



CS207 #1, 26 Sep 2014

Gio Wiederhold and Vishal Sikka

<http://infolab.stanford.edu/people/gio.html>

Hewlett 103



Other participants

- Vishal Sikka, ex CTO SAP, Stanford PhD
- Ron Burbach, Stanford PhD
- Bob Zeidman, consultant
- Larry Tesler (Apple, Evernote)
- Eugene Miya, ex NASA
- . . .



Syllabus:

The order and coverage is flexible

1. Why should software be valued? Cost versus value.
2. Economic Flow. Market value of software companies.
3. Spending. Intellectual capital and property (IP).
4. Income from Sales and Service
5. Principles of valuation.
6. Software growth.
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.
14. Setting licensing rates.
15. Role of Government
16. Risks when outsourcing and offshoring development.
17. Effects of using taxhavens to house IP.



Theme

Financial focus

- How do the results of intellectual efforts enter the global market place?
- How is their financial benefit, i.e., potential profits assessed?
- What happens to the profits?

Not how to innovate, build, etc.

- would make course too broad



Topics

For past topics and class notes see

<http://infolab.stanford.edu/pub/gio/cs207/>

Slides from most prior talks are found there. Many will be reused.

For a motivation see Jeff Hawkins:

What I wish I'd learned in college

<http://ecorner.stanford.edu/authorMaterialInfo.html?mid=57>

Text:

Gio Wiederhold: *Valuing Intellectual Capital, Multinationals and Taxhavens*; Springer Verlag, August 2013.

Mainly Chapters 1-5, appendices

Pointers at i.stanford.edu/VIC

Chapters available as e-books



Course Info

Meets weekly, Fridays 10:00-11:50pm, Hewlett 103.

Me: Gio Wiederhold, Prof. Emeritus, Gates 436,
hours by appointment only gio@cs.stanford.edu

For course updates and references see
<https://cs.stanford.edu/wiki/cs207/>

Grading: 2 units P/F for one report & attendance

Report draft due 14 Nov. 2014

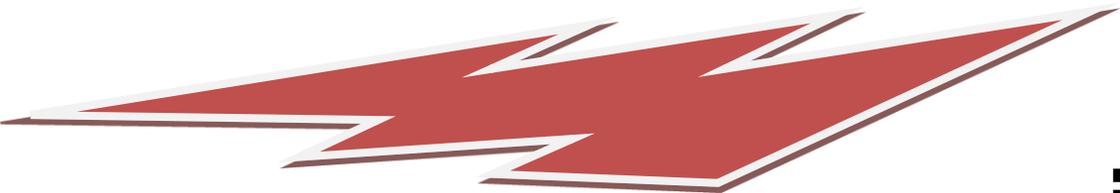
Final report due 5 Dec. 2012

find your own source or use /cs207/Citations (to be update soon) or
many more at i.stanford.edu/VIC/allVICcitations.pdf

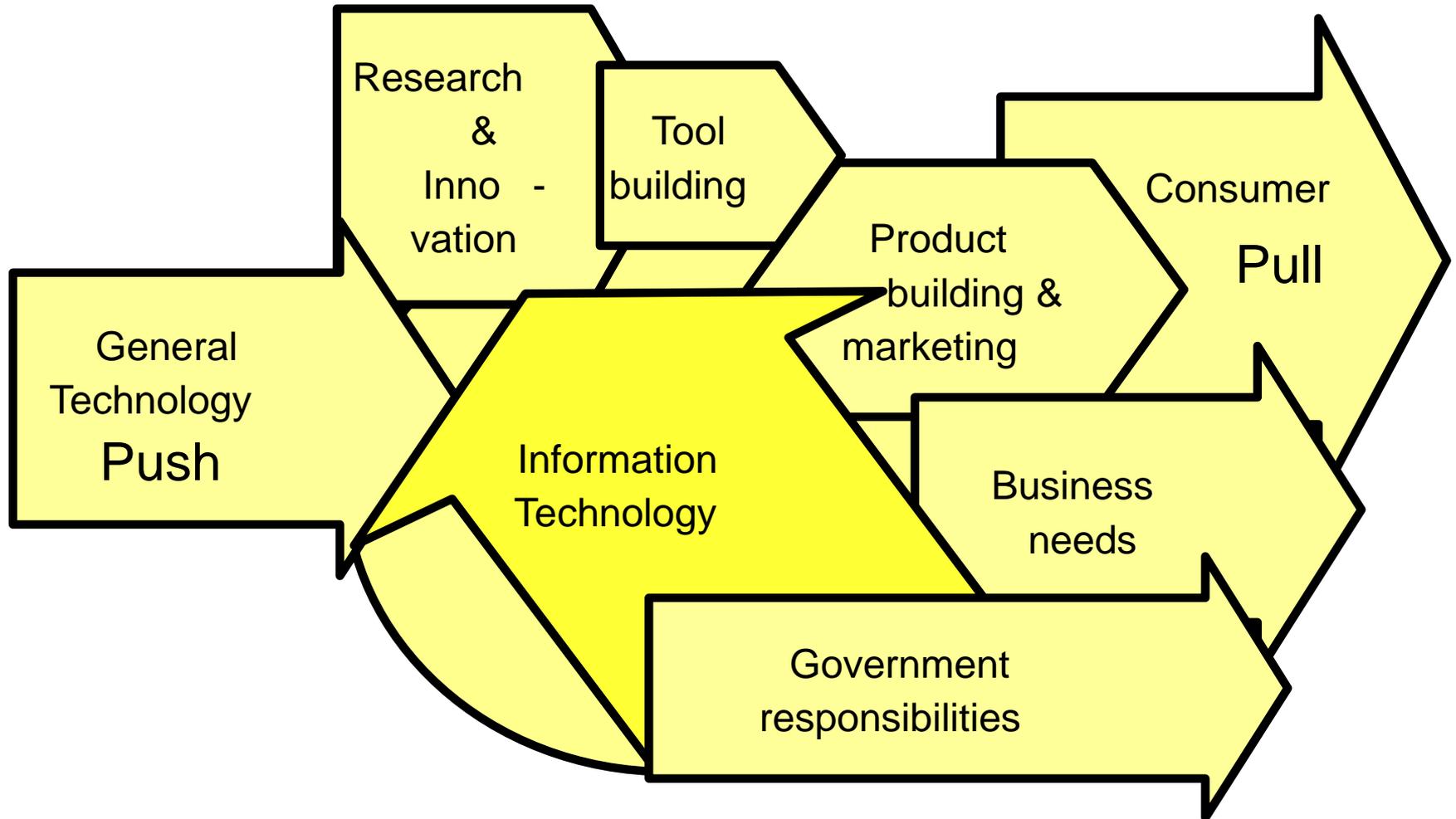
Glossary, references etc. free at Springer website as `Backmatter`:

http://download.springer.com/static/pdf/223/bbm%253A978-1-4614-6611-6%252F1.pdf?auth66=1379963889_e2f73ef1b9d76ee9a18d4534c7e9a188&ext=.pdf

If a class is missed: 1 page report on a related topic



Flow of innovation





1

2

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 people → **you**
2. Good languages → expressive and constraining
3. Good methods → Waterfall, Spiral, Rapid prototyping, Scrum, Extreme programming, Agile processes.

And when the work is done

2. Predicting & maximizing the benefits of the SW

the topic of CS207



Current State

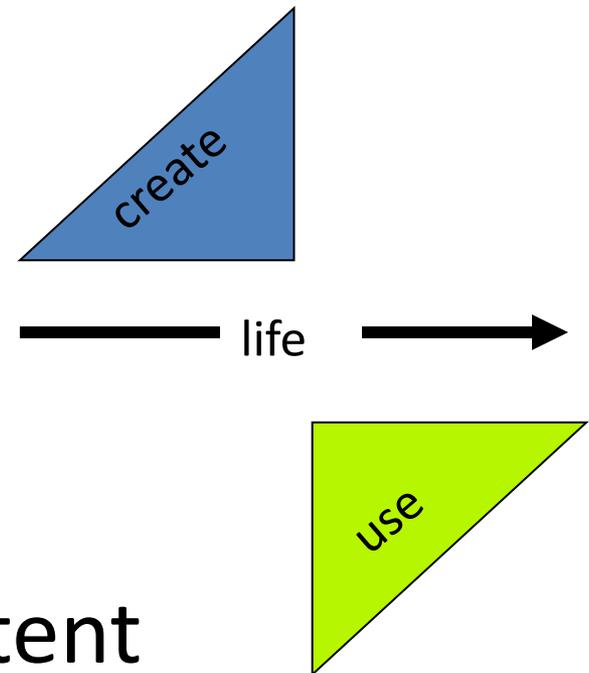
1. Software producers traditionally care about

- 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.

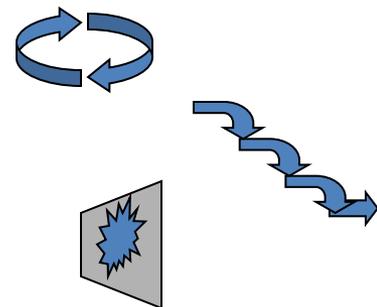
What should the selling company pay you?

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 ~1M/year



or ~1K/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

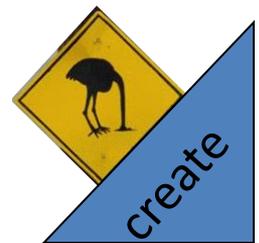
- *Software engineers*

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

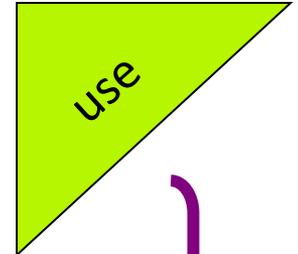




Value depends on use

When the value is a concern

- Business people
 - Income from sales or businesses improvements
 - Price or license determination
- Economists
 - Effects on national productivity
 - have to rely on inadequate data from accountants
- Lawyers
 - Settlement of disputes and infringements
- Promoters
 - Motivating investments



inconsistent



Where is the scientist ?



Principle of valuation

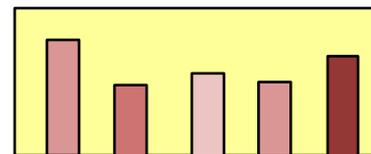
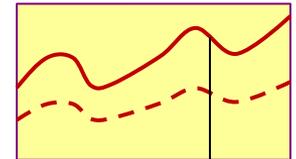
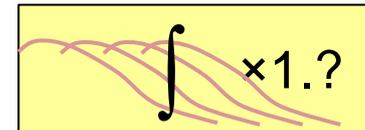
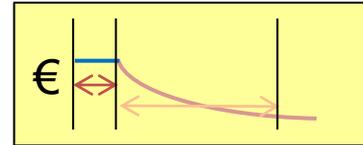
The value of an asset (product, SW, real estate)
**is the sum of all future income derived from it
discounted to today (NPV)**

- Value is based on future income
 - Looking into the future is risky
 - Many alternative scenarios
 - Many methods
 - Having multiple methods match gives confidence
 - There is no best method

Approaches to assess IP value

Rapid summary only

1. Income estimation based on expected sales
2. Income experience for similar existing SW
3. Experience with R&D investments
3. Market capitalization (Market Cap)
4. Comparisons with prior acquisitions with similar IP





Shareholders value income

Implicitly estimated by shareholders through the market cap

Market capitalization = share price × no. of shares
in public or private hands

- Example: Market Cap value of a company (*SAP, 2005*)
 - Largely intangible – like many modern enterprises

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

Intangible/tangible = 4 x

- How much of it is due to software at *SAP* ?



What's to value?

- Software that is sold for profit
- Software embedded in gadgets
- Software that enables profitable businesses
 - inside companies to improve their business
 - inside government to improve its operations
 - to be used in non-profits as education

Missing

- Software written as part of education
- Open-source software (later – freemium)



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



1987 Quote

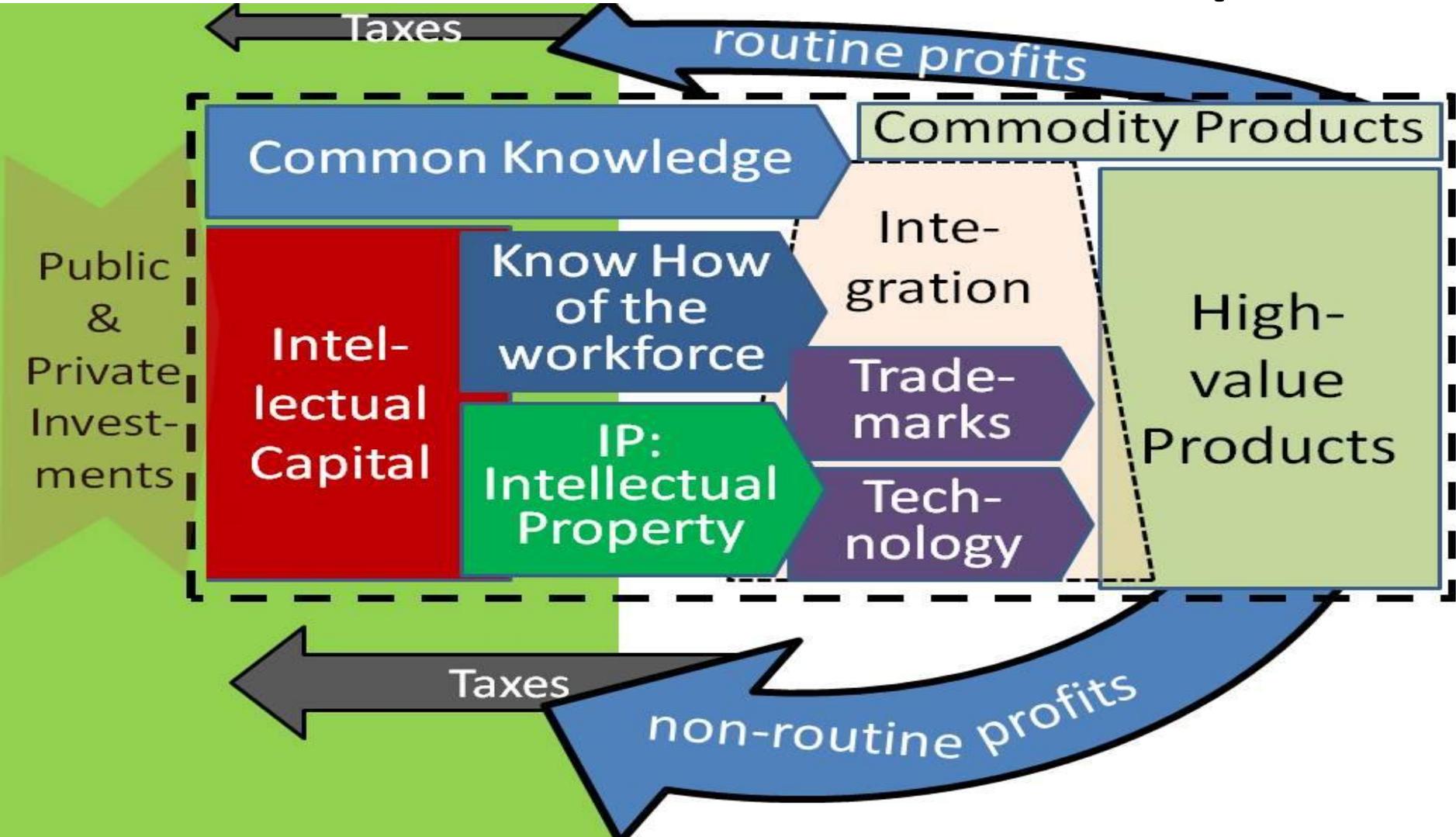
“Some day, on the corporate balance sheet, there will be an entry which reads, ‘Information’; [now *Intellectual capital*] for in most cases the information is more valuable than the hardware which processes it.”

-- *Grace Murray Hopper* 1906-1992
Rear Adm., US Navy, 1943-1986.

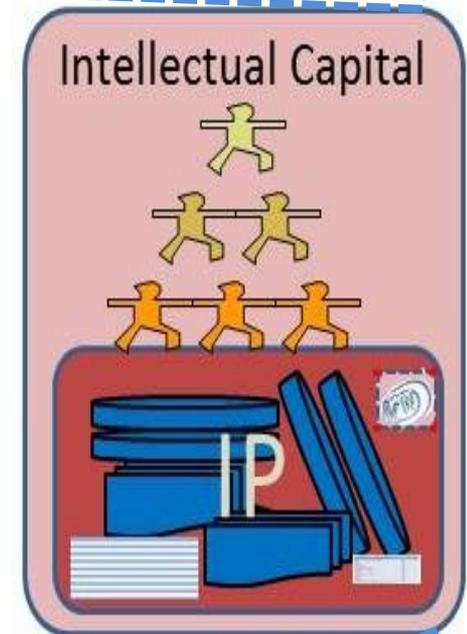
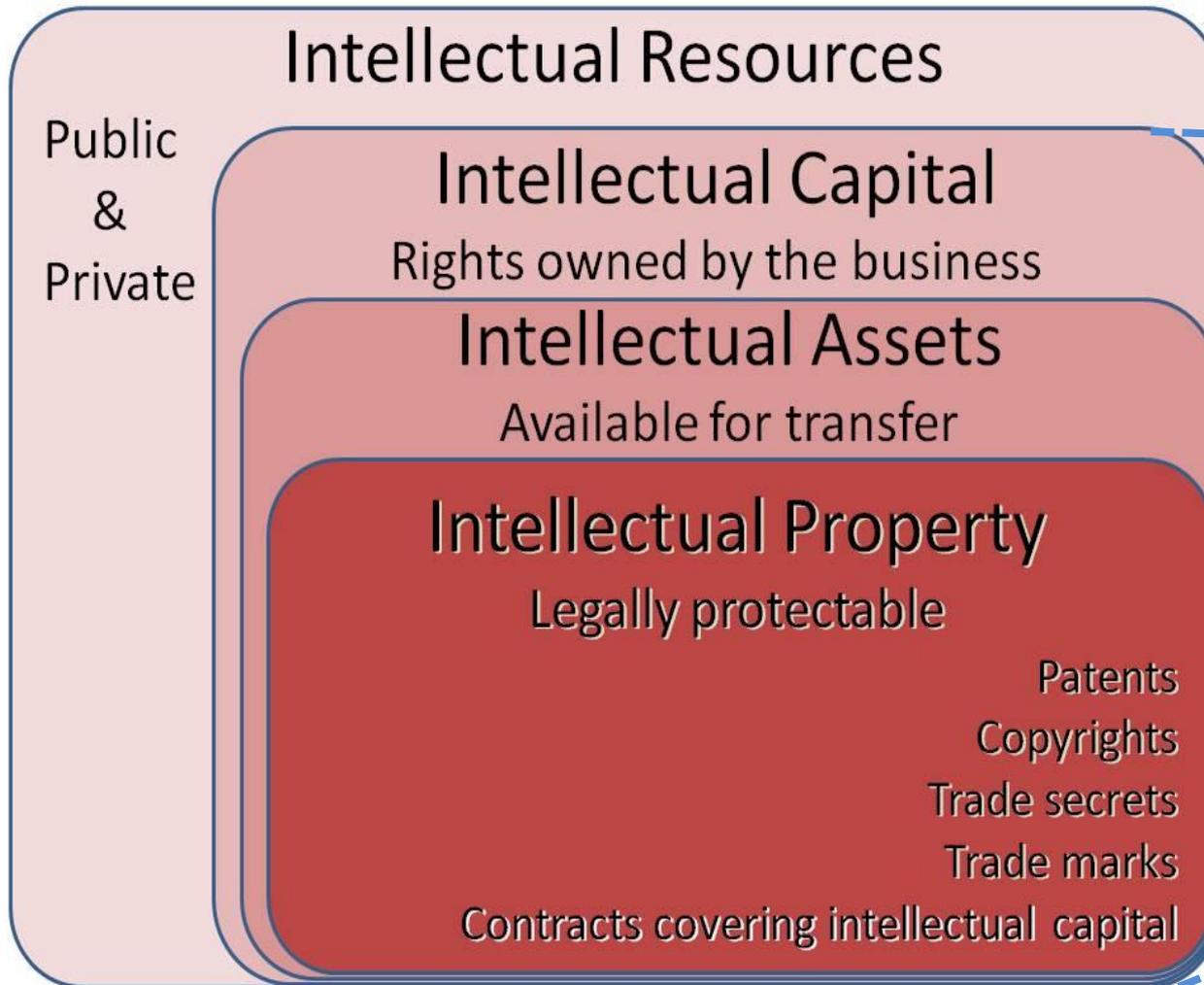
Early Univac programmer, *when computers cost > \$1,000,000*
contributor to the development of COBOL language and compiler, *given away at no cost to Univac purchasers*



Economic Loop



Intellectual Capital



Broader
Concept



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 **I**ntangible **P**roperty
or **I**ntellectual **P**roperty

similar – distinction is metric

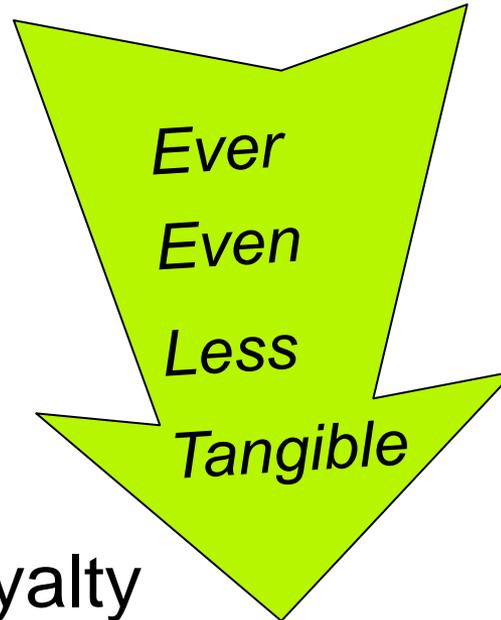


Intangibles

- Product of knowledge

Cost of original >> cost of copies

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



by

authors
programmers
engineers
advertisers
managers

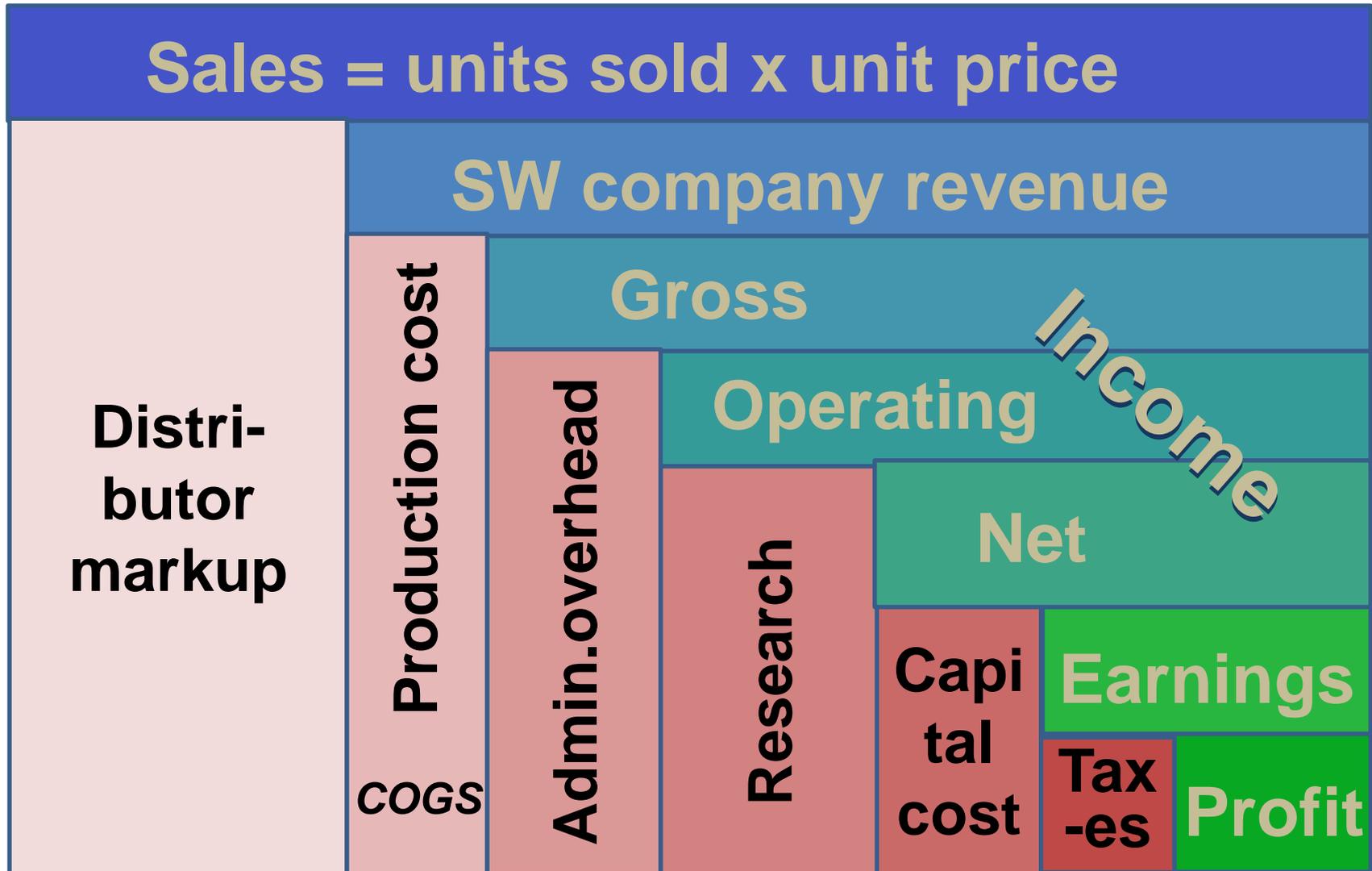
➤ *Interacts with long-term quality*



IncomeS

- Many definitions
 - some depend on objectives
 - ❖ make company look good
 - ❖ make business decisions look good
 - ❖ make company look bad
 - ❖ make business decisions look bad
- Net income – after research costs
 - best if company’s future depends on R&D
- Operating income
 - often used “unknown effect of research in the future”

Accounting simplified



Assets	model MNC	\$	Liabilities	model MNC	\$	
Plant	Factories in the US and Malaysia	40M	Mortgages	Factories and land in the US & offshore	35M	
Property	Land in Malaysia. Unsold inventory	30M	Rents on leases due	US land, offices all over the world	15M	
Equipment	Manufacturing tools & Office equipment	50M	Obligations to employees	Retirement, health care & employment contracts	11M	
Cash & equivalent	Bank, notes, receivables due	100M	Debts and interest due	Loans for acquisitions & to start subsidiaries	50M	
subtotal	tangible assets	<u>220M</u>	Reserve for taxes due	Accumulated each quarter before paid	9M	
Capitaliz'd R&D	Mainly from acquisitions	90M	subtotal	tangible liabilities	<u>120M</u>	
Goodwill	Left from the \$300M initial acquisitions after write offs	140M	Shareholders' equity	\$100M in excess tangible assets plus \$230M in intangibles.	330M	
total	book assets	450M	=	total	book liabilities	450M



Value

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

Low for SW

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



Ownership

Claimed via

3. Patents

2. Copyright

1. Trade secret

0. Employee contracts and loyalty

More on those issues on another day

Income example

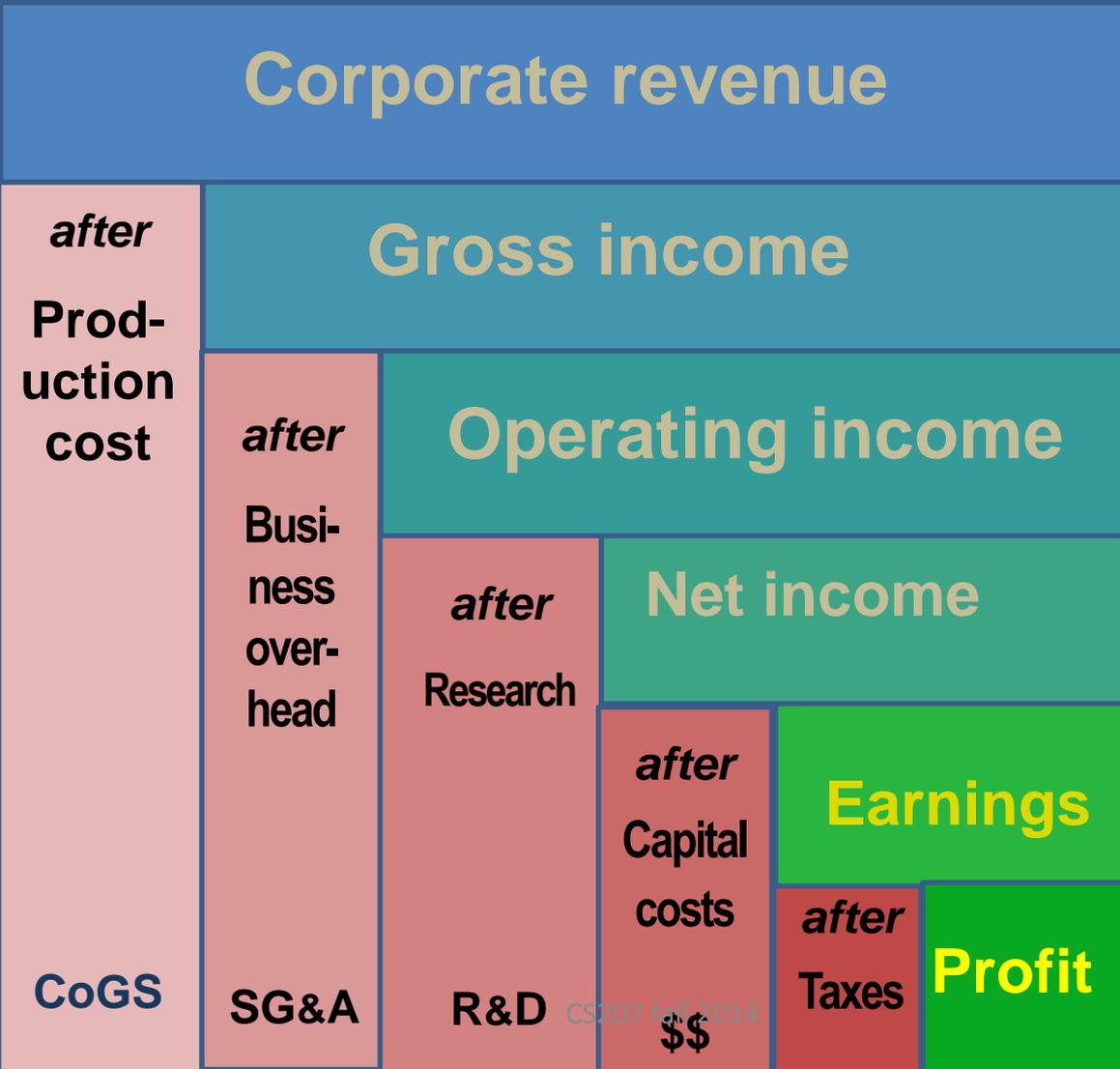
high tech

model | actual
MNC | ForestLabs:

gadgets	pharma
525M 140%	\$99/unit 130%
375M 100%	\$76/unit 100%
284M 76%	\$56/unit 74%
250M 67%	\$45/unit 59%
164M 44%	\$40/unit 53%
154M 41%	\$35/unit 47%
100M 27%	\$33/unit 44%

Sales revenue = units sold x unit price

after
Distrib-
utor
markup





Typical or not?

- Most high tech companies look similar
- Do look for divergence from expectations
 1. Spending on upkeep of intellectual capital
 2. Income from selling parts of the company
 3. Costs from acquiring other companies
 4. Revaluation of assets
 - Often intangibles as goodwill or unprofitable operations
 5. Moving assets offshore
 - Should not change total if fairly valued
 6. Successful tax avoidance & reserves for possible penalties



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

See: *Valuing Intellectual Capital, Multinationals and Taxhavens*



Next Week

- Spending
 - on people, other software, advertising,
- Intellectual Capital
 - What is owned and what is sold
- Questions?
 - Email to Gio@cs.stanford.edu
- Dates

Sign-up starts October 3th

Last class December 5th – Final reports due then

Draft reports for review to be in 14 Nov. 2014

Final Reports due 6 Dec. 2013

No exam