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.

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 tax havens 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

Public & Private Investments → Common Knowledge → Intellectual Capital

Know How of the workforce → IP: Intellectual Property

Integration → Technology → Trademarks → High-value Products

Commodity Products

Taxes → non-routine profits → routine profits → Taxes
Value

Profit margins are the excess left after \textit{CoGS} [Cost of Goods Sold] 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 is not a tangible
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* it is considered **Intangible Property**
Intangibles

- Product of knowledge

Cost of original >> cost of copies

1. Books
2. Software
3. Inventions
4. Trademarks
5. Knowhow
6. Customer Loyalty

by

authors
programmers
engineers
advertisers
managers
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 spill-over
   Based on life and effectiveness of R&D

Broader alternative approaches

3. Market capitalization (Market Cap)
   Covers everything the shareholders value

4. Real opportunity options (included in market cap?)
   Increase value of IP for uncertain income
   can expand market if > expected, cancel if < expected
Fraction of intangibles

• Principle
  The sum of all future income discounted to today (NPV)
  Implicitly estimated by shareholders by 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 x

  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

Independent of cost
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
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 & new 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
  - Customer loyalty, trademarks
Maintenance is beneficial

Lifetime maintenance cost

Depreciation / year = 1 / lifetime

Maintenance cost

Maintenance cost

Depreciation

Typical Life

Maintenance

Maintenance cost

Depreciation

PCs

cars

software

intangibles

3 years

5 years

12 years

18 years

2% / year

5% / year

15% / year

most

over asset life

6%

21%

80%

13.75% / year

Depreciation

33 / y. linear

20% / y. linear

8% / y. linear

12% geometric

10/2/2010

CS207 Fall 2010
Software is slithery!

Continuously updated

1. Corrective maintenance
   *bugfixing reduces for good SW*

2. Adaptive maintenance
   *externally mandated*

3. Perfective maintenance
   *satisfy customers' growing expectations*

[IEEE definitions]

Ratios differ in various settings

Life time

- 100%
- 80%
- 60%
- 40%
- 20%
Next Class

• Cost of maintenance
  ▪ Fighting the projector - Didn’t finish hat was planned resources needed

• Combine it with income