Sign-ups start

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For more credit: complementary Directed Reading Projects:
1. This quarter or winter: 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
Syllabus:
The order and coverage is flexible

1. Why should software be valued? Cost versus value.
4. Income from Sales and Service
7. Sales expectations and discounting of future income.
8. Legal & forensics
9. The role of patents, copyrights, and trade secrets.
10. Life and lag of software innovation.
11. How to grow a software company: organic or by acquisitions
12. Open source software; theory and reality. Freemium.
13. Separation of use rights from the property itself.
15. Role of Government
16. Risks when outsourcing and offshoring development.
17. 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

Public & Private Investments

Common Knowledge

Intellectual Capital

Know How of the workforce

IP: Intellectual Property

Integration

Trademarks

Technology

High-value Products

Commodity Products

Taxes

routine profits

non-routine profits

Taxes
Value again

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 creation 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 (etc.) is not a tangible.
Intangibles

1. The **know-how** of management & employees: experience with the product and predecessors

2. **Intellectual property**: Software, distribution methods, designs, development methods, trademarks, etc.

   • 1 & 2 make up the **Intangible Capital** of a company.

   • Software is an intangible good

     If it is *owned* then it is **Intangible Property**
Intellectual Capital

Public & Private

Intellectual Resources

Intellectual Capital
Rights owned by the business

Intellectual Assets
Available for transfer

Intellectual Property
Legally protectable

- Patents
- Copyrights
- Trade secrets
- Trade marks
- Contracts covering intellectual capital

Broader Concept

Intellectual Capital
• 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)
Basis for SW value as of today

• Sum of future income
  ▪ Sales = price \times 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

Discounted to today
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 $0.962, 5-year is $0.822, 15 year only $0.555
   ▪ 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 $0.84, 5-year is $0.42, 15 year only $0.074
   ▪ Tables per industry are available (at a price), based on past experience

Discounting has a large effect on income estimates and 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 crowd?
  ➢ Are fed limited information
  ➢ Indirect indicators are delayed: sales by principals
• Market cap is unreliable due to high variability
  ➢ Market bubbles mislead \( \text{Facebook lemmings} \)
  ➢ Option values are hard to judge \( \text{startups 30\% of stock} \)
• In a multi-product company
  ➢ Allocate income to each product line

Over time, many factors should even out \( \text{Never ignore it if available} \)
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 expected 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

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

Maintenance cost
- PCs: 6%
- cars: 5%
- software: 15%
- intangibles: most over asset life

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

Maintenance
- PCs: 2%/year
- cars: 5%/year
- software: 15%/year
- intangibles: 13.75%/year

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Topics for paper

Something your are interested in / wondering about

• Value in very recent companies: Ali Baba, Twitter
• Value in very recent acquisitions:
• Value in Google offer for Facebook, Yahoo & Bookpad, ...
• Value in SW producers: Microsoft, Oracle
• Value in gadget makers: Apple,
• Value in a company you plan to start
• Value of education when starting a company
• Company problems -- real or potential (Sun, Yahoo, HP)
• Accounting for intangibles in 10-K, annual reports
• Current tax proposals  \( \downarrow \text{tax, } \uparrow \text{investment, } \uparrow \text{income, } \uparrow \text{tax} \)
Send me an email with the Title of your topic by next week’s class, Oct 10: gio@cs.Stanford.edu.

If you need references, look in i.Stanford.edu/VIC/allVICcitations.pdf and relevant publications. If that fails you can email me.
Current sources there is a wide variety

Newspapers, business & tech. society (ACM, IEEE) magazines, blogs, books

- Peter Thiel: “Corporate Executives Are Out of Ideas for Reinvesting”; *New York Times*, 14 Sep. 2014. He is the Chairman of Paypal
- Jay Flatley: The Gene factory; *New Yorker Magazine*; 6 Jan 2014.
- Steve Denning: Clayton Christensen: Do We Need A Revolution In Management?; *Forbes*, 26 May 2014. Outsourcing, Apple Foxconn, and TSMC.
- Mike Willoughby: Are you making the most of your engineering talent?; *The Engineer*, IEEE, Feb. 2014.
- Matthew Chapman: Marks&Spencer £150M website launch ends Amazon partnership; *Marketing Magazine*, 18 Feb. 2014.
- Christof Ernst et al. : Corporate taxation and the quality of R&D; *Journal of International Taxation and Public Finance*, Springer, 4 May 2014.
Recent in HBR
Recommended by Denning in Forbes

- Clayton Christensen and Derek van Bever in *Harvard Business Review* (HBR) In June 2014: “The orthodoxies governing finance are so entrenched that we almost need a modern-day Martin Luther to articulate the need for change.”
- Also in *June 2014 HBR*, Gautam Mukunda in “The Price of Wall Street Power” points out “excessive financialization” of the economy and the “unbalanced power” of the financial sector over management mindsets. Executives are “making choices they know are wrong.”
- In the *September 2014 HBR*, “Profits Without Prosperity,” by William Lazonick, professor of economics at the University of Massachusetts Lowell, pointed out the massive scale and impact of share buybacks.
- In the *October 2014 HBR*, Roger Martin’s classic article, “The Rise and (Likely) Fall of the Talent Economy”, states: “The move from building value to trading value is bad for economic growth and performance. The increased stock market volatility is bad for retirement accounts and pension funds... talent is being channeled into unproductive activities and egregious behaviors.”
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
• Corrective maintenance
  ➢ Feedback through error reporting mechanisms
    ▪ Taking care of bugs and missed cases, conditions
    ▪ Complete inadequate tables and dimensions

• Adaptive maintenance
  ➢ Staff to monitor externally imposed changes
    ▪ Compliance with new standards
    ▪ Technological advances
    ▪ Keeping with viruses, spam etc.
    Effort depends on number & volatility of external interfaces

• Perfective maintenance
  ➢ Feedback through sales & marketing staff
    ▪ Minor features that cannot be charged for