Computing and Economics

CS 181

Computing Ethics and the news

- Trolls and IP
  - https://www.chinatechnews.com/2014/03/24/20383-lenovo-succumbs-to-patent-troll-in-usd100-million-deal
  - Lenovo had to pay 100M to a patent troll

Apple, China, and IP

- https://www.chinatechnews.com/2016/06/17/23657-china-bans-apples-latest-iphones-over-patent-dispute

- The article is a bit boring, but raises many of the interesting IP issues companies face:
  - Apple violating Shenzhen Baili's 100C smartphone design
  - Apple losing its trademark attempt on Iphone with Beijing Xintong Tiandi Technology Co., Ltd. (who makes handbags with that name)

China Cracks Down on News Reports Spread via Social Media

http://www.nytimes.com/2016/07/06/world/asia/china-internet-social-media.html

http://cn.nytimes.com/china/20160706/china-internet-social-media/

- The Cyberspace Administration of China will "punish websites that publish 'directly as news reports unverified content found on online platforms such as social media.'"

- For the policy paper, the CAC website has lots of good ideas! For example, in one news article, President Xi Jinping calls for better collaboration between tech companies, and between tech companies and academic partners towards better research into cybersecurity.

A software bug

- http://www.bbc.com/news/technology-30948123

- This bug is being widely used by criminals as part of online cybercrime kits to enable the purchaser to "ransom" important files from the victim

The "cloud" as a Tragedy of the Commons

- http://www.cio.com.au/article/542365/unsw_scientists_using_ai_create_elastic_cloud/
- Trying to solve this problem
  - An academic approach (out of a university in New South Wales), but it is good to see this problem being tackled

Free speech and the Internet

- http://www.bbc.com/news/technology-30982556
- FB agrees to block a page Turkey claims is offensive to Islam
  - "January - June 2014, shows that 1,893 'content restrictions' were made inside Turkey during that time."

Critical Observations about Software

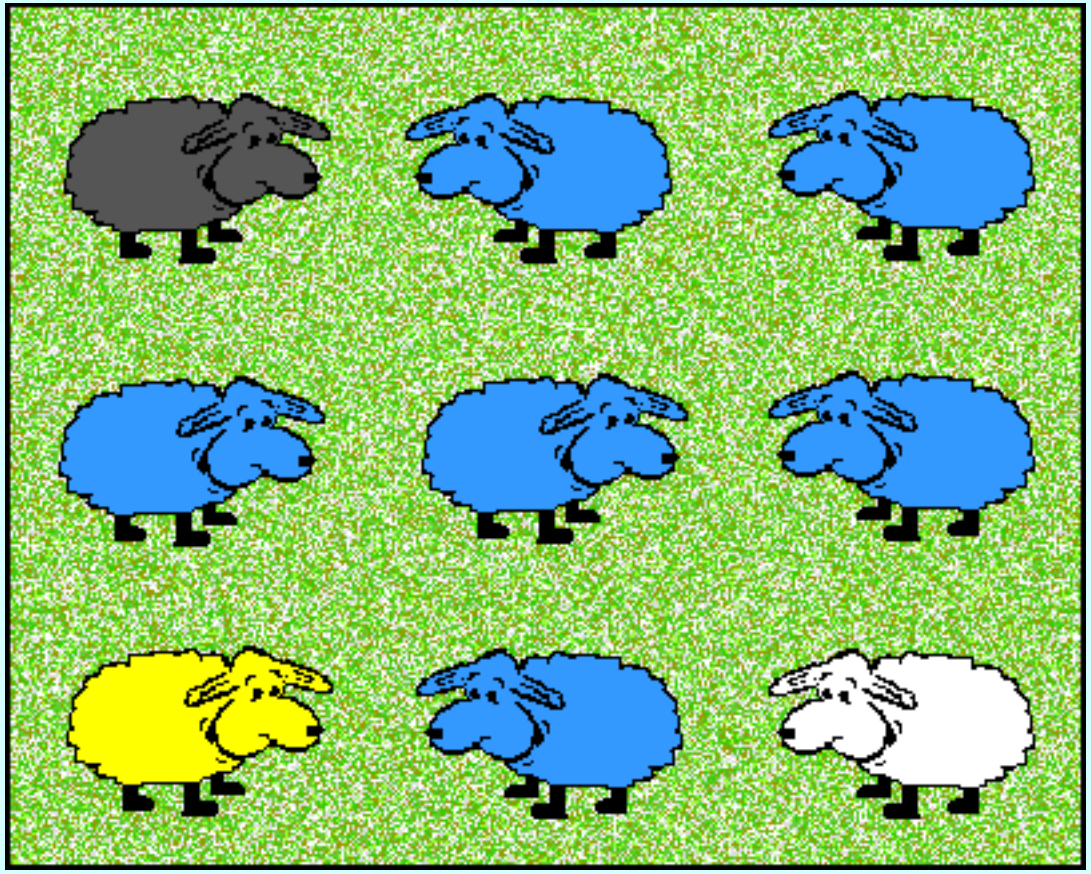
1. Software development is an extraordinarily difficult task, exceeding in complexity most other engineering work. That difficulty, moreover, is intrinsic to the discipline and is not likely to change in the foreseeable future.

2. Individual software developers differ remarkably in their level of productivity, sometimes by several orders of magnitude. Very good people are in short supply, even though their economic value is huge. Unfortunately, the shortfall appears to be getting worse rather than better.

3. The direction of evolution in computing is not controlled solely by technological innovation. Economic, social, and political factors play at least as large a role.

Tragedy of the Commons

—Garrett Hardin, 1968



Eventually, all the sheep go hungry, but the selfish owner gains a relative advantage.

Gerard Winstanley and the Commons

- Hardin's conception of the "Tragedy of the Commons" is actually much older than the 20th century.
- In 1652, Gerard Winstanley, the founder of a group called The Diggers, wrote a political essay entitled "The Law of Freedom in a Platform" in which he railed against the practice of overstocking the grazing land that had formerly functioned as a shared resource:

> In parishes where commons lie, the rich Norman freeholders, or the new (more covetous) gentry, over-stock the commons with sheep and cattle; so that inferior tenants and poor labourers can hardly keep a cow, but half starve her. So that the poor are kept poor still, and the common freedom of the earth is kept from them, and the poor have no more relief than they had when the king was in power.

The Commons and Technology (examples)

- http://www.theatlantic.com/technology/archive/2012/05/the-tragedy-of-the-internet-commons/257290/
  - Internet speeds and throughput
  - Virtual versus bricks and mortar stores
  - Personal privacy

The Commons and Technology examples (2)

- Labor

Prisoner's Dilemma

B's options	A's options: deny all responsibility (cooperate)	A's options: testify against partner (defect)
cooperate	A gets 1 year B gets 1 year	A goes free B gets 10 years
defect	A gets 10 years B goes free	A gets 5 years B gets 5 years

The Iterated Prisoner's Dilemma

- The primary purpose of the thought experiment that goes by the name of the prisoner's dilemma is to show that rational behavior by all players does not necessarily lead to a global maximum. Mathematically, it is easy to prove that defection is always the best option, even though that leads to a suboptimal result.
- The reason that real-life examples of the prisoner's dilemma don't work out so badly is that we don't typically play a single game. The analogues of these games usually happen over and over again with the same players, which means that social processes have a chance to influence behavior in later games.
- Most strategies for the ***iterated prisoner's dilemma*** game begin by cooperating but then punishing antisocial behavior when it occurs.

Prisoner's examples in Tech

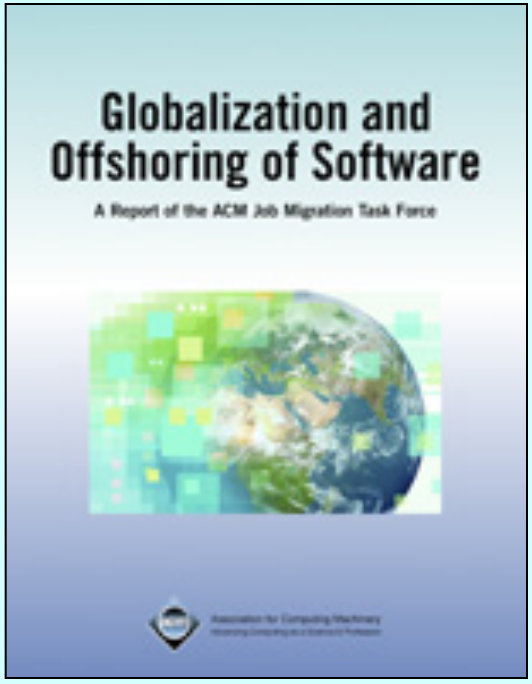
- Final exam performance
  - http://boingboing.net/2013/02/19/students-get-class-wide-as-by.html
    - Agreement among students in a class to all earn a 0
- Anti-trust
- http://techcrunch.com/2010/03/25/four-vc-firms-battle-for-foursquare-valuation-goes-stratospheric/
  - VCs bidding for Foursquare

Myths about Offshoring

1. All IT jobs will soon be outsourced to India and China.
2. Good IT workers will be easy to find in the new "flatter" world.
3. Companies will always seek the lowest-priced labor.

The 2006 ACM report on Globalization and Offshoring of Software finds that even though offshoring of software has increased the number of computing jobs in India and China, it has also increased the number of jobs in the United States.

Thus, at least in computing, globalization has functioned exactly as the theory of comparative advantage suggests.



The Underlying Principles

David Ricardo (1772-1823)

Conclusions of the ACM Report

1. Globalization of, and offshoring within, the software industry are deeply connected and both will continue to grow. Key enablers of this growth are information technology itself, the evolution of work and business processes, education, and national policies.

2. Both anecdotal evidence and economic theory indicate that offshoring between developed and developing countries can, as a whole, benefit both, but competition is intensifying.

3. While offshoring will increase, determining the specifics of this increase is difficult given the current quantity, quality, and objectivity of data available. Skepticism is warranted regarding claims about the number of jobs to be offshored and the projected growth of software industries in developing nations.

Conclusions of the ACM Report

4. Standardized jobs are more easily moved from developed to developing countries than are higher-skill jobs. These standardized jobs were the initial focus of offshoring. Today, global competition in higher-end skills, such as research, is increasing. These trends have implications for individuals, companies, and countries.

5. Offshoring magnifies existing risks and creates new and often poorly understood or addressed threats to national security, business property and processes, and individuals' privacy. While it is unlikely these risks will deter the growth of offshoring, businesses and nations should employ strategies to mitigate them.

6. To stay competitive in a global IT environment and industry, developed countries must adopt policies that foster innovation. To this end, policies that improve a country's ability to attract, educate, and retain the best IT talent are critical. Educational policy and investment is at the core.

The New York Times On the ACM Report

The New York Times

Wednesday, March 1, 2005

Computing Error

[illegible] the computer sector is booming, while the number of students interested in going into the field is falling.

The Association for Computing Machinery, the professional organization that issued the report, says that there are more [illegible]

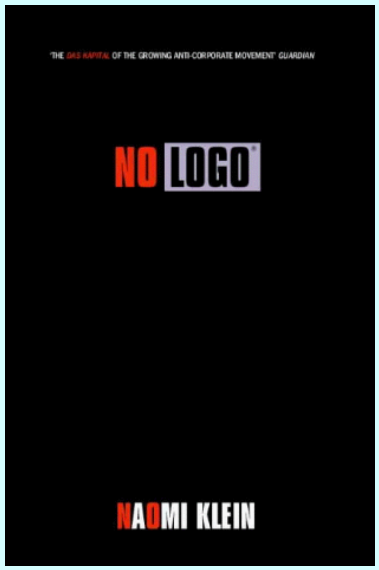
[illegible] policies to "attract, educate and retain the best I.T. talent are critical" to future success. . . .

A Thought Experiment about Offshoring

- Suppose that you are Microsoft and that you can hire a software developer from Stanford whose loaded costs will be $200,000 per year. Over in Bangalore, however, you can hire a software developer for $75,000 per year. Both are equally talented and will create $1,000,000 annually in value. What do you do?
- Although the developer in Bangalore has a higher return, the optimal strategy is to hire them both. After all, why throw away $800,000 a year?
- Any elementary economics textbook will explain that one hires as long as the marginal value of the new employee is greater than the marginal cost. The essential point is that companies seek to maximize return, and not simply to minimize cost.

From Eric Roberts

Talking Past Each Other



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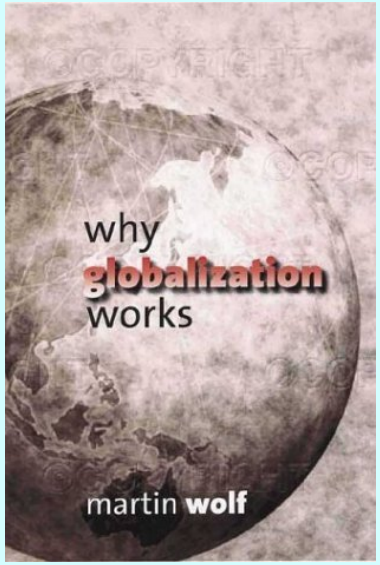
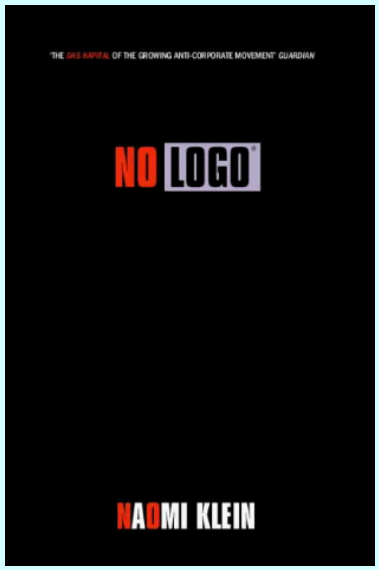


Talking Past Each Other

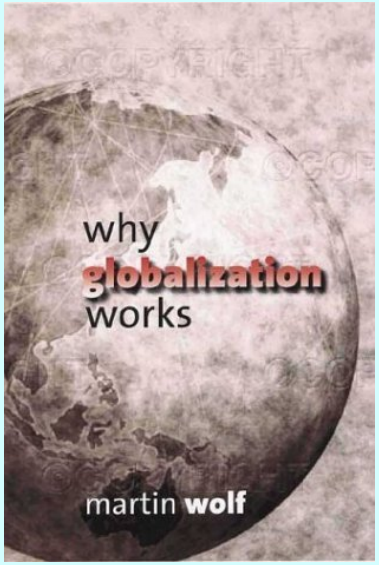


"The shift from the recession to the cutthroat global economy happened so suddenly I feel as if I was sick that day and missed the whole thing—as with Grade 10 algebra, I will forever be playing catch-up."

—Klein, *No Logo,* page 259

"The economic globalization discussed here has cultural, social and political consequences (and preconditions). But those consequences and preconditions are neither part of its definition or a focus for our attention."

—Wolf, *Why Globalization Works,* page 19



Fundamental Concepts in Economics

- *Cost*

  The cost of an item represents the amount of money that the producer must pay to manufacture, promote, distribute, and support it. Cost is influenced by a variety of factors including—for our purposes at least—labor rates, quality of the item, and economies of scale. Costs must often be divided into ***fixed costs*** and ***marginal costs***, which are the costs required to produce one additional item.

- *Price*

  The price of an item reflects how much the customer pays to obtain it. Price is only tangentially related to cost. The primary factors that determine price in a free market are ***supply*** and ***demand***. The concept of demand implicitly includes the subjective valuation that customers place on the item, which is in turn influenced by many factors.

Economic Realities in the Software Industry

- Economies of scale
  - Suppose you have a product that costs $1,000,000 to make.
    If you sell one copy, you sell it for $1,000,000.
    If you sell a thousand copies, you can sell each one for $1000.
    If you sell a million copies, you can sell each one for $1.
- Network externalities
  - The value of the product grows in direct proportion to the number of users
- Customer lock-in
  - The cost of changing software systems is huge
- Diminishing value
  - Inventories make no sense with rapid obsolescence

The Importance of Economics

Economics often has more impact on the direction of computing evolution than technology does. The most significant factors are:

- *Low distribution costs.* Software is hugely expensive to produce, but essentially free to duplicate and distribute. Because development costs can be distributed across a larger base, big players have a distinct advantage.
- *Network externalities.* The value of software increases with the number of people using that software.
- *Shortage of highly skilled labor.* The most productive programmers are in high demand, but short supply.
- *High cost-effectiveness.* Software tends to be remarkably useful, even when bugs exist.

Economics and Philosophical frameworks

- Utilitarianism
- Deontology