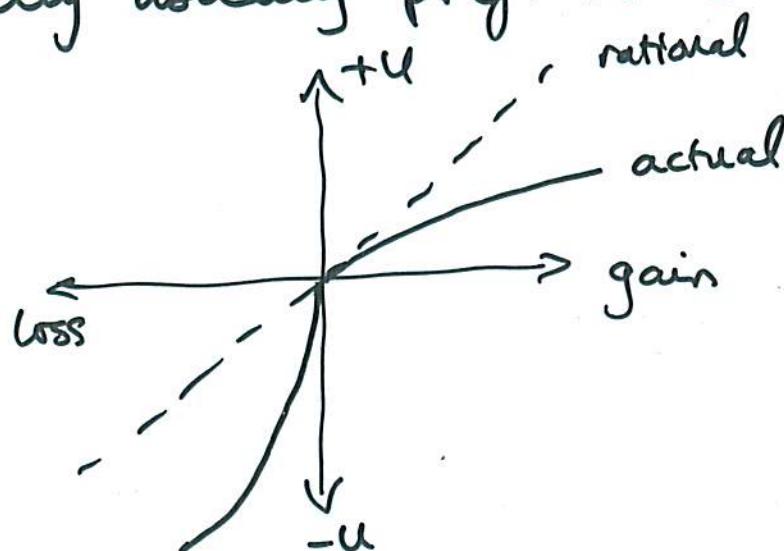


BOUNDED RATIONALITY

- Risk aversion is sometimes rational (e.g. portfolio choice as a function of age) but often it isn't
- People offered \$10 or a 50% chance of \$20 usually prefer the former ; if offered a loss of \$10 or a 50% chance of a loss of \$20 they usually prefer the latter!



- Kahneman and Tversky's prospect theory seeks to explain this in terms of mental heuristics and biases
- This is why marketers talk of 'discount' or 'saving' - frame actions to make them more attractive
- Misperception of risk + uncertainty is a big deal
- Behavioral economics studies all this

BOUNDED RATIONALITY (2)

- The economist Herb Simon coined the term 'bounded rationality' in the 60s, along with the term 'satisfice' (from satisfy + suffice.)
- A satisficer will work hard until lifestyle goals are met, then slack off. Many people are satisficers, and VCs are very wary of this! If you want to raise serious money for a startup, you'll have to convince backers you are greedy / ambitious enough to keep working even once you've got the Ferrari
- Another common rationality bound is 'hyperbolic discounting' where people disregard events in the distant future. Most people have quite inadequate pension provision ... and don't think of the effects on future job interviews of their online activities today
- Then there's the endowment effect : people will generally demand a higher price for something they already own. There seems to be an innate conservatism, linked to sensitivity to change

BOUNDED RATIONALITY (3)

- Decisions are heavily influenced by how they are framed. Eg the 'Asian disease problem': suppose you're making public-health decisions about vaccines to combat a disease that might kill 600
 - A : "200 will be saved"
 - vs B : " $p = \frac{1}{3}$, 600 will be saved ; $p = \frac{2}{3}$ none will be saved"
 - here, 72% chose A over B
 - C : "400 will die"
 - D : " $p = \frac{1}{3}$ no-one will die, $p = \frac{2}{3}$ 600 will die"
 - here, 78% prefer D over C !
- Defaults also matter. If people have to opt in to a company pension scheme, most won't bother; if they have to opt out, again most won't bother.
- 'Libertarian paternalism' is about designing the choice architecture to get the socially optimal outcome while leaving people free to choose differently if they wish. (See Thaler and Sunstein, 'Nudge')

PATENT

- Protects an invention, which must be
 - novel ('prior art' disallows)
 - useful (no perpetual motion machines)
 - non-obvious (to someone skilled in the art)
- Must be registered (per country); and except in the USA, must file before any public disclosure
- Typical duration - 20 years
- Only right it gives you is the right to sue an infringer
- Traditionally, only physical inventions wanted; couldn't protect 'the theories above, or the facts beneath'
- Now, IP lawyer lobby pushing USPTO in particular to grant patents on everything from DNA to business methods...

TRADEMARKS

- Marks capable of distinguishing your goods or services from others (eg 'IBM')
- May be registered or not (registering makes litigation easier) ® - registered ; TM - not
- Registered trademark owners usually win domain name disputes
- Can sue infringers , but have to show a misrepresentation that damages your business
- Pitfalls - some companies very aggressive about registration + enforcement ('McDonalds')

COPYRIGHT

Since Statute of Anne (1709-10), has protected original literary works - including drama, music, art and software. Protects the expression, not the underlying ideas

- No need to register - but asserting copyright ('© Ross Anderson 2002') can make dispute resolution easier
- Duration - has steadily increased over recent years, and is now author's lifetime plus 70 years in most cases
- Protects against copying, adaptation etc; 'fair use' or 'fair dealing' exceptions such as for criticism, parody, private study
- Moral rights remain with author even if copyright sold (last defence against bad publishers)

OTHER 'IPRs'

- Specialist rights
 - database rights (EU only) - protect large collections of data
 - US Semiconductor Chip Protection Act
 - Plant breeder's rights
 - Design rights
- Rights based on contract
 - Materials transfer agreements
 - Confidential information
- Limits - e.g. an employer can't restrict knowledge that's part of the 'tools of your trade'

SOFTWARE

- Primary protection is copyright : programs are 'literary works' (some quibbles at the fringes about export control, but established for copyright)
- Software patents not allowed in Europe : EPC Art 52 'The following shall not be regarded as inventions... rules and methods for performing mental acts, playing games or doing business, and programs for computers'
- Don't you believe it !
- See Richard Stallman's talks on software patents etc, 25 Mar 2002, 30 Apr 2008
- So far, Microsoft's policy is not to sue free software suppliers for infringement. Other patent holders (e.g., Public Key Partners) have been less generous
- In general, innovation in CS is highly incremental ; a large program may use thousands of ideas, while a blockbuster drug is still just one molecule

STRATEGY

- 'IPR': is used in all sorts of business plays, often in combination (e.g., patent on biotech hardware + software copyright + materials transfer agreement on reagents +...).
- Basic IT industry strategy: portfolios are defensive, plus they get access to other companies' patents by cross-licensing
- Startups: what matters is know-how, (but VCs like to see some IP (the mantra is 'global sustainable competitive advantage'))
- The underlying game is the extent to which you can lock customers in
- The largest winnings usually go to firms who end up owning interfaces and platforms (e.g., Windows)
- Royalties by comparison are puny - only 3 patents ever caused \$100m to change hands (virtual memory, public key, mppeg)
- But other industries are different!

DRM | DMCA | EUCD | EUIPRD

- Copyright owners have panicked at previous tech breakthroughs (printing, audiocassette, videotape) but prospered, sometimes with small change of business model
- Current panic at MP3s / P2P / ... and pushing IT industry to introduce digital rights management technology - lock files down with crypto, tamper-resistant hardware etc
- Economic evidence - file sharing doesn't harm CD sales overall, even helps top sellers
- The DMCA made it an offence in the USA to 'circumvent' a copyright-control mechanism, creating 'paracopyright'
- It also led to the Lexmark v SCC case in which Lexmark tried to use the DMCA to control the market for printer cartridges (but lost)
- In the EU, we've had the EU Copyright Directive and the EU IPR Enforcement Directive with a broadly similar effect (but complex due to variations in national implementation)
- The copyright lobby keeps pushing for more ...

TC

TCPA set up in 98 by Intel, MS, IBM, HP, Compaq; now TCG with AMD, Sun + many lower-tier members

Idea: cryptoprocessor on PC motherboard monitors environment and stores keys. Prevents bad things happening to O/S, which in turn lets apps seal data with keys specific to their platform and context ('multiple virtual Playstations')

MS software component to appear in Longhorn, though some planned TC features, such as IRM, shipped already with Win 2003

Others rushing to join, from ARM's TrustZone through Sun to IBM/HP project for 'Trusted Linux'

Concern over lock-in issues (app data lockdown → higher switching costs)

Other issues range from effects on SMEs through censorship bundled with some RM apps through 'trusted viruses' to national sovereignty issues

It didn't ship in its full form with Vista; will we see it in a later SP or OS?

BROADER POLICY ISSUES

- "Paracopyright" - protecting the mechanism rather than the rights gives regulatory power to the mechanism owner
- Security-economics implication : SPDC ? Since the 1970s, the IP movement has shifted power from individuals to employers, small firms to large, poor countries to rich... but hopefully it's running out of steam as the lobby of 'users' grows to equal the lobby of 'winners' in size
- The commons matter - private property is more valuable where roads and parks exist
- So what's the ideal nature, duration and scope of protection? How does this change with technology?
- Further reading : Larry Lessig, Richard Stallman, Pam Samuelson, Suzanne Scotchmer, ...