that are proportional to amount of product made. Examples:
 - raw materials / purchased components
 - direct labor
 - maintenance
 - utilities



Overhead costs

- Costs not attributable to a specific product or project. Examples:
 - administrative costs
 - janitorial services



Exercise

In your teams:

- Make a list of the fixed costs of your designed system
- Make a list of the variable costs.
- Project out to full implementation / market introduction



Time Value of Money

- A dollar today is worth more than a dollar tomorrow.
- \$100 a year from now is worth \$91 today, at 10% discount rate.
 - to compensate for **opportunity cost**
- Therefore, we must account for:
 - Amount of expense, and
 - Timing of the expense



Basic Economic Analysis Equation

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

where:

- F = future value
- P = present value
- i = discount rate per time period
- n = number of time periods



Alternatively

$$P = F (1 + i)^{-n}$$

Simply discount all future cash flows to present value, and sum.

If comparing alternatives, projected usable life must be the same.



Return on Investment

- Interest rate at which benefits = costs



Exercise

For your project, create a timeline of projected expenses for implementation / market introduction

Label the cash flows (don't worry about values for now).



Estimating Costs

- Bill of Materials
 - specifies all the parts for the system
 - quantities
 - hierarchical by subsystems
- Labor
 - direct
 - indirect
- Overhead



Estimating costs, cont.

- Economies of scale
- Rules of thumb
 - discipline specific
 - e.g., cost per pound or cost per ft²



Costing versus Pricing

- Pricing is determined more by market value than product cost.
- Profit = Revenue - cost



Exercise

- With your team, plan out what information you need to gather to complete a cost analysis of your project
- Note: a cost analysis is required in the final notebook submission.

