Cost Analysis and Estimating
for Engineering and Management

Chapter 1
Importance

Pearson Prentice Hall, Pearson Education, Upper Saddle River, NJ 07458
Ostwald and McLaren / *Cost Analysis and Estimating for Engineering and Management*

Overview

- The Design Process
- Economic Evaluations
  - Users
  - Results
  - Reasons
- Business Strategies
- Information
- International Business

Reasons for Study

- The Goal of Business Is to Make Money
- Desire to Know Outcome Before Making a Commitment
- Need for Cost and Price Estimates

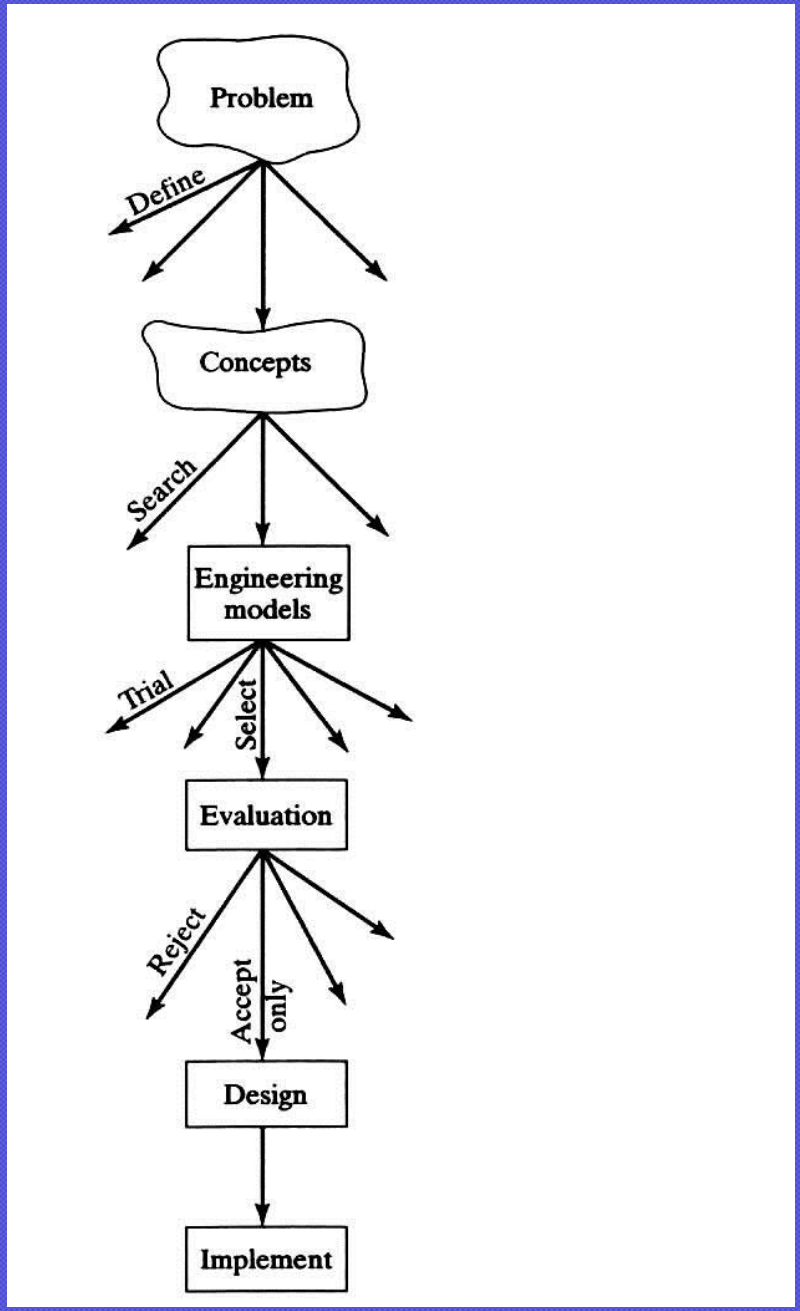
Design

- Every Design Is a *New Combination* of *Pre-Existing Knowledge* that Satisfies an *Economic Want*
  - –New Combination – Creativity
  - –Economic Want – Driver

Elements of Design

- Identification and Definition of Problem
- Development of Concepts
- Engineering Models
- Evaluation
- Design
- Implementation

Engineering Design Process



Problem

- Recognize a Need
  - –Economic Want
- Good Description = Good Solution
- Detailed Specification of Requirements

Concept

- New Combinations of Existing Knowledge
- Need to Collect a Lot of Knowledge
  - Relative to the Problem
- Unrestricted Generation of Concepts
- Then Select and Refine

Engineering Models

- Representation to Explain an Aspect
- Prediction
- Discover Pertinent Parameters
- Flexibility
- Simplistic

Evaluation

- Compromise
- Iterative Process with Modeling
- Satisfies Requirements?
- Cost
- Profit
- Fit with Capabilities

Sources of Cost

- Largely Determined by Design
- 50% Purchased Material / Parts
- 30% Overhead
- 15% Factory Labor

Design

- Addresses All Requirements through
  - Computing
  - Drafting
  - Checking
- Answers
  - What It Looks Like
  - How Shall It Be Built
  - How Will It Work

Implementation

- Requires a Decision to Proceed
- Must Be Assured:
  - It Satisfies All Requirements
  - It Will Yield a Profit
- Needs an Economic Evaluation

Economic Evaluation

- Market Defines “Economic Want”
- Cost Needs to Satisfy
- Cost Model Should Parallel the Design
- Detail and Accuracy of Estimate
  - –Depends on Amount of Info Available
  - –Depends on the Time for the Estimate

Users

- Economic Evaluation Produces:
  - –Dollar Estimates
  - –Labor Hour Estimates
  - –Material Requirements
- Used By:
  - –Engineering
  - –Manufacturing
  - –Marketing
  - –Materials Mgmt.
  - –Accounting/Financial Planning

Results from Economic Evaluation

- Requires Answers to 2 Questions
  - "What Does It Look Like?"
  - "How Many?"
- Selects from Design Alternatives
- Determines Manufacturing Methods
- Decisions to Proceed

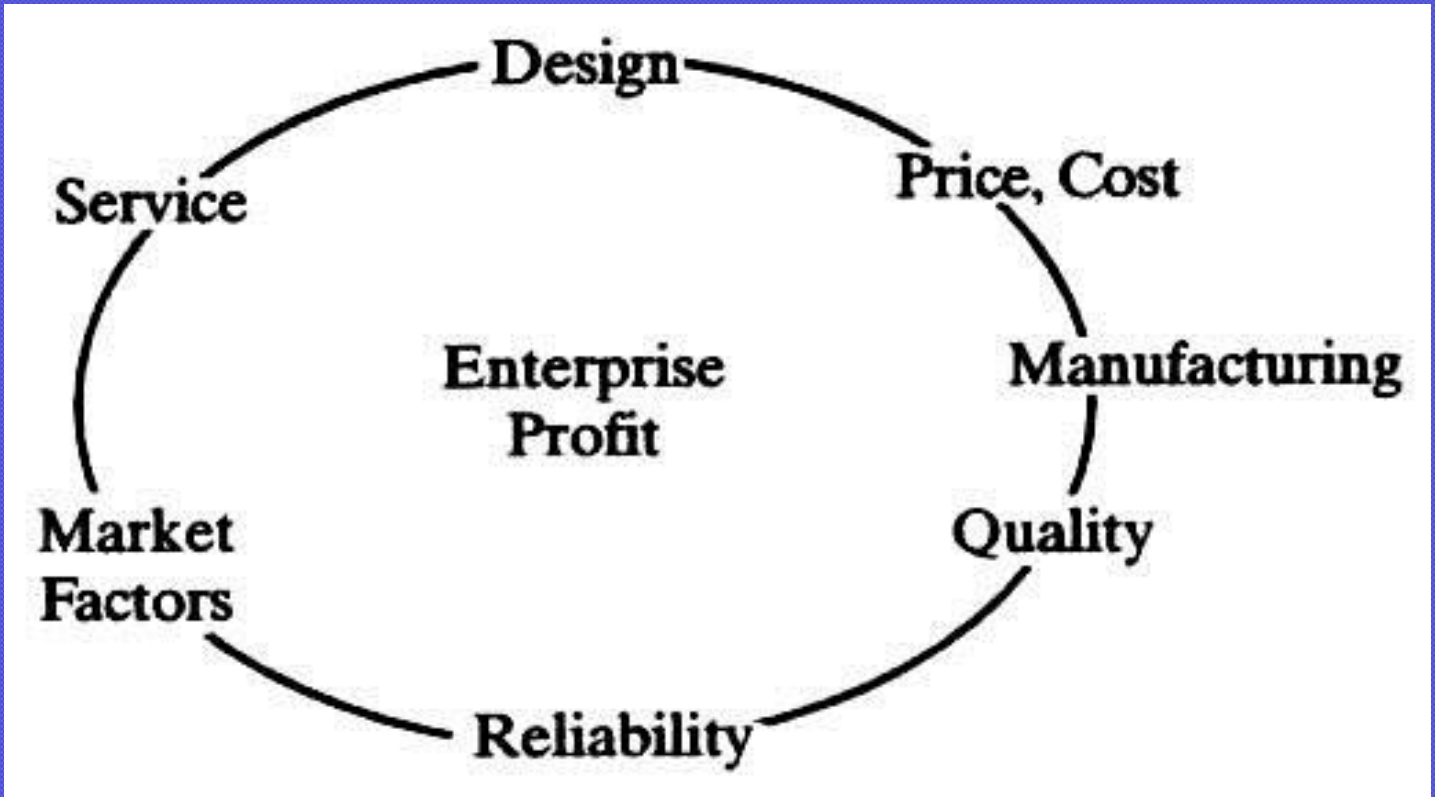
Other Reasons

- Cost to Manufacture
- Profit Prediction
- Labor Requirements
- Time (Scheduling)
- Control of Operations
- Improvement
- Budgets
- Equipment Justification

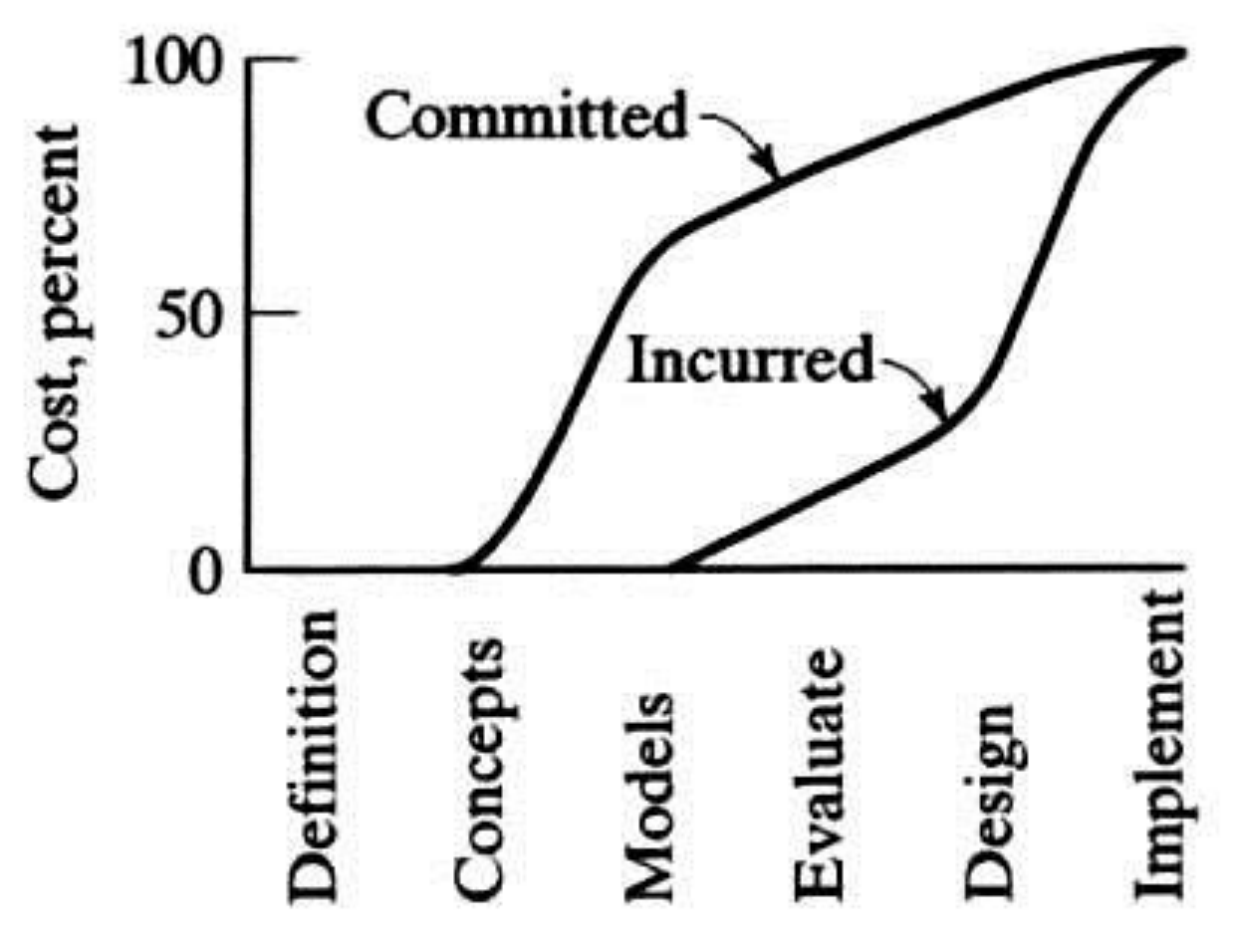
Strategies

- Mass Production
  - –Large Quantities / Little Variation
- Batch Production
  - –Smaller Quantities / Large Variation
  - –Similar Processes
- Projects
  - –Very Small Quantities / Specialized

Strategies



What Determines Cost and When



Modes of Competition

- Design Uniqueness or Superiority
- Price and Cost
- Quality
- Reliability
- Innovation / First to Market
- Customer Support
- Custom Design / Manufacturing
- Commodity Products

Business Classification

- Traditional

Established Products

Slow Evolution

Incremental Changes

History of Costs

- High-Tech

Rapid Changes

Short Cost Recovery Period

Fast Time to Market

Flexibility

Concurrent Engineering

Challenging Cost Analysis

Information

- Available Information Varies
  - –By Point in the Development
  - –Amount of Uniqueness of Product
- Historical Data (Accounting Records)
- Measured Data
- Policy Data

Sources of Information

- Accounting
- Personnel Department
- Operating Departments
- Purchasing
- Sales/Marketing
- Supervisors/Managers
- Trade Associations / Media

About the Estimate

- Amount of Information Available
- Time Allotted to Make the Estimate
- Overall Size (Amount) of the Estimate
- Intended Use for the Estimate
- All Impact the Quality and Accuracy of the Estimate

International Business

- Global Economy
  - –Competitors
  - –Markets
- Measurements in SI Units
- Monetary Transactions in Multiple Currencies

Currency Exchange

- Exchange Rates
  - –Conversion Factors
  - –Constantly Varying
- Spot and Future Rates
- Rates Obtained from:
  - –Banks, Newspapers, Internet

Effects of Exchange Rates

- Strong Dollar

Import Goods Cost Less

Export Goods Cost More – Lose to Foreign Competition

Requires Price Cuts

- Weak Dollar

Expensive Imports

Exports Are More Competitive

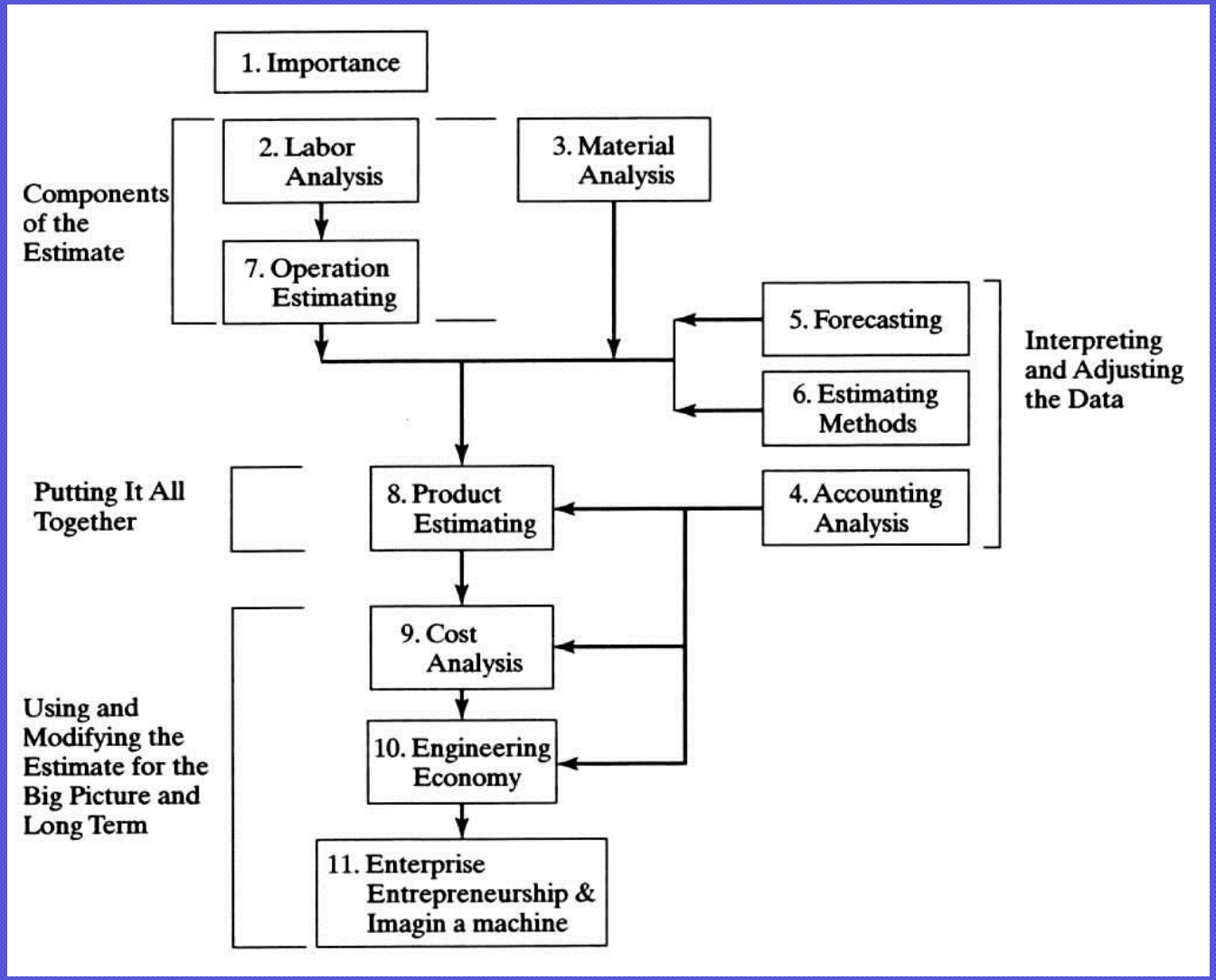
Higher Trade and Budget Deficits

Overall – Worse for the U.S. Economy

Significant Digits

- Addition and Subtraction
  - –Round to 1 Significant Digit to the Right of the Number with the Least Significant Digits
- Multiplication and Division
  - –No More Significant Digits than the Number with the Least Significant Digits

Layout of the Book



The Book

- Chapter 1 – Introduction
- Chapter 2 – Labor Calculations
- Chapter 3 – Material Calculations
- Chapter 4 – Accounting Practice
- Chapter 5 – Statistics and Indexing for Forecasting

The Book

- Chapter 6 – Estimating Methods
- Chapter 7 – Operation Estimating
- Chapter 8 – Product Estimating
- Chapter 9 – Cost Analysis
- Chapter 10 – Engineering Economy
- Chapter 11 – Enterprise and Entrepreneurship

Summary

- How the Design Process Works
- Where Economic Analyses Fit
- How Businesses Are Organized and Compete
- The Role of Information
- Global Aspects