Software Economics:
How Do the Results of Intellectual Efforts Enter the Global Market Place
SSTiC 2013, Tarragona, 22-26 July 2013.

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http://infolab.stanford.edu/people/gio.html
1. Background & Definitions
2. Why should software be valued?
4. Market value of software companies.
5. Intellectual capital and intellectual property (IP).
7. Methods based on assessing life of software
8. Sales expectations and discounting.
9. Putting it all together in a simple business model.
1. Alternate business models.
2. Service models
3. Open source software
4. Freemium
5. Allocation among IP contributions
6. Estimating development efforts
7. The role of patents, copyrights, and trade secrets.
8. Advertising.
1. Licensing and Royalties
2. Separation of IP rights from the property itself.
3. Outsourcing and offshoring development. IP flow.
4. Effects of using taxhavens to house IP rights.
5. Changing taxation.
6. Summary
Background

Two aspects to Software Economics

1. Minimizing the cost of building effective SW
   Much literature exists, taught as part of SW engineering
   Factors
   1. Well educated scientists → you
   2. Good languages → expressive and constraining

And when the work is done

2. Predicting & maximizing the benefits of the SW

the topic of this course
1. Software producers traditionally care about
   - Cost of writing software
   - Time to complete products
   - Capabilities

2. When the value is a concern
   - Business people
   - Economists
   - Lawyers
   - Promoters

   inconsistent
What is the problem?

Say you create some great software and then ship it on a CD to a company that sells software.

• Let’s assume they get the exclusive right to the SW. What should the selling company pay you?

1. The cost of the CD and mailing it? about €10.-?
2. The amount it cost you to write the SW:
   
   5 months at €10,000/month = €50,000.-?

3. Half of their sales that year (~50% is their cost of selling):

   50% of 10,000 copies at €49.99 = €250,000.-?

4. 50% of their €2M lifetime sales = €1,000,000.-?

• How does what you get affect your obligations?
Why is value a Concern

• Making decisions about creative tradeoffs
  ➢ Elegance versus functionality
  ➢ Rapid generation versus maintainability
  ➢ Careful specification versus flexibility

• Dealing with customers
  Dijkstra model: for self-satisfaction
  Engineering model: formal process driven
  Startup model: see if it sticks to the wall

• Gain respect: know what you are doing
Computer Science vs. other professions

• **Architects of buildings**
  
  Know if they are designing public housing or a castle
  
  That helps specify the type of furnishing and fixtures: *zinc / nickel*

• **Car Designers**
  
  Produce \( \sim 1M/\text{year} \) or \( \sim 1K/\text{year} \)
  
  Know if they are designing a people’s car or a Siddeley
  
  That helps specify the level of sound insulation and parts’ life time

• **Software scientists and engineers**
  
  Don’t consider if the software will be widely used,
  
  *Bugs, when encountered by many customers, are costly*
  
  May spend much time refining software that will be used rarely
  
  *Not taught, no textbook*
Value depends on use

When the value is a concern

- Business people
  - Income from sales or businesses improvements
  - Price or license determination
- Economists
  - Effects on national productivity
    To an economist, reality is a special case, and usually the least interesting [Kenneth Arrow]
- Lawyers
  - Settlement of disputes and infringements
- Promoters
  - Motivating investments

Where is the scientist?
What’s left to value?

- Common software that is sold or licensed
- Software that enables Internet Services
- Software that is written inside companies to improve their business
- Software purchased from vendors by companies to improve their business
- Software purchased from vendors by government to improve its operations
  - Military, Social Security, IRS, Healthcare, . . .
Economic Loop

Public & Private Investments

Common Knowledge

Intellectual Capital

Know How of the workforce

IP: Intellectual Property

Integration

Trademarks

Technology

Commodity Products

High-value Products

Taxes

routine profits

Taxes

non-routine profits
Sales = units sold x unit price

<table>
<thead>
<tr>
<th>SW company revenue</th>
<th>Operating Income</th>
<th>Net Income</th>
<th>Capital Cost</th>
<th>Earnings</th>
<th>Profit</th>
</tr>
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<tbody>
<tr>
<td>Gross</td>
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<td>Production cost</td>
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<tr>
<td>Admin. overhead</td>
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<tr>
<td>Research</td>
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<tr>
<td>COGS</td>
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</tr>
<tr>
<td>Distributor markup</td>
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Accounting simplified
<table>
<thead>
<tr>
<th>Assets</th>
<th>MNC</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant</td>
<td>Factories in the US and Malaysia</td>
<td>40M</td>
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<tr>
<td>Property</td>
<td>Land in Malaysia. Unsold inventory</td>
<td>30M</td>
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<tr>
<td>Equipment</td>
<td>Manufacturing tools &amp; Office equipment</td>
<td>50M</td>
</tr>
<tr>
<td>Cash &amp; equivalent</td>
<td>Bank, notes, receivables due</td>
<td>100M</td>
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</tbody>
</table>

| subtotal               | tangible assets                             | 220M  |
| Capitaliz’d R&D        | Mainly from acquisitions                    | 90M   |
| Goodwill               | Left from the $300M initial acquisitions after write offs | 140M  |

<table>
<thead>
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<th>Liabilities</th>
<th>MNC</th>
<th>$</th>
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</thead>
<tbody>
<tr>
<td>Mortgages</td>
<td>Factories and land in the US &amp; offshore</td>
<td>35M</td>
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<tr>
<td>Rents on leases due</td>
<td>US land, offices all over the world</td>
<td>15M</td>
</tr>
<tr>
<td>Obligations to employees</td>
<td>Retirement, health care &amp; employment contracts</td>
<td>11M</td>
</tr>
<tr>
<td>Debts and interest due</td>
<td>Loans for acquisitions &amp; to start subsidiaries</td>
<td>50M</td>
</tr>
<tr>
<td>Reserve for taxes due</td>
<td>Accumulated each quarter before paid</td>
<td>9M</td>
</tr>
</tbody>
</table>

| subtotal               | tangible liabilities                        | 120M  |
| Shareholders’ equity   | $100M in excess tangible assets plus $230M in intangibles. | 330M  |

| total                  | book assets                                  | 450M  |
| total                  | book liabilities                             | 450M  |
### Income Example

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

#### Corporate revenue

**Gross income**

- **Operating income**:
  - **Net income**
    - **Earnings**
      - **Profit**

#### Company Examples

<table>
<thead>
<tr>
<th>Model</th>
<th>Actual</th>
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<tbody>
<tr>
<td><strong>MNC</strong></td>
<td><strong>ForestLabs</strong></td>
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<tr>
<td>Gadgets</td>
<td>Pharma</td>
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<tr>
<td>525M</td>
<td>$99/unit, 140%</td>
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<tr>
<td>375M</td>
<td>$76/unit, 100%</td>
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<td>284M</td>
<td>$56/unit, 76%</td>
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<td>250M</td>
<td>$45/unit, 67%</td>
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<tr>
<td>164M</td>
<td>$40/unit, 44%</td>
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<tr>
<td>154M</td>
<td>$35/unit, 41%</td>
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<tr>
<td>100M</td>
<td>$33/unit, 27%</td>
</tr>
<tr>
<td>50M</td>
<td>100%</td>
</tr>
<tr>
<td>250M</td>
<td>50%</td>
</tr>
<tr>
<td>150M</td>
<td>33%</td>
</tr>
<tr>
<td>100M</td>
<td>25%</td>
</tr>
<tr>
<td>50M</td>
<td>12.5%</td>
</tr>
<tr>
<td>25M</td>
<td>5%</td>
</tr>
<tr>
<td>10M</td>
<td>2%</td>
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<tr>
<td>5M</td>
<td>1%</td>
</tr>
<tr>
<td>5M</td>
<td>1%</td>
</tr>
<tr>
<td>1M</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

#### After Part

- **Distributor markup**
- **Production cost**
- **Business overhead**
- **Research**
- **Capital cost**
- **Taxes**
- **Profit**

#### CoGS

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

Cost +

➢ 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
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, trademarks, 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**
  
  or **Intellectual Property**

  *similar – distinction is metric*
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 in Part 2
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
ongoing IP sources

• 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
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
     Find 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 $\times$ 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%

  - How much of it is software at SAP?
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...Facebook lemmings
  - Option values are hard to judge...startups 30% of stock

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

Over time, many factors should even out

Never ignore the market capitalization if available
To hide a bubble
Adjust market cap

Deal with the argument:
“Market cap is due to bubble!”
Expense Rollover
A valuation based on cost

1. Collect the expenses $e_i$ over the total lag period $p$
2. Adjust the expenses by a discount rate $d$, $a_i = (1+d)^{p-i}$
3. For year $i = 1 \rightarrow p$ estimate the R&D retained $r_i = 1 - 1/p$
4. Aggregate retained to the end date, $R = \sum r_i \times e_i \times a_i$
5. From experience, publications obtain an expected expense to income margin $m$; $m$ can range from 1 to 20 ...
6. Expected value of IP $V = m \times R$

But the estimation of $m$ is verrrrrrrrrrrrry iffy
Technological advances are rarely stable
But used for a) advertising -- much untrustworthy data
b) stable maintenance component only
c) venture capitalist’s result assessments

$m \approx 2$ in the first model we used
Basis for Software value as of today

• Sum of future income
  - Sales = price × 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
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 brand intangibles
  ➢ Costumer loyalty, trademarks
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
Maintenance is beneficial

Maintenance is beneficial

Lifetime maintenance cost = 1 / lifetime

Depreciation

Maintenance

PCs

Typical Life: 3 years
Maintenance: 2%/year
Maintenance cost: 6%
Depreciation: 33/y. linear

cars

Typical Life: 5 years
Maintenance: 5%/year
Maintenance cost: 21%
Depreciation: 20%/y. linear

Software

Typical Life: 12 years
Maintenance: 15%/year
Maintenance cost: 80%
Depreciation: 8%/y. linear

Intangibles

Typical Life: 18 years
Maintenance: 13.75%/year
Maintenance cost: most over asset life
Depreciation: 12% geometric
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 $1/1.04 = €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

Makes looking into the future less risky
Current value

Prior investment has created what you have now

“a bunch of software”

➢ That’s what’s to be valued

☐ Based on reasonable expectations
  • future maintenance will be needed to earn income
  • future maintenance represents future investments

More “software code”

☐ not promises of new innovations ← new IP

Later we look at other valuation/business models
Technical Parameters needed

IP is to be valued as of some specific date

1. **Life** of the IP in the product from that time on
   
The interval from completion until little of the original *stuff* is left

2. **Diminution of the IP** over the Life
   
   A bit like a depreciation schedule, but based on content replacement, until little IP is left. 10% is a reasonable limit.

3. **Lag period**, interval from transfer to start of IP diminution
   
   • also called “Gestation Period

   **Effective Lag** = the average time before an investment earns revenue

4. **Relative allocation**, if there are multiple contributors to income.
Crucial assumption for a quantitative valuation

• IP content is proportional to SW size
  - Not the value, that depends on the income
  
  ✓ Pro: Programmers’ efforts create code
    ✓ An efficient organization will spend money wisely
  ✗ Counter: not all code contributes equally
    ✓ early code defines the product, is most valuable
    ✗ new versions are purchased because of new features

• Arguments balance out
  ✓ it is the best metric we can obtain
Maintenance → SW Growth

Rules:

\[ S_{n+1} = 2 \text{ to } 1.5 \times S_n \text{ per year} \] [HennesseyP:90]

\[ V_{n+1} \leq 1.30\% \times V_n \] [Bernstein:03]

\[ V_{n+1} = V_n + V_1 \] [Roux:97] ([BeladyL'72], [Tamai:92,02] [Blum:98] indications)

Deletion of prior code = 5% per year [W:04]
• Linear growth has been observed, is reasonable
• Software cannot grow exponentially

Because

1. Cost of maintaining software grows exponentially with size
   ❖ The number of interactions among code segments grow faster \cite{Brooks:95}
2. Can't afford to hire staff at exponential *2
3. Cannot have large fraction of changes in a version
   ❖ And get it to be reliable
4. Cannot impose version changes on users < 1 / year
5. Deleting code is risky and of little benefit
   ❖ except in game / embedded code

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Price

*remember IP = f(income)*

• But --- Price stays ≈ fixed over time
  like hardware Moore's Law

Because
1. Customers expect to pay same for same functionality
2. Keep new competitors out
3. Enterprise contracts are set at 15% of base price
4. Shrink-wrapped versions can be skipped

• Effect

The income per unit of code reduces by 1/

size →
Growth diminishes IP

For constant unit price

Assumptions:
- IP \approx\text{codesize}
- deletion \approx\text{codesize}

Note:
- less steep if start with \( V > 1 \)
  if \( V > 2 \) obeys rule B

Unit value

\[ V_1, V_2, V_3, V_4, V_{1,T2}, V_{1,T3}, V_{1,T4} \]

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>( v_1 )</td>
</tr>
<tr>
<td>1</td>
<td>( 0.75 \times v_1 )</td>
</tr>
<tr>
<td>2</td>
<td>( 0.50 \times v_1 )</td>
</tr>
<tr>
<td>3</td>
<td>( 0.25 \times v_1 )</td>
</tr>
</tbody>
</table>

Years →

Versions →
Total income

Total income = price $\times$ volume (year of life)

- Hence must estimate volume, lifetime

Best predictors are Previous comparables

- Erlang curve fitting ($m=6$ to 20, 12 is typical)
- and apply common sense limit = Penetration

- estimate total possible sales $F \times \#\text{customers}$
- above $F=50\%$ monopolistic aberration
“Gestation period”

Staff Growth: Linear
Effort total = \( \frac{1}{2} E \times T \)
A simple metric: lag vs completion=
Centroid of prior expenditure
here @ 33% (without discounting)
Timing of expense and income

capitalization of cost allowed under GAAP

Distribution to Sales

Centroid of revenue

Sales lag

Marketing lag

Sales

Development done

Testing

Research, Design, Implementation

Development lag

Post-sales marketing, part of sales cost: CoGS

Pre-sales marketing costs part of investment: IGE

Revenues

Release to Production

RTP

Manufacturing & distribution delay

Dts

Centroid of total development cost

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Lag differs less than development period

Effective lag = Development period × Centroid fraction
1. Normal curve: simple, no defined start point
2. Erlang: realistic, more complex
both have same parameters: mean and variance
\[ f_r e q(t) = \frac{(\lambda m)^{m} t^{m-1}}{(m-1)!} e^{-m \lambda t} \quad \text{for } t \geq 0 \]
Erlang sales curves

$m=\text{mean/variance}$

For 50,000 units over 9 years

- **Flash-in-the-pan**
- **One-time promotion**
- **Long-lived single product**

$\text{Erlang } m = 6$

$\text{Erlang } m = 12$

$\text{Erlang } m \sim \text{infinite}$

$\text{^50,000 when \ Erlang } m \sim \text{infinite}$

$\text{1/18/2014}$

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Predicted product sales for 5 versions, stable rate of product sales
3 year inter-version interval, first-to-last product 12 years, life ~15 years
Fraction of income for SW

Income in a software company is used for:

- **Cost of capital**
  - Dividends and interest 典型值 ≈ 5%

- **Routine operations** -- not requiring IP
  - Distribution, administration, management  ≈ 45%

- **IP Generating Expenses (IGE)**
  - Research and development, i.e., SW  ≈ 25%
  - Advertising and marketing  ≈ 25%
    - Joint distributor & creator

These numbers are available in annual reports or 10Ks
Recall: Discounting to NPV

Standard business procedure

• Net present Value (NPV) of getting funds 1 year later = $F \times (1 - \text{discount }\%)

Standard values are available for many businesses based on risk ($\beta$) of business, typical 15%

Discounting strongly reduces effect of the far future

NPV of €1.- in 9 years at 15% is €0.28

Also means that bad long-term assumptions have less effect
Example

Software product

- Sells for €500/copy
- Market size 200 000
- Market penetration 25%
- Expected sales 50 000 units
- Expected income €500 x 50 000 = €25M

What is the result?
Combining it all

<table>
<thead>
<tr>
<th>factor</th>
<th>today</th>
<th>y1</th>
<th>y2</th>
<th>y3</th>
<th>y4</th>
<th>y5</th>
<th>y6</th>
<th>y7</th>
<th>y8</th>
<th>y9</th>
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<td>0.95</td>
<td>0.92</td>
<td>0.88</td>
<td>0.85</td>
<td>0.82</td>
<td>0.78</td>
<td>0.75</td>
<td>0.72</td>
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<tr>
<td>Fraction</td>
<td>100%</td>
<td>57%</td>
<td>39%</td>
<td>29%</td>
<td>23%</td>
<td>19%</td>
<td>16%</td>
<td>13%</td>
<td>11%</td>
<td>10%</td>
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Result of Example

Software product

- Sells for €500/copy
- Market size 200 000
- Market penetration 25%
- Expected sales 50 000 units
- Expected income €500 × 50 000 = €25M

Earnings (Profit before taxes) is just €1M after your salary etc ...
Combining it all and adjusted for end-of-life

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1/18/2014

SSTiC 2013
Software product

- Sells for €500/copy
- Market size 200,000
- Market penetration 25%
  - Expected sales 50,000
  - Expected income €25M
  - Discounted gross income €14.7M
  - Available for SW maintenance €3.7M

Ok but see when it is needed
Result of Example

- Selling 50,000 SW units at €500 ≈ €1M not €25M

Once its in a spreadsheet, the effect of the many assumptions made can be checked. When assumptions later prove unwarranted then management can make corrections. To be wise, don't spend more than ≈ €500,000 to develop the software product.
Total income vs technical cost
Net income, after sales cost

End of profit on sales

End of profit on all income
Life of Software

We learned now why software has a finite life

Although SW can be indefinitely maintained

Eventually the maintenance costs exceed income

- A very well-selling product can have a long life
  1. Unique
  2. High quality
  3. Well maintained

- An easy to maintain product can have a long life
  1. Well designed
  2. Insulated from change by established standards

Conflict?
Dealing with Income Factors

1. Business overhead takes 50% of net revenue
   - An average, when sales are low, fraction is higher
   - Be lean, especially when sales fall
   - Focus on on-line sales

2. Marketing uses 25% of net revenue
   - Assess customer base, but don’t skimp here

3. Available for maintenance is still 25% of net
   - Enough once sales become substantial
   - Requires initially additional capital
Transients due to versions

Customer behavior w.r.t. new versions, superimposed on basic sales curve
Ongoing development

New considerations

1. Have staff already
   a. Early versions rapid growth, but observe ~20% limit
   b. Later, best grow slower

2. Can overlap version development
   a. Don’t let valuable staff be idle
   b. Missing features should already be understood
   c. Rapid analysis of problems to allow next version fixes
   d. Any research should be done before major staff effort

3. Adequate testing to keep reputation

more next session
Marketing

• Business model must allocate spending optimally
  ➢ Technology, as needed, long life and lag
  &
  ➢ Marketing, necessary, less lag, slower growth
    ➢ Life of advertising 50% of technology, mix product & brand

• Interdependence
  ➢ Consistent
  ➢ Relevant
  ➢ Linked by a common name and label
  ➢ Honest name for file software misled: FLASH for flexible, but it wasn’t fast

in your brain forever

SW value

1/18/2014
SSTiC 2013
Let’s ignore the intangibles, we cannot measure them reliably.
End of Part 1

References at ilab.stanford.edu/VIC

Dilbert / By Scott Adams

DOGBERT IS A CREATIVITY CONSULTANT

WE DON'T NEED ANY OF YOUR "INTUITION" MUMBO JUMBO. WE NEED QUANTITATIVE DATA!

THE ONLY WAY TO MAKE DECISIONS IS TO PULL NUMBERS OUT OF THE AIR, CALL THEM "ASSUMPTIONS," AND CALCULATE THE NET PRESENT VALUE.

OF COURSE, YOU HAVE TO USE THE RIGHT DISCOUNT RATE, OTHERWISE IT'S MEANINGLESS.

GO AWAY.
1. Alternate business models.
2. Service-based models
3. Open source software
4. Freemium
5. Allocation among IP contributions
6. Estimating development efforts
7. The role of patents, copyrights, and trade secrets.
8. Advertising
Summary of part 1

Valuation is important for business decisions. Always based on expected future income: uncertain

Using multiple methods reduces uncertainty:

1. Fundamental: Income prediction (sales – costs)
   based on SW growth, maintenance, IP diminution
2. Market estimates  *Wisdom of the crowd*
3. Leverage of R&D:  *investment expectation*
4. Comparison with parameters of similar businesses
5. Comparison with other corporate investments
Multiple method results compared

Average

Interquartile mean

error
Guidance obtained earlier

Income determines value
Income is due to sales

• We applied an overall Erlang sales curve
  ➢ new versions keep market going but customers do not replace earlier versions

• The assumption are sufficiently simple that alternatives can be intelligently discussed
  1. keep development costs low
  2. design so that SW maintenance is low
  3. charge a higher price
  4. minimize sales cost, without reducing market size
  5. broaden the market
  6. or →
Software product

- Sells for €500/copy
- Market size 200 000
- Market penetration 25%
  - Expected sales 50 000
  - Expected income €25M
  - Discounted gross income €14.7M
  - Available for SW maintenance €3.7M

Ok but see when it is needed
Business models

0. New versions do not replace earlier versions

Alternative business models

1. New versions encourage replacement
2. Provide related services
3. Charge for maintenance
   Lower initial cost, slower income stream
4. Make product Open source to broaden market
   Charge only for services
Alternate business model

Consider maintenance and its income

"Service model"

More assumptions — now include cost @50% of value

1. Original cost €500 000 (used to estimate 2.)
   a. Maintenance cost 15%/year of aggregate original cost
   b. Maintenance fee 15%/year of original price, 1 year delay.
   c. 85% annual retention of customers.

2. Maintenance Lag = Δ (t cost , t income) = 1 year

3. Stop maintenance when cost > income
### Additional Effect of service model

**Cost of maintenance = 1523/(500+1523) = 75% of total**

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Service model factors

- Same proportion was used for SW contribution: 25%
  - Maintenance income has lower sales cost, perhaps more should be made available for software improvements
- Discount total only after maintenance cost
  - Income comes at time of spending
- Maintenance fees still generate substantial income
  - Organize business sector to collect those in out years
  - Use excess SW income for replacement or new products
- Continue longer, but stop in time!
  - When maintenance costs more than income
More years of service model?

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Less, out year losses because €5 687M spent on maintenance

**Good time to quit**

**But still have income to v12**

**Quit: reduce expense & income 1/3 each year**

1/18/2014

SSTiC 2013
Open Source software?

Should software should be a free good?

Implicit in that view is that government, universities, and foundations should pay for software development, rather than the users.

1. *Programmers are creative artists, creating beauty and benefits for all of Mankind!* 😊

vs.

2. Software is an industry. 😈

SW revenue is $121B per year in the U.S. alone, well over 1% of the US GDP. Non-software companies spend yet more for business-specific software. Over 4.8 million people are employed in IT, earning nearly $333B annually.

• It is unlikely that universal free software is an achievable and even a desirable goal.
Open Source Practice

• Appropriately, open source initiatives actually focus on software that deserves wide public use and should be freely available to students and innovators, as editors, compilers, and operating systems.

• Much open source software is incorporated into Commercial software, that is not made freely available,

  ➢ even if it should be made available.
Open Source SW, from a 10-K report

• Certain of our software (as well as that of our customers) may be [is] derived from “open source” software that is generally made available to the public by its authors and/or other third parties.

• Such open source software is often made available to us under licenses, such as the GNU General Public License (GPL), which impose certain obligations on us in the event we were to [for] distribute[ing] derivative works of the open source software.

• These obligations may require us to make source code for the derivative works available to the public, or license such derivative works under a particular type of license, rather than the forms of licenses [it] customarily used to protect our intellectual property.

• In the event [If] the copyright holder[s] of any open source software were to successfully establish[their rights] in court that we had not complied with the terms of a license for a particular work, we could be [must] required to release the source code of that[our] work to the public and/or stop distribution of that work.
Freemium

Software is free
1. Charge for fancy version
2. Charge for upgrades (maintenance)
3. Charge for multi-user version
4. Charge for Internet sharing
Planning: Consistency in plans

When comparing business alternatives

• Give each choice the same chance

1. Temporal consistency
   - Computing versus communication
     - Local versus Cloud in 2012
       - *Skate to where the puck is going* [Gretsky]

2. Discount rate

3. Resource prices
   - Green alternatives
     - Benefits may depend on future price of oil —
       - if you assume future price = 3 x now, why not invest in oil instead
Example

Enterprise SW versus cloud
[Benioff:2009]

• SIEBEL enterprise sales force management $
  1. Price $1,500 per seat, at 200 users = 300,000
  2. $54,000 for support (18%) /year, x 5 = 270,000
  3. $1,200,000 consulting for installation = 1,200,000
  4. $100,000 admin.personnel/year, x 6 = 600,000
  5. $ 30,000 training / year, x 6 = 180,000
    6 years’ usage

Total = 2,550,000

Note that the customer’s total is >> than the price
Software users & IP

Companies that

1. develop & sell software
   • Basis of IP: income from sales

2. purchase & license software for internal use
   • Do not generate IP with software

3. develop software internally for their own use
   • Basis of IP: relative SW expense × all income

4. combinations
• Software is an intangible good
  If it is owned it is considered Intangible Property
In a business there are 3 parts that have value.
  (Contributes to potential income)
1. **Tangible goods**: buildings, computers, money
2. The **know-how** of management & employees
3. **Intellectual property**: Software, patents, etc.

  2. + 3. make up the **Intellectual Capital** of a company.
IP Protection

Intellectual Capital
all intangibles that contribute to non-routine returns

People: “Operational capital” hard to protect
encourage loyalty stock options

Intellectual Property
Should be protected against misappropriation
a) Patents
b) Copyright
c) Trade Secret

All can be
- Sold
gone to someone else
- if you cannot use them profitably
- Licensed
specified rights to the IP box are rented
- Sales of a product in Europe, Japan
Overview IP protection

1. Patents
   - Use only if the invention is visible in the product
   - Or use to hinder others … “blocking patents”

2. Copyright
   - Protects source code and chip masks
   - Not the underlying ideas

3. Trade Secret
   - If it can be kept secret, best choice
   - Must be defended: NDAs, action when violated
1. Patents

1. Device patents
   - Good for visible ideas
   - Headlights built into fender  
     (Pierce Arrow ~1918)

2. Materials patents
   - Analyzable stuff
     - Glue, drugs,

3. Business patents
   - Hard to assure that they represent new findings
     - Grand Fishery of Great Britain (1720): ocean fishing — rejected
     - Wireless Electronic Mail (NTP versus RIM [Blackberry], Nokia, suing Palm)
Limits to patents

• Genes
  ➢ Recent ruling overturns patentability

• Stemcell: EU Court of Justice, said the use of human embryos ‘for therapeutic or diagnostic purposes which are applied to the human embryo and are useful to it is patentable. But their use for purposes of scientific research is not patentable.’

  case was Re: Greenpeace versus Oliver Brüstle, Director of the Institute of Reconstructive Neurobiology at Bonn University, whose research in turning embryonic stem cells into neural cells for treating Parkinson’s disease.

• Business Methods
Patent troll instance?

Sharing Sound, which holds an actual, government-approved patent. Improbably issued in 2001, Sharing Sound’s absurdly broad patent covers “distribution of musical products by a web site vendor over the internet.”

Actually: specifically includes the generation of a user-specific key that is inserted into the music file at the time of purchase and used in conjunction with keys on the user’s computer to verify authorization.

The inventor was Bernhard Fritsch, whose short-lived MCY.com music service launched in early 1999 does appear to have been the first to employ this type of system. Sold the patent to Sharing Sound, instead of creating a product or service with the patent, Sharing Sound lied in wait and finally in May 2010 filed patent infringement lawsuits in the U.S. District Court for the Eastern District of Texas against Apple, Sony, Microsoft, Rhapsody, Brilliant Digital Entertainment (BDE) and Napster, and separately also sued Amazon, Netflix, Barnes and Noble, Wal-Mart, and GameStop. The patent (here is a good summary of it) essentially describes how these companies sell music online. Other than BDE, all of the companies have reportedly settled, the latest being Apple and Rhapsody. But online selling of digital goods was well underway before the Patent Office issued the Sharing Sound patent.

The terms of the settlements remain private, Sharing Sound no doubt kept its monetary demand below the defendants’ anticipated cost of litigation.

[Glenn Lammi: The Legal Pulse; Washington Legal Foundation, 2010 & comments]
Patent bundles

- Many – 100’s – patents are needed for many modern products.
- Negotiating with all the patent owners is much work and leads to costly total royalties ► 20% of cost of GSM phone
- Alternative – standard-specific patent organization ► UMTS for 3G
  1. Bundles all patents needed for a standard, SEP patents
  2. Collects a global royalty from all manufacturers
  3. Reimburses all patent owners – keeps say 6%
      Historical model: U.S. aircraft industry at the start of WW II
      without a patent pool no manufacturer could build good planes
- Bundles also used to negotiate among companies
- Still threatened by patent trolls
  ➢ Costs for a legal defense are huge, often companies just give up
     ▪ Pay-up for a license
     ○ Devise a work-around

East Texas district court

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2. Copyright

Differs by country, although ongoing harmonization even when laws are the same, expectations differ.

Often changed, last major US changes 1978, 1990

- grants very long period: 120 years or
  70 years after the death of the author
was 28 years in the U.S. but renewable another 67 years
Copyright

• To defend your work you must show the violation
  ➢ Substantial code must match precisely
  ➢ Automatically derived code is protected as well
    ➢ Binary versions are protected, even if they differ
    ➢ Changes of variable names don’t invalidate copyright
    ➢ Damage awards depend on loss sustained

• Recoding the embodied concepts is not protected
  ➢ Feasible for well defined tasks
    ▪ Worked for IBM PC BIOS → (COMPAC, now HP)
  ➢ Difficult for large, diverse code
    ▪ Fujitsu IBM case for OS370 (base OS 360 was not protected)
      o Used a clean room, but did not succeed, had take a license out.
Trade secret

• Origin in Roman law: *Actio servi corrupti*
  - Bribery, kidnap of servants/slaves to divulge secrets
  - Guilds in the middle ages protected their secrets
    - watchmaking, black-cloth dying,

• Also applies to marketing schemes

• Supported by Agreements + for company / + $ for employee?
  - Non-disclosure agreements
    - Employees, Consultants, Contractors, Customers, Tax officials
  - Invention assignment agreements to cover
    - Invent for hire, invent using resources, invent independently
  - No-compete agreements (limits differ by state: CA↓ MA↑)
    - Even covering one’s own inventions, but not routine knowledge
    - Are limited in time (3 months to 3 years), but deceit is a violation

• Must be defended when a violation is known
There is at least one type of trade secret that is recognized by US federal law:

• Exclusive access for 4 or 12 years to
  • Small molecules • biological material
  the `sponsor’ of IP material collected for
  ➢ Clinical trial data
  ➢ Software to design drugs
  ➢ Drug-making processes
  ➢ Software to control drug-making processes

Even though the information must be made available to the FDA for drug approval.
Trade secret and SW

• Reverse engineering of public SW is legitimate!
  ➢ Unless copyright is violated – masks, code
  ➢ Threats in the fine print that is ignored by most

• Getting a patent invalidates the trade secret
  ➢ Patents invite trolls

• Determining loss of trade secret is hard
  ➢ Code and Documents in hand of thief
    ➢ Often voluminous
    ➢ Having labeled documentation helps greatly
      ▪ ‘company confidential’
      ▪ Tracking of documents and document copying
      ▪ Meetings in room without personal, but corporate recording

• Prosecution is hard
Protecting trade secrets

Covers majority of IP value in modern companies

• Period of usefulness is limited in practice
  ➢ but adequate given its simplicity versus patent, copyright

• Reasonable practice is important

• Do not hire employees based on loyalty vs. smarts
  ➢ Pay for loyalty commitments as well as for smarts
    ➢ Employee should receive a comparable benefit for signing a restrictive covenant.
    ➢ New hires should arrange a parachute (payment for not divulging secrets) at hiring don’t wait for the termination.
Convey benefits of keeping secrets to your staff and contractors

Contracts should not infringe employee mobility / betterment

- Doctrine of ‘inevitable disclosure’
  even without a non-compete contract

- State laws differ:
  California supports mobility, leakage; Midwest less so

- Dishonesty or aggressiveness on either side makes a difference in court. Use facts.
- Legalistic NDA forms make enforcement awkward
- Brief summary and discussion with signer should be routine
- Exceptions should be possible: student intern vis-à-vis professor
Allocation

- When there are multiple products
- When there are other contributors to income
  - Substantial hardware
  - Financial consultants in financial firms
  - Experts in call centers
  - Brand name
    Not all of the income can be allocated to the software
- Pareto Optimum
  - Assume the company invests its income optimally
The point were any change lowers the total benefit/cost:

- Spending more on software will have less benefit than spending on other stuff:
  - People
  - Hardware
  - Advertising
  - For large 10 IT companies the average value allocated to their brand name is 22% (BW survey).

Conclusion:

- If a company is managed optimally, we can allocate IP contribution by multi-year spending patterns:
  1. simple total $\sum_i \text{cost}_i$, for $i = n .. 0$
  2. Exponential diminishing $\sum_i 80%^i \times \text{cost}_i$, for $i = n .. 0$, 20% annual loss
Review Allocation

When is allocation needed?

1. Technology, Pharmaceutical company:
   - income due to R&D versus advertising

2. Financial Company:
   - income due to software versus investment experts

3. Internal — product mix
   Expenses for:
   a. products
   b. tangibles
   c. personnel needed to realize income from the products
   d. marketing, advertising

For a Pareto-optimality allocation of income we use cost.

- But recall: Do NOT use cost as a surrogate for value, value of intangibles come from derived income.
Timing of expense and income

Release to Production (RTP)
Development lag
Centroid of total development cost
Research, Design, Implementation
Testing
Development done
Centroid of pre-sales marketing costs
part of investment: IGE
Post-sales marketing,
part of sales cost: CoGS

Manufacturing & distribution delay
Distribution to Sales

Sales lag
Centroid of revenue
Sales

Costs

Revenues

time

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Centroid of revenue lag.

Development done $\rightarrow$ General availability $\rightarrow$ Sales

Costs $\rightarrow$ Research, Implementation & Testing

development lag includes testing

Tables of pre-sales marketing costs

Marketing $\rightarrow$ marketing lag

Sales lags

Centroid of revenue

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Lag delays benefits of R&D investments

Ongoing Development (5% increase in personnel)

Mature company

Simple Model

Startup

Research

Development

Testing

Delivery to Sales

Effort

Gestation period

Start
75%
50%
25%
done

Estimate effective lag

~37% → ~14%

Estimate benefits of R&D investments

~37% → ~14%

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A startup is unlikely to ramp up linearly

Use exponential growth, exp 0.025

Assume

1. 12.5% research
   
   Given that idea is clear, only towards for implementation

2. 25.0% testing
   
   Minimal and risky

3. 67.5% left for implementation

• Overlap research and implementation until testing starts
• Overlap implementation and testing until RPS

Results

Overall centroid @ 0.27 before RPS -- later

Research from 1.00 to 0.33, centroid @ 0.65 before RPS

Implementation from 0.67 to 0.00, centroid @ 0.29 before RPS

Testing from 0.17 to 0.00, centroid @ 0.08 before RPS

Hiring rate at RPS 21%, at the limit for effectiveness
Graph of start-up development

- 21% effort growth
- Testing starts when 17% time remains
- Res., Imp, & Test @0.27
- Implementation starts when 67% time remains
- Research ends when 33% time remains
- 12.5% Research @0.65
- 62.5% Implementation @0.29
- 25% Testing @0.05
- Release to sales

Graph of start-up development
Development in mature company with 12.5% research and 25% testing effort, 62.5% implementation.

38% effort growth at start

5% company staff growth

Available resources

Research ends when 65% time remains

Implementation starts when 85% time remains

Testing starts when 40% time remains

Relative Effort

@0.42

Values based on finite integration, exp= 0.05

1.00 0.75 0.50 0.25 0.00
done

@0.85

@0.46

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Relative Effort

100%
75%
50%
25%

Research for version n release
Implementation for version n release
Research & Implementation

25% Testing for version n
Starts at 0.057

Staff becomes available when prior version enter testing
Rapid, 33% increase in personnel per version interval

Version n development interval

2nd version technical lag

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Mature ongoing technical lag

Staff becomes available when prior version enter testing

Research & Implementation for version $n$ release

Overall @ 0.63

25% Integration and Testing @0.21

Delivery of version $n$
Version development, mature growth, much testing

Research & Implementation effort towards version n release

Testing at 35% effort during version n interval

Overall @0.77

5% increase in personnel per version interval

Release version n

Release version n-1

@1.00

@0.33

Effort

100%

75%

50%

25%

1.50 1.25 0.75 0.50 0.25 done

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110
2nd Version substantial testing

33% increase in personnel per version interval

43% Testing during version n interval

Staff becomes available when prior version enters testing

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Growth and Perception

E-commerce [this slide based on a 2001 CS99/73N class exercise]

- Gartner: 2000 prediction for 2004: 7.3 T$
- Revision: 2001 prediction for 2004: 5.9 T$ drastic loss?

Examples
Artificial Intelligence
Databases
Neural networks
E-commerce

Perception level
Invisible growth

Extrapolated growth
Combinatorial growth
Disapointment
Perceived growth
Perceived initial growth

50 companies, each after 20% of the market

Realistic growth
Failures

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Advertising

1. Audience
   Focused
   - Salesforce
     In front of competitors
     annual sale meetings 3x
   1. Fake demonstrators in SF.
   2. Give coffee, mugs, rides, literature to attendees in NY
   3. Hire all taxis in Nice, give free rides to site in Cannes.

   Vs. Superbowl?
   - Much buzz
   - Huge audience
   - Your audience?

2. Address
   a. Buyers in corporations
   b. Users and employees
   c. Both

   Understand motivations for change

3. Logo & name
   Essential for branding
   - Metaphor
     Negative?

4. Timing
   Have Product ready
   - Few bugs
   - Clear operation
   - Useful
The Mobile Ad Ecosystem

Brands → Agencies → Ad Exchanges → Ad Networks → Publishers

- Brands: Primarily buy wholesale inventory for advertisers, rarely aggregate inventory
- Agencies: Audience measurement and targeting, usually run on multiple networks
- Ad Exchanges: Streamline multiple ad networks for publishers, run on exchanges to optimize ad inventory rollout
- Ad Networks: Aggregate inventory

Only the largest publishers
Trends 1998 : 1999

- Users of the Internet 40% \(\Rightarrow\) 52% of U.S. population
- Growth of Net Sites (now 2.2M public sites with 288M pages)
- Expected growth in E-commerce by Internet users [BW, 6 Sep. 1999]

<table>
<thead>
<tr>
<th>segment</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>books</td>
<td>7.2%</td>
<td>16.0%</td>
</tr>
<tr>
<td>music &amp; video</td>
<td>6.3%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Toys</td>
<td>3.1%</td>
<td>10.3%</td>
</tr>
<tr>
<td>travel</td>
<td>2.6%</td>
<td>4.0%</td>
</tr>
<tr>
<td>tickets</td>
<td>1.4%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Overall</td>
<td>8.0%</td>
<td>33.0%</td>
</tr>
</tbody>
</table>

An unsustainable trend cannot be sustained [Herbert Stein, Council Econ. Adv, 1974]

\[\Rightarrow\] new services
Why me

US Treasury concern:

- Much software is being exported as part of **offshoring** (offshore outsourcing)
- It is typically property – i.e., *protected*
- If it is not valued correctly – i.e., *too low*
  1. Loss of income to the creators *in the USA*
  2. And loss of taxes *to the US treasury*
  3. Excessive profits *kept external to the USA*
  4. Increased motivation for external investment

- Book: How Multinationals avoid Taxes
  - Chapters available for review
Ancestor in 1758 to sell clocks to the King of Spain
Preparation & correspondence over a year
Travel 49 days travel
Wait for appointment.
Sale arrangement 1 week
Travel back with gold pieces

Today 255 years later
Gain interest 15 minutes
Sale arrangement 1 minute
Delivery of goods 3 days
Cost of shipping iPad $1.
from China to Europe/US
Delivery of funds 1 minute

Rapid Change in business, enabled by
1. The Internet
2. Containerized shipping
1. Licensing
2. Separation of IP rights from the property itself.
3. Outsourcing and offshoring development. IP flow.
4. Effects of using taxhavens to house IP rights.
5. Changing taxation.
6. Summary
Multi Version product effort and lag

Effort total = 8.6 x original effort
Test ratio: 37%
First to market advantage

Original Multi Version efforts and lag

Original product creation time

**Competition** *(drawn to scale)*
- Growth Rate 20%/year average
- Effort total = 5.4 units

**Competition/ Original multi version source**
- Effort ratio R/O = 0.63
- Time ratio \( \frac{(t(R)-s(R))/(t(O)-s(O))} = 0.41 \)
- Effective Lag ratio = 0.23

But at that point the original is 3.5 versions ahead of the competition!

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1. No product yet
Selling to an independent exploiter

2. Already have a product,
But want more growth
Sharing with a participant
Bundling & valuing the box

1. Piece by piece
2. Tranche of the company – say, all sales in Europe
3. Can include available knowhow (+) for maintenance

1. Package the box
   - Create a subcorporation to hold the rights to the IP+

2. Sell the subcorporation to European sales co.: SE
   1. Receive a single payment matching the value
      - Requires a well-off buyer
   2. Receive payments over time of equivalent NPV
   3. Make a royalty (fraction of SE’s sales) arrangement
      1. A fraction of sales at SE commensurate with the amount of IP
      2. A period that is sufficiently long to recover the IPs NPvalue
      3. A premium to compensate the seller for the risk of SE defaulting
Setting License fees

Say you want to delegate sales in Europe to some company EUsales that can do it easier over there

- How do you set the fees or royalties?
  1. You have computed a value of your SW of $1M
     - But without discounting, it is actually $1.6M = \sum (due old, slide 5)
     - You will also maintain the SW 1.36M = \sum (maintenance cost, slide 12)
     
     The total due is $3M
  2. You expect the European sales will be 40% of total, 20 000
     - The reason for not discounting is that funds arrive at the same times.

- To earn the same you should charge $150/unit
  - It does not matter how EUsales sells it and what it charges
  - Complexities are required language, interface improvements
Setting License fees

Say US company want to delegate sales in Europe to a local company EUsales that can do it easier over there

• How do you set the fees or royalties?
  1. You have computed a value of your SW of €1M
     ➢ But without discounting, it is actually €1.6M = Σ(due old, slide 5)
     ➢ You will also maintain the SW 1.36M = Σ(maintenance cost, slide 12)
     
     The total due is €3M
  2. You expect the European sales will be 40% of total, 20 000
     ➢ The reason for not discounting is that funds arrive at the same times.

• To earn the same you should charge 1/2 = €150/unit
  ➢ It does not matter how EUsales sells it and what it charges
  ➢ Complexities are required language, interface improvements
Example of Free

- Adobe produced software to generate and read markup text (pdf) for sale to companies.
  - minor business for internal publishing
- Arrangement with the IRS that if Adobe would separate the reader and provide for free, it would publish tax forms using pdf
  - huge business – now everyone needed a reader and companies bought pdf generators to publish in pdf
- When patents ran out, others companies made pdf generators available
  - Adobe still provides many pdf related services
Cloud delivery by salesforce.com

- Benioff  Salesforce.com new entry:
  - $150.-month & user only -- monthly billing
  - Make interface look like Amazon – no training needed
  - Low risk for individual adopters
    - Still a high risk for a changeover in large businesses, where changes are controlled by a risk-adverse IT manager or CIO.
  - Start focusing on small businesses
    - Hard to reach a broad market with little cash
    - Must make a lot of noise
  - Later sales force had to change its initial model
    - Deal with large companies
    - Deal with the Dot-com bust, when many companies failed
  - Business must remain flexible
Rights are flexible

These rights can then be moved off-shore. Income from these rights can avoid taxes. Even easier to do with intellectual property And invisible – not on corporate books

2. *USco* may sell its HQ building to a real-estate enterprise *REco* with a provision that the *REco* will lease the building back to *USco*.

3. If *USco* has received a fair value for the building, *USco*’s total tangibles remain unchanged until it spends the money it received.
   - *REco* may offer an attractive lease because of tax advantages.

4. Actually, *REco* can be set up by *USco* and controlled by *USco*, which also remains its only tenant.

5. Nobody moves and few employees will notice a change.
   - There is a new brass plaque on the building.
   - A sign `*REco*’ on the door to the rooms housing the folk who maintain the HQ.
   - The public consolidated annual report of *USco* only lists the name and location of the controlled subcorporation *REco*; the assets of both are combined.

6. Since the lease receipts at *REco* and payments by *USco* are similar, the more complex financial flow is invisible.
Tenant

Owner

Needs cash

USco

Tenant

New owner

buy

REco

USco

rents

USco

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Owner

Converts to partial tenancy

USco

Formal tenant

MyREco

Tranche price

rents

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Formal owner
Internal sale for intangibles

Procedure functionally identical to tangible example, but

- Even less visible
  - IP transactions are harder to value than buildings
- IP is a much larger fraction of corporate value than HQ
- The consumers of the IP are the sales organizations
  - Not the tenants
- Typically involves three or more entities
  1. Parent company, creator, or sponsor
     - Creates and maintains the IP
  2. IP holding company, often in a tax haven
     - Buys IP initially and pays for its maintenance. Licenses its use.
  3. IP consumer: selling company
     - Buys license to use the IP in products it sells, pays royalty to IP holder
  4. Off shore IP generators → more to come
Offshoring

Task transfer to Enterprises in Foreign countries

Two aspects:

1. Work migration: jobs are moved to lower-cost countries

2. Support software etc. is moved to enable similar productivity in those countries

Income is generated by people and (intellectual) capital
Types of Foreign Entities

• **Independent Foreign Contractors**
  - IFC may serve multiple customers
  - Share trade secrets with competitors
  - Owners need contracts to protect the IP
  - Hard to monitor and enforce

• **Owned, Controlled Foreign Corporations**
  - CFC provides much more control over IP
  - Ownership often in third-party countries
  - Avoids taxation of sales to other countries
Hypothesis

• Offshoring of jobs is effective because of concurrent Intellectual Property (IP) transfer
• Much of that IP is corporate property
• Transfer of corporate IP & IP rights is poorly understood
  - IP as property is not well defined, hard to measure
  - There are many components to IP, coming from
    - Open source, R&D, marketing, reputation
    - Patents, copyright, trade secret (covered by NDAs)
• Even if hard to value, IP & IP rights is a significant export
Knowledge is the Link

To be effective a worker has to know what has to be done

- That knowledge consists of
  - The technology
    - Documentation, prior versions, quality control
  - The business methods
    - How technology in the product is marketed
    - The flow from buyers to improved products and methods

- Companies distinguish themselves by proprietary IP
  1. Patents, sometimes Copyrights
  2. Confidential Documents
  3. Knowledge within its people - protected by NDAs

- call center employees
- technicians
- engineers
- managers
Transfers of rights tangible \approx intangible

But setting the right value is harder, and easily misused
IP flow in the Hard- & Soft-ware industry

- **Design & validation in US**
- **Development, testing in the US and at CFCs**
- **Technical IP Investment**

- **Manufacturing, distribution**
  - **CD creation**
  - **Internet**

- **Product Sales within the US**
  - Income is taxable

- **Product Sales external to the US**
  - Part of income is due to US contribution & taxable
Flow of IP in the financial industry

INYB system experts in the US

Design & feedback

Programming and testing

Operations of INYB within the US

Operations of INYB external to the US

Service Sales within the US

Service Sales external to the US

All US Income is taxable

Income due to technical US contribution is taxable

Financial IP Investment by INB

Technical IP Investment by INB

Finance experts at INYB site external to the US

say: INYB investment bank
Manufacturing

Booking of sales

Income from sales

EMEA distributor and adapter

PFE distributor

MNC

LSA distributor

Taxable income
Taxhavens

Places where

1. Taxes are low
2. Financial and IP supervision is minimal
3. Reporting requirements are minimal

• Three cooperating types are needed
  1. Primary tax havens (about a dozen countries)
     ➢ Small populations,
     ➢ Can live largely of license fees
       ▪ Cayman Islands, pop. 50K, 90K companies @ 3000/year
  2. Semi-taxhavens (more, but diverse)
     ➢ Large populations, need jobs
     ➢ Enact, often temporary, tax benefits for foreign work
  3. Conduit taxhavens (few, small, financially active countries)
     ➢ trusted, separate taxhaven activities by ringfencing
     ➢ can shuffle funds invisible among locations
Need 3 types of taxhaven entities

Flow

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MNC
California

IP
documents and knowhow

Product for US customers

Semi-taxhaven

Conduit

Holland

IP rights

Product cost

Product for RoW customers

Profit

$sales

Palm Island

Primary

Malaysia, India
Forest Labs flow
[from Business Week 14 May 2010]

1. Phoenix
Tyler Hurst purchases a prescription of Lexapro for $99 at a Phoenix Walgreens. The money heads east.

2. New York
Forest Laboratories, the maker of Lexapro, is headquartered in New York City. While all of the company’s sales of Lexapro are in the U.S., most of the profits end up with an Irish subsidiary. The pills are purchased from the Irish subsidiary and distributed throughout the U.S.

3. Dublin
A subsidiary called Forest Laboratories Ireland manufactures and sells Lexapro to its U.S. parent. This lets Forest legally shift most profits from the U.S. to Ireland, avoiding a 35 percent U.S. corporate income tax. To reduce its tax bill even further, the manufacturing unit’s corporate cousin, Forest Laboratories Holdings, registered an office in Hamilton, Bermuda, declaring the island its tax residence.

4. Amsterdam
Forest avoids a 20 percent Irish withholding tax on payments it sends to Bermuda by first paying another subsidiary, Forest Finance in the Netherlands. Forest Finance then pays the office in Bermuda. By going to another European Union member state first, the withholding tax is avoided.

5. Bermuda
An Irish manufacturing unit of Forest pays the Bermuda office to sublicense Lexapro’s patents. Those payments move the taxable profits out of Ireland and into Bermuda. This maneuver helped cut Forest’s Irish income tax rate from 10.3 percent the year before to 2.4 percent the year after.

Bottom Line
Tax dollars that could be paid to the U.S. on profits generated by a product sold entirely in the U.S. are significantly reduced. Income taxes in Ireland are largely avoided. Technically, the U.S. taxes are deferred but the offshore profits back home to the U.S. But American companies rarely repatriate significant portions of that income.

$99 estimates, based on article & the FRX 10-K filings, by Gio W. Forest Labs Research, St. Louis, MO

Cost $5
$64
$12 IP license
$45 profit, after tax + overhead
$50 available for new investment?

IP rights
IP rights transfer to Bermuda
IP value?
$2.38 US taxes for public use
$76
$5
$7
$50 available for new investment?

FFBV
FLH
FLR
FLI
$7
$5
$2.38 US taxes for public use
$50 available for new investment?

0. Initial transaction: IP rights transfer to Bermuda

Design Hermann Zschiegner

Sub corporation “CFH” purchased the rights to IPb

License fees $\rightarrow$ Know How of the workforce

Salaries $\rightarrow$ Offshore job sites

Integrating IP documentation $\rightarrow$ High-value Products

Rights to the Intellectual Property

non-routine profits
Capital and IP creates more IP and Income

Income

Capital & IP at source

Capital and IP in CFH

Income
Example

Apple paid less than 2% corporation tax on its profits outside the US, its filing with US regulators has shown.

The company paid $713m in the year to 29 September on foreign pre-tax profits of $36.8bn, 1.9%.
It is the latest company to be identified as paying low rates of overseas tax, following Starbucks, Facebook and Google in recent weeks.
It has not been suggested that any of their tax avoidance schemes are illegal.
All of the companies pay considerable amounts of other taxes in the UK, such as National Insurance, and raise large sums of VAT.
Apple's figures for foreign tax appear on page 61 of its form 10-K filing with the US Securities and Exchange Commission (SEC), used to summarize the performance of public companies.
It had paid a rate of 2.5% the previous year.
Apple channels much of its business in Europe through a subsidiary in the Republic of Ireland, which has lower corporation tax than Britain.
But even Ireland charges 12.5%, compared with Britain's 24%.
Many multinational companies manage to pay substantially below the official corporation tax rates by using tax havens such as Caribbean islands. http://www.bbc.co.uk/news/business-20197710
Capital flow with a tax haven

Tangibles are harder to move than IP
Job Flow @ different levels of personnel

Parent ------------------------ → CFC
Is knowledge transmitted from the top or acquired from experience at the bottom?
Longer term effect

• Repatriation of €->$ from the CFH to the US is taxed.
• Current workers are paid by the CFH.
  US and offshore employees are unaware of the source of their paycheck
  ➢ The CFH acquires an increasing fraction of the IP
  ➢ The CFH is paid an increasing fraction of the income
  ➢ The CFH in time can becomes richer than the company.
• It is more efficient for the company to invest in low-tax countries and create jobs there.
  ➢ Job losses in the U.S. increase
• Eventually the CFH can buy the parent company.
  ➢ Control by stockholders is gone as well
Not all tax havens are offshore: Delaware

Formal HQ of Coca-Cola, Ford, General Motors, Google, Hewlett Packard, Intel, Kentucky Fried Chicken, Texas Instruments and 200,000 more corporations

owner:
Corporation Trust, a subsidiary of Wolters-Kluwer, a Dutch publishing house.

[Shaxton:11]
Need increased understanding and accounting for IP exports (making them visible) in the past handled by customs officials imposing ‘toll charges’

To rationalize political concern by populists & traditional conservatives versus strong lobbyists pressures and globalists

Correct pricing, licensing and its taxation of IP exports

• will increase corporate profits in the U.S.
• reduce cash in offshore accounts, more for U.S. investment
• provide taxes that could be used to compensate
  • for R&D support provided by the government
  • for educational costs
  • for unfunded retirement benefits of workers whose IP was outsourced

• Is unlikely to stop offshoring substantially
• Amounts would be large in a number of cases
• But ….
Bernie?

Hey, Mike! What's up?

Space for Lease

Call (415) 555-1234 ext 217

What happened?

I'm standing in front of your office, and it's vacated! What's going on?

You didn't hear? We closed the facility.
Doonsbury 2/2

We've outsourced everything off-shore - back office, customer service, even distribution.

My margins are way better now. You might want to consider doing the same thing with your operation.

Gee, I dunno...

I'm telling you, Mike, it's the way to go. Let's talk about it over lunch. Set it up with my secretary.

Um...Okay, where is she?

India. Just call the main number.
US total worldwide corporate earnings $1,550B/year (less during 2008-2009)

1,250B from domestic sources $W - F$

US-sourced earnings moved abroad = $300B $U$

Earnings on $1,800B income from foreign sources = $400B $F$

US tax paid on US Corporate earnings $335B

US tax paid on foreign earnings $130B

Uncollected US tax on US earnings $100B

US corporate earnings sources → destinations

available in taxhavens for corporate investment

US corporate tax revenue $340B

$690B available for corporate dividends & investment in the U.S.

$620B available for corporate dividends
Who pays taxes?

Government

Businesses

Employees

Shareholders

Independent workers

SEP

Misc.: Customs Fees

salaries

dividends

Double taxation?
Proposal: Eliminate corporate taxation and full income taxation

No corporate taxation and no reductions on dividend and capital gains taxes

- Removing a component of US tax revenues is worrisome
- But now no `double taxation’ Corporate + Shareholders
  - Revenues from corporate taxation are decreasing,
  - Its contribution to the US economy in 1994 was already less than 2.5% of GDP.
  - The 2008 recession lowers the amount of corporate income tax collected

A linear extrapolation of the trend in corporate tax rates makes the revenues from corporations zero by 2050!
Economic Models
[Orrell: Economyths+]

• Used to predict effect of policies and tax changes
  use assumptions → based on: counterexamples
    ➢ Equilibrium → ignores dynamics and lag: housing
    ➢ Normal distribution → based on additive model
    many effects are multiplicative: power-law
    ➢ Symmetric distribution → value S-curve not centered:
      downside risk hurts more than upside gain
    ➢ Rational behavior → perfect foresight: shopping

• Governments get poor advice
<table>
<thead>
<tr>
<th>Taxed item</th>
<th>Action</th>
<th>Change</th>
<th>Motivation and result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate income tax (CIT) for C-corporations -- not S-corps. LLCs</td>
<td>Abolish</td>
<td>($143.3B)</td>
<td>Cannot be administered fairly</td>
</tr>
<tr>
<td>Dividends to individuals</td>
<td>Tax as income</td>
<td>$30.4B</td>
<td>Treat all sources of individual income identically</td>
</tr>
<tr>
<td>Capital gains by individuals</td>
<td></td>
<td>$69.0B</td>
<td></td>
</tr>
<tr>
<td>Effect of taxation of greater dividend payouts</td>
<td></td>
<td>$9.6B</td>
<td>Tax on compensation of shareholders for their increased taxes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$20.4B</td>
<td>Purchases (based on DoD spending)</td>
</tr>
<tr>
<td>Research credit, similar corporate tax deductions (loopholes), corporate AMT</td>
<td></td>
<td></td>
<td>If incentives are still desired, they must be replaced by explicit grants</td>
</tr>
<tr>
<td>Indirect effect of increased investment and repatriation of offshore holdings</td>
<td></td>
<td></td>
<td>No trustworthy data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(7.2%) of business tax</td>
</tr>
</tbody>
</table>
Why now

Worrying about economics is a sign of a maturing field

Phases:

1. Get new stuff to work
2. Getting adequate performance
3. Get it to be sufficiently reliable to be useful
4. Get it into routine production
5. Increase capacity
6. Make it safe
7. Make it affordable
Problems

• There is a lack of trustworthy data

1. $209M spent [US commerce department, 2003]
   + 4663 jobs lost [U.S. labor dept, 1Q04]

2. $2400M income [Business week, in 2003]
   + 50000 jobs gained [Indian NAS&S Cos, Fy04/4]

• Attitudes are inconsistent

Greenspan 1: IP rights have assumed increasing importance [27Feb03]

Greenspan 2: Our economy is best served by full and vigorous engagement in the global economy – when defending reducing protection [11Mar03]
Related Intellectual capital issues

Not all intellectual capital is owned, property, IP

1. **Education**: Services that transmit valuable, but non-proprietary knowledge to others.
   - If receiver pays, certainly can take it anywhere
   - If the state pays, can it / should it be reimbursed? Now not.

2. **Publication**: *IP* placed into the public domain is no longer IP
   - Who benefits?
     - The reader gets knowledge / The writer gets fame
     - Society becomes more egalitarian, effective

- These 2 aspects can easily confuse IP discussions
Exports and Transfers go both ways

• There is innovation everywhere

• If the U.S. imports IP, the receiver should pay
  
  ➢ Basic and fundamental research in the U.S. is declining
    ➢ Growth was motivated by WW II experience [Vannevar Bush]
    ➢ Many countries now fund fundamental research
  
  ➢ The ratio of applied to basic research is increasing
    ➢ Industrial research is mainly applied
    ➢ Technological research is rarely basic
  
  ➢ Development requires more resources
    ➢ Industrial and management infrastructure
  
  ➢ Demonstration and Beta sites - early adopters
Discussion

• Many parameters used to estimate IP
  ➢ Uncertainty!
  ➢ But better than not knowing what’s going on.

• Many choices now
  a. Technical options
  b. Business options

Interact with each other.
The end!
Question?
<table>
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<tr>
<th></th>
<th>2009</th>
<th>T</th>
<th>B</th>
<th>M</th>
<th>K</th>
<th>$</th>
<th>%</th>
<th>#M</th>
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<tr>
<td>US GDP</td>
<td></td>
<td>14, 259, 800, 000, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>US GNP</td>
<td></td>
<td>14, 014, 800, 000, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>US tax revenues</td>
<td></td>
<td>2, 524, 000, 000, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>US business revenue</td>
<td>21, 584, 866, 000, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.8</td>
<td></td>
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<tr>
<td>US business net income</td>
<td>1, 614, 866, 573, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>US business taxable.</td>
<td>894, 900, 000, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US tax on business</td>
<td>204, 996, 000, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US tax on C-corporations</td>
<td>143, 000, 000, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>75%</td>
<td>1.7</td>
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<td>US tax paid by multinationals</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Home mortgage interest</td>
<td>75, 182, 000, 000</td>
<td></td>
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<td></td>
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<tr>
<td>Research credit</td>
<td>5, 400, 000, 000</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Dividends @15%</td>
<td>123, 570, 203, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18.1%</td>
<td>25.4</td>
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<td>net Capital gains</td>
<td>231, 547, 946, 000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.6%</td>
<td>20.3</td>
</tr>
</tbody>
</table>
$1 Billion

Stanford x 2.5

Your Life

1 Billion Dollars

$1,000,000,000 - This is how a billion dollars looks like.
10 pallets of $100 bills.
US government
2.5 in 2.9T out
In 2008

$1 Trillion
in $100 bills

$1 Billion


Topics see http://infolab.stanford.edu/pub/gio/cs207/

For a motivation see Jeff Hawkins: What I wish I’d learned in college
HREF="http://ecorner.stanford.edu/authorMaterialInfo.html?mid=2289">

Slides from all lectures:

Why should software be valued? Open source software, theory and reality. Scope.


Cost versus value. Market value of software companies. Sales expectations and discounting.

Alternate business models.

Life and lag of software innovation

The role of patents, copyrights, and trade secrets. Managing IP.

Off shoring (Prof. Amar Gupta) from 2009


Effects of using taxhavens to house IP.

Acquisitions and growth, Summary.
Valuing Intellectual Capital
Multinationals and Taxhavens
Management for Professionals
Gio Wiederhold

Springer
MNC purchased the rights to hold and license the IP to others.

Salaries for R&D costs created, sold rights to 42% of the initial IP.

Integration documents

License and exploit the IP

Rights to use the IP

Know-how of the workforce $ for 5 years

PFE

Selling
distribution

Non-routine earnings

MNC JB

MNC MY

MNC EMEA

MNC LSA

CONCH

Sub corporation

MNC JB Integration IP documents

3.1: MNC JB

3.2: MNC MY

3.3 & 2.1: MNC EMEA

2.2: MNC LSA

2.3: MNC LSA

PFE

Sell

Maniacs

Consolidated enterprise

1: MNC created, sold rights to 42% of the initial IP. Controls all actions.
MNC

Before buy-in

MNC US Taxes on sales in North America and on CONCH transfers

Taxes paid

Profit

After buy-in, actual MNC in U.S.

Acquisitions paid mainly by MNC

CONCH established

Acquisitions paid by CONCH

$M

0 20 40 60 80 100 120 140 160 180 200

Earnings from sales

MNC

Initial acquisition

1st round

2nd round

+ support from R&D cost sharing

+ payments for loan

Net earnings from sales

Buy-in
Before Buy-in

Initial acquisitions

Sales in U.S.

Foreign sales

MNC U.S. earnings share

AJCA-motivated acquisitions

US earnings held at CONCH

Unadjusted cost-sharing payment

CONCH earnings share

After Buy-in and cost-sharing

Acquisitions paid mainly by MNC

Acquisitions paid by CONCH

CONCH established

MNC
Before buying-in or acquisitions, US earnings were only

Earnings from acquisitions are untaxed income kept at CONCH.

Acquisitions paid mainly by MNC.

Acquisitions paid by CONCH.

MNC U.S. only

Initial round

First round

Taxes paid

Taxes without CONCH

MNC US Taxes on CONCH transfers

MNC US Taxes on sales in North America

@5.25%

AJCA tax rate

CONCH established

After buy-in and acquisitions, US earnings grew.

US Profit
MNC’s consolidated corporate value

MNC has an offshore holding company: CONCH
MC-VM: Valuing MNC on the basis of its share values

**Valuation point**

**Events**
- Stock options granted: dilute share value, increase stability, IP
- Acquisitions made: paid with shares & cash, add IP and income
- Setting up CONCH: minor cost, IP and income shared, tax avoidance ensues

**Incomes**
- $M/y
  - Acquisitions
  - Organic

**Net Income**
- $M
  - 500
  - 0

**History**

**Future**
Prepackaged Software  SIC 7372 / NAICS 511210

Year  | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005
--- | --- | --- | --- | --- | --- | --- | ---
Sales | $1,600,000 | $1,400,000 | $1,200,000 | $1,000,000 | $800,000 | $600,000 | $400,000 | $200,000 | $0

Note: The graph shows the sales trend over the years from 1999 to 2005.
Inc-VM: Valuing MNC on the basis of its operating income

Valuation point

Growth with AJCA acquisitions

Expected growth

Acquisitions

Organic growth without acquisitions

Actual net income

Discounted expected net income

History

Future
Becomes Figure Ch5.4
Software embedded in Hardware

Becomes Figure Ch5.5
Software versions embedded in Maniacs

Version 1.0
Version 2.0
Version 3.0
Version 4.0
Version 5.0
Version 6.0
Version 7.0

Time

% of total SW size

Version 1.0 SW left

over a long time

7.96 y 8.0

To be cropped. Scale based on 100% = 3"

9.45 y 9.5

Becomes Figure Ch5.6
Valuation point

expected Maniac release date . actual Maniac release date

Version 1.0
Version 2.0
Version 3.0
Version 4.0
Version 5.0
Version 6.0
Version 7.0
Version 8.0
Version 9.0

Maniac software

Version 3.0 software remaining

Maniacs built

future Maniacs

To be cropped. Scale based on 100% = 3”

Becomes Figure Ch5.7
IIP-VM: Effect of discounting

Income

$M/y

Valuation point

Initial growth

Discounted Net Income from IP

Annual Net Income from IP

future

history

800

600

400

200

0

M

1K

2K

3K

4K

5K

6K

7K

8K?
future
lag
without AJCA acquisitions
lag
cut-off IP life
future
Earnings | Price
---|---
Assets | Earnings

Operating income

Product revenue

Gross income

\[ \text{CoGS} + \text{SG&A} \]

Market cap - Debt

\[ \text{Total net assets} \]

Common Margins

Operating income

\[ \frac{\text{Maintenance R&D} + \text{CoGS} + \text{SG&A}}{\text{CoGS} + \text{SG&A}} \]

Operating income

\[ 0.85 \frac{\text{R&D} + \text{CoGS} + \text{SG&A}}{\text{CoGS} + \text{SG&A}} \]
Delay (ignored)

$p$  

$E$  

$m = E / C$ available

Total earnings after R&D

Non-routine earnings derived from sales

Cost of IP generation

R&D capitalization permitted by GAAP

Total capitalized expenses

Investment to be capitalized at RtP

Expenses $e$ relevant to R&D

Product feasibility

R&D capitalization permitted by GAAP
Options

Alternative 1: build ManiMobile

Alternative 2: abandon mobile idea

$\uparrow$

-income

$\downarrow$

-cost

0 1 2 3 4 5

Acquisition date

Decision Point

Research, Develop, Test

Development lag

Manufacturing & distribution delay

Sales lag

Income from selling ManiMobiles

no further cost, no further income

Salvage sale
<table>
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<tr>
<th></th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
<th>6000</th>
<th>7000</th>
<th>8000</th>
<th>9000</th>
<th>10K</th>
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<td>300%</td>
<td>400%</td>
<td>500%</td>
<td>600%</td>
<td>700%</td>
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<td>100%</td>
<td>75.0%</td>
<td>60.0%</td>
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<td>42.9%</td>
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<td>37.5%</td>
<td>33.3%</td>
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<td>27.3%</td>
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<tr>
<td></td>
<td>11</td>
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<td>47</td>
<td>13</td>
<td>67</td>
<td>(83)</td>
<td>42</td>
<td>42</td>
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<td></td>
<td>17</td>
<td>57</td>
<td>104</td>
<td>117</td>
<td>184</td>
<td>212</td>
<td>226</td>
<td>267</td>
<td>309</td>
</tr>
<tr>
<td>100%</td>
<td>60.8%</td>
<td>40.6%</td>
<td>24.6%</td>
<td>17.2%</td>
<td>10.0%</td>
<td>7.6%</td>
<td>4.9%</td>
<td>3.2%</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

Source?
% of GDP

Corporate tax rates
Federal/central + average of states
2004

@35.4%
@30%
@39%
@40.9%
@39.6%

Canada          France     United Kingdom  Germany         Italy               Japan

United States

[OECD:06]
Corporate Tax Revenue as a Share of G.D.P.

Center for Budget and Policy Priorities
Relative growth metrics

all scaled by GDP growth to show relative growth rate
values are actuals
World income by multinationals

US earnings
RoW earnings

IRS share                     Taxhaven share
16%                           84%
Federal Corporate income Tax / Corporate after-tax Profit
Conventional Royalty split. Platform split.
Repatriation of rights to intellectual capital

Retained Financial Capital

IP rights reduced

Non-routine Earnings

ongoing

Home Country

Foreign Countries

Linked

Future earnings

Repatriation of financial capital
Felix Salmon of the St. Louis Federal Reserve Bank and [Drum:11]
Relative US population growth (8.0%, scaled)

Employment By U.S. Multinationals, 1999-2007
(in millions)

- In the United States: 23.0 to 22.0
- In Foreign Countries: 9.2 to 11.7

(279.0) to (301.2)

adapted from [Sullivan:11L]
Relative US population growth (8.0%, scaled) adapted from [Sullivan:11L]

Employment By U.S. Multinationals, 1999-2007
(in millions)

- In the United States
- In Foreign Countries

Relative US population growth (8.0%, scaled)

Multinational employment trends prior to the 2008-2010 recession
Staff Growth: Linear, Total effort = \( \frac{1}{2} E \times T \)

Centroid of prior expenditure \( L_c \)
here @ 33% of \( T \)
(without discounting)

Gestation period \( T \)

Effort \( E \)

Product ready for manufacturing, distribution, and sale
Original set of 16 comparable transactions

Inter-quartile range per IRS formula = 1450 to 325

Statistical mean = 1000

Inter-quartile range = 1380

Comparable A
Comparable B
Comparable C
Comparable D
Comparable E
Comparable F
Comparable G
Comparable H
Comparable I
Comparable J
Comparable K
Comparable M
Comparable N
Comparable O
Comparable P
Comparable L
Comparable A

Trusted set of 9 comparable transactions

Inter-quartile range = 1450 to 325

Inter-quartile range per IRS formula = 1305 to 685

Low

High, not typical

Still high

Still low

Inter-quartile mean = 925

Analysis
CONCH income
Diminished CONCH Income

Moved to Appendix F
Income valuation method

Income diminished by IP diminution and discounted to annual NPV

**Incomes**

- $250M
- $200M
- $150M
- $100M
- $50M
- $0M

**Relative years**

- First full year
- End of life

**Fraction**

**$ adjustments**