Complementary Directed Reading Projects:

1. Define the topic you'd like to study and email me a brief memo. I can either provide readings then or we can discuss it further by appointment.

2. Sign up for a directed reading course at your level (UG or Grad) in EE or CS. Use my Directed course Section Id, either 17(CS) and 65(EE). The number of units should be about the (number of hours/week you plan on) / 4.


4. Topics later today. Pointers to references: see main WikiPage.
1. Why should software be valued?
2. Open source software. Scope. Theory and reality
4. Market value of software companies.
5. Intellectual capital and property (IP).
6. The role of patents, copyrights, and trade secrets.
7. Life and lag of software innovation.
8. Sales expectations and discounting.
10. Risks when outsourcing and offshoring development.
11. Licensing.
12. Separation of use rights from the property itself.
13. Effects of using taxhavens to house IP.
Review: Knowing what software is worth

• Allows rational design decisions, as
  ▪ Allocating development efforts
  ▪ Programming investment for long-lived SW
  ▪ Understand limit to Software Life

• Allows rational business decisions, as
  ▪ Choice of business model
  ▪ Where and when to invest
  ▪ How to assign programming talent

• Improve focus of education in software
  ▪ Consider quality, not just quantity in assignments
  ▪ Effectiveness of curriculum
Economic Loop again
Value

Profit margins are the excess left after CoGS [Cost of Goods Sold] and business costs (SG&A, capital cost, tax) are deducted.

Conclusion from last week

- If goods are sold based on their manufacturing cost, there is no accounting for the value added due to their uniqueness.
- If anyone can compete profit margins will be modest.

- Uniqueness has value because it raises profit margins
- Uniqueness in software in not a tangible

9/13/2012
### Income Allocation

Sales revenue = units sold \( \times \) unit price

<table>
<thead>
<tr>
<th></th>
<th>Gadget</th>
<th>Software</th>
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<tr>
<td>525M</td>
<td>140%</td>
<td>162%</td>
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<td>375M</td>
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<td>284M</td>
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<tr>
<td>100M</td>
<td>27%</td>
<td>31%</td>
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**Product revenue**

**Gross income**

**Operating income**

**Net income**

**Profit**

**Examples**

- **Income allocation**
  - Sales revenue
  - Product revenue
  - Operating income
  - Net income
  - Profit

- **Cost of Goods Sold (CoGS)**
- **Selling, General & Administrative (SG&A)**
- **Research & Development (R&D)**
- **Taxes**
- **Earnings**
Quick definitions: Intangibles

In a business there are 3 parts that have value (Contribute to potential income)

1. **Tangible goods**: buildings, computers, working capital
2. The **know-how** of management & employees
3. **Intellectual property**: Software, designs, methods, etc.

• 2. + 3. make up the **Intangible Capital** of a company.

• Software is an intangible good

  If it is *owned* then it is **Intangible Property**
Intangibles

• Product of knowledge

Cost of original >> cost of copies

1. Books by authors
2. Software by programmers
3. Inventions by engineers
4. Trademarks by advertisers
5. Knowhow by managers
6. Customer Loyalty

➢ Interacts with long-term quality
Ownership

Claimed via
3. Patents
2. Copyright
1. Trade secret

More on those issues another day
Approaches to assess IP

• Technical alternatives
  1. Income Prediction
     Based on expected sales, life, lag
  2. R&D roll-over
     Based on life and effectiveness of R&D

• Broader alternative approaches
  3. Market capitalization (Market Cap)
     Covers everything the shareholders value
  4. Comparisons with another existing businesses
     With other companies based on industry, operational similarity and then check their performance based on ratios royalties gathered, costs/earnings (price/earnings needs market cap)
Fraction of intangibles

• Principle
  The sum of all future income
discounted to today (NPV)
*Implicitly estimated by shareholders through the market cap*

Example: Market Cap value of a company *(SAP, 2005)*

- Largely intangible – like many modern enterprises
  1. Market cap = share price × no. of shares  €31.5B  100%
  2. Bookvalue = sum of all tangible assets  €6.3B  20%
     Equipment, buildings, cash
  3. Intangible value per stock market  €25.2B  80%

Intangible/tangible = 4 ×

- How much of it is software at SAP?
Basis for SW value as of today

- Sum of future income
  - Sales = price x copy count
  - Maintenance fees if service subscription

- Minus sum of future costs
  - Cost of goods sold
  - Cost of marketing
  - Cost of doing business
  - Cost of maintenance

- Discounted to today
  - To account for value of money and risk
Discounting

• Standard economic accounting principle

Getting $1 next year is less valuable than getting $1 today.

1. If no risk of getting it later, discount by available interest rate
   • Say 4%, 1-year off is $0.96, 5-year is $0.855, 15 year only $0.542
   • Formally, use Federal bonds rates for that period

2. If there is a risk - likely in business – use risk experience
   • Say 15%+4%: 1-year is $0.81, 5-year is $0.349, 15 year only $0.042
   • Tables per industry are available (at a price), based on past experience

Discounting has a large effect on income estimates

Makes looking into the future less risky
Market cap: only a hint

Issues

• Stockholders don’t know what is really going on
  ➢ Wisdom of the masses?
  ➢ Are fed limited information
  ➢ Indirect indicators are delayed: sales by principals

• Market cap is unreliable due to high variability
  ➢ Market bubbles mislead
  ➢ Option values are hard to judge

• In a multi-product company
  ➢ Allocate income to each product line

Over time, many factors should even out
For that hint: Adjust market cap

Deal with the argument: “Market cap is due to bubble!”
A better, direct approach

• Value the software specifically by income over its lifetime

• But software is not stable over time: *Slithery*
  - Getting long-term income requires maintenance
  - Maintenance enables long-term income

• Much more so than other intangibles
  - Books, music,

• Similar to some intangibles that contribute to life
  - Costumer loyalty, trademarks
Maintenance is beneficial

Lifetime maintenance cost = 1 / lifetime

Maintenance is beneficial

Depreciation

- PCs: 33/y. linear
- cars: 20%/y. linear
- software: 8%/y. linear
- intangibles: 12% geometric

Maintenance

- PCs: 2%/year
- cars: 5%/year
- software: 15%/year
- intangibles: most over asset life

Maintenance cost

- PCs: 6%
- cars: 21%
- software: 40%
- intangibles: 80%

Typical Life

- PCs: 3 years
- cars: 5 years
- software: 12 years
- intangibles: 18 years

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Continuously updated

1. Corrective maintenance
   *bugfixing reduces for good SW*

2. Adaptive maintenance
   *externally mandated*

3. Perfective maintenance
   *satisfy customers' growing expectations*

[IEEE definitions]
Topics for paper

• Something your are interested in / wondering about
• Value in Apple
• Value in Microsoft
• Value in Google
• Value in Facebook
• Value in a company you plan to start
• Value of education when starting a company
• Company failures -- real or potential (HP)
• Accounting for intangibles
• 9% income + 9% corp.+ 9% sales tax [Cain]
Next Class

• Cost of maintenance
  resources needed
• Combine it with income
  ▪ Estimate sales
• Subtract costs
  ▪ Sales etc
• Discount it all
  ▪ life if well-maintained
• Estimate current value