

Digital Divides and Web Science

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What am I Going to Talk About?

- A few observations about digital division
- Some methodological thoughts about engineering the Web
 - How to begin to amalgamate the two







The Social and the Digital

- Several well-researched digital divides
 - Young/Old
 - Male/Female
 - Rich/Poor
 - White/Nonwhite
 - High Level of Education/Low Level of Education
 - Trained/Untrained
 - Writers/Readers
 - Networked/Isolated
 - Developed World/Developing World
 - Urban/Rural
 - English-speaking/Minority Languages
 - Able-bodied/Disabled
 - Families With Children/Families Without Children







Divided With Respect to What?

- Political functions
 - Receiving government services
 - Democracy: registering votes/preferences
 - Democracy: expressing point of view
 - Privacy
 - Opposing corruption
 - Evading censorship
- Personal life
 - Education
 - Expertise: Google and the doctor
 - Communication
 - Managing memories
- Social life
 - Knowledge sharing/science
 - Commerce and banking
 - Mobile working environment
 - Community memories & histories







Types of Technology

- Preferred access mode to the Internet
 - PC in developed world
 - Mobile in developing world
- Level of technology
 - Laptops
 - SMS
 - WWW
 - Content creation tools (cf. Web 2.0)
 - Servers
 - Proxy servers
 - P2P
 - Semantic Web
 - Grid computing
 - Pervasive computing
 - Web services
 - Ontologies/conceptualisations
- The number of digital divides is large







The Significance of the Divide(s)

- Some surveys suggest that in some countries everyone who wants to be connected is connected (e.g. Dutton & Shepherd 2005)
- Some types of distribution are effectively done by the market (e.g. mobile phone in UK)
- Some types of non-market distribution or intervention will suppress innovation
- Some types of non-market intervention are likely to be inappropriate (e.g. gizmos designed in California for use in Upper Volta)
- Some say techno-optimism is overblown
- Some say that food/peace/land rights come before ICT
- Degree of compulsion?
 - What alternative routes are there to the same access?
- Distort behaviour, unintended consequences
 - Essential to avoid targets
 - Support a prioritarian approach (O'Hara & Stevens 2006)







A Wide Range of Understandings Needed

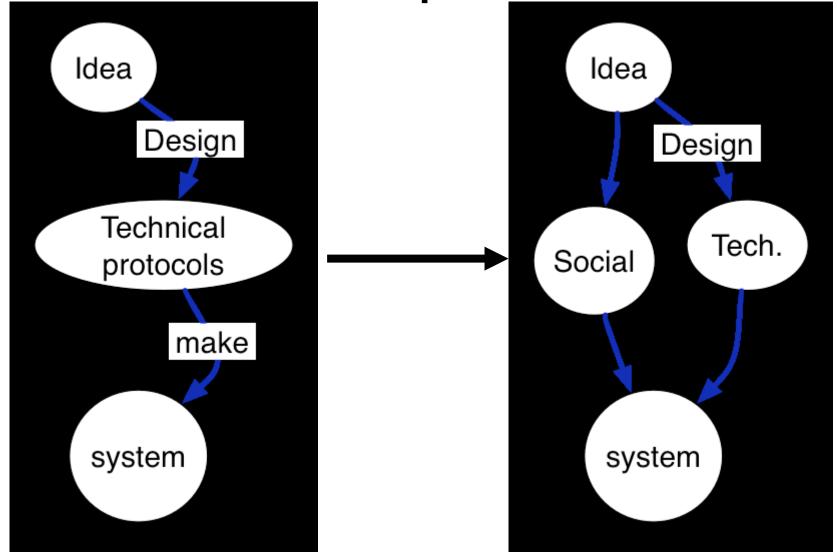
- There is a clear need for social science expertise and techie expertise
 - Need to understand society
 - Need to understand computer engineering
 - Need to understand users
 - Need to understand economics
 - Need to understand network effects at high scale
- Different solutions may be required
 - New systems
 - New interfaces
 - New tools
 - New protocols
- The Web scale changes all assumptions







System Design Makes Assumptions About Use



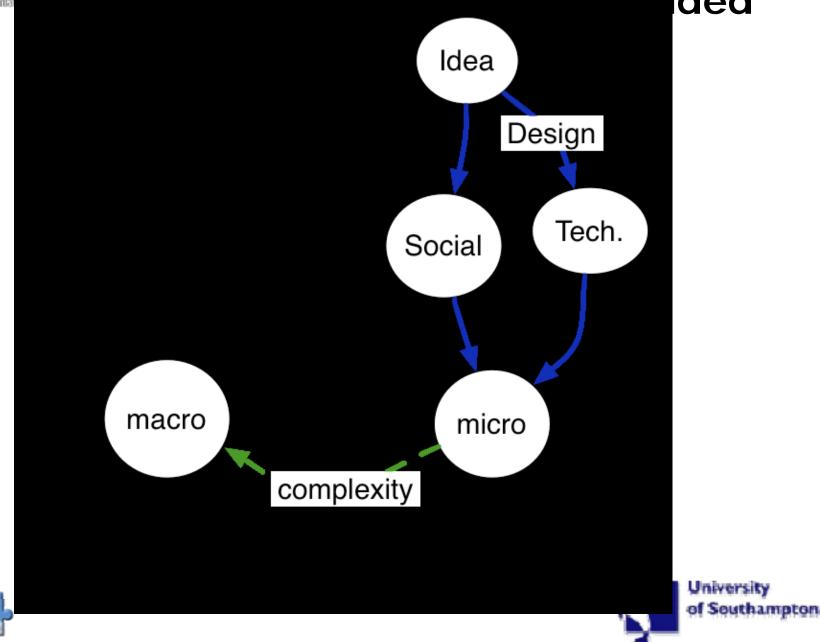






Result can be an Emergent Macro

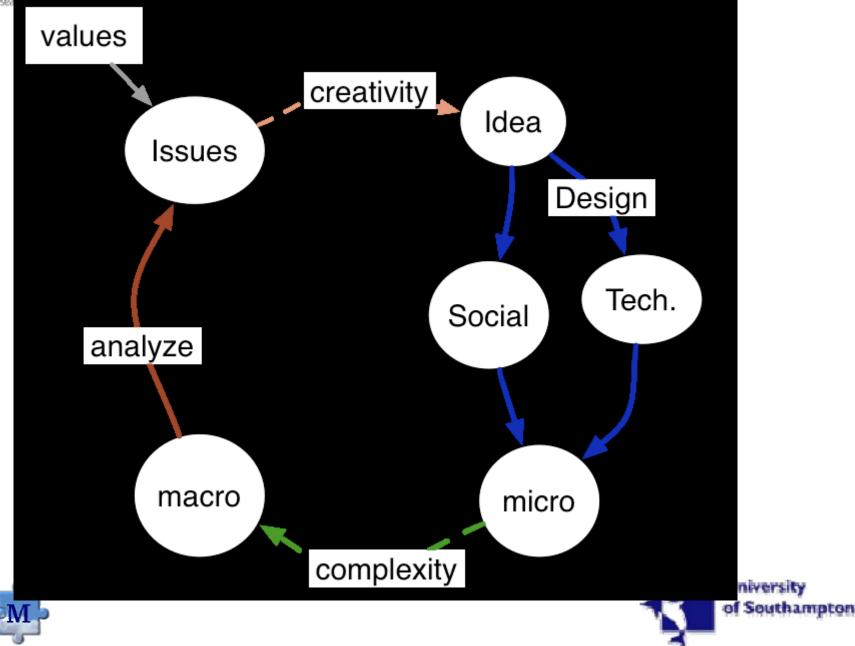
Effect Intended or Unintended





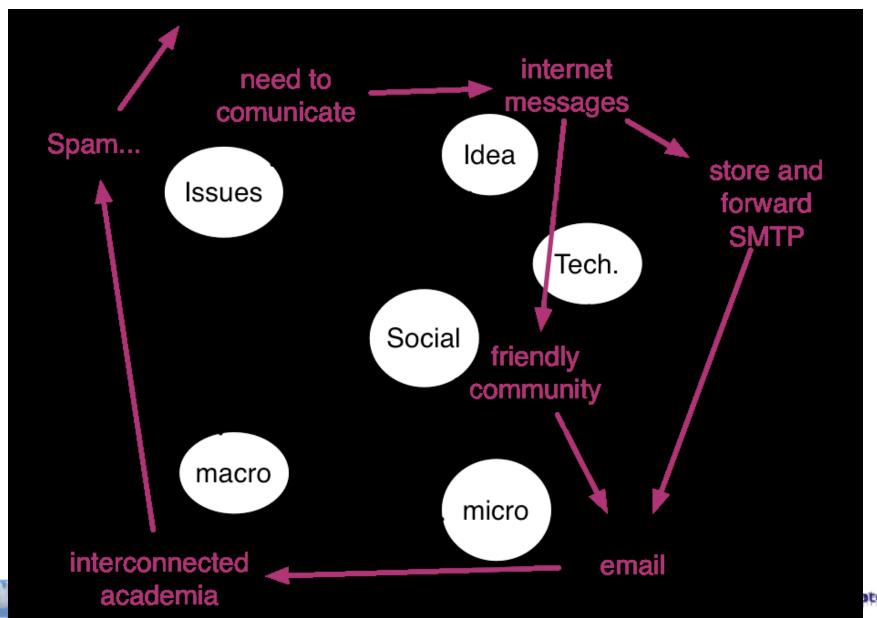


WSRL Science and Engineering in a Cycle





Example: Email

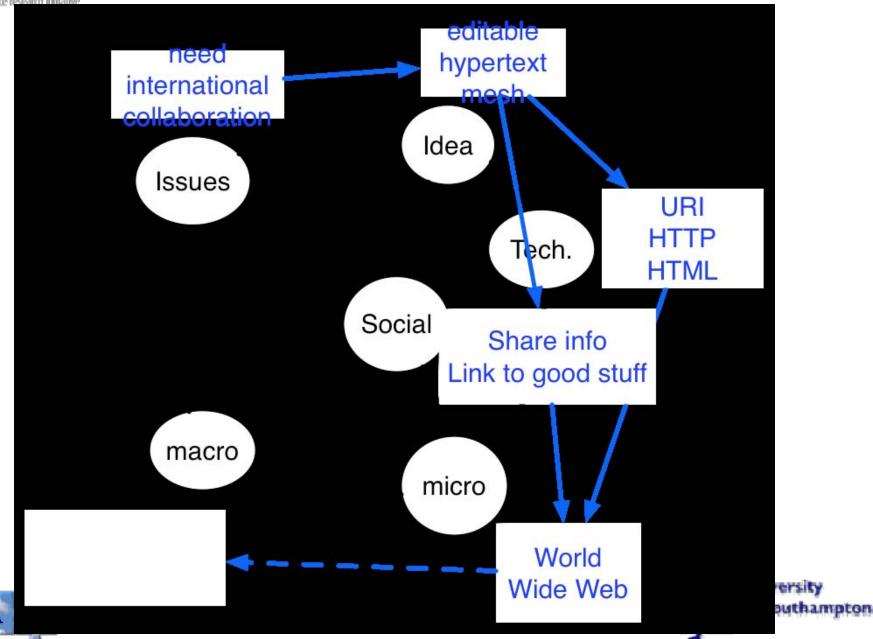




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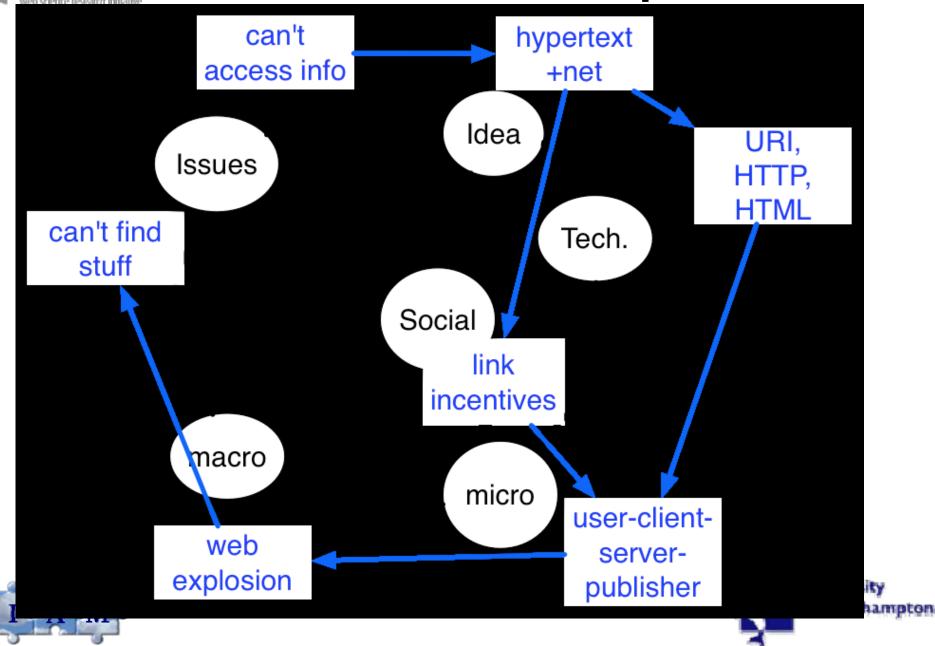


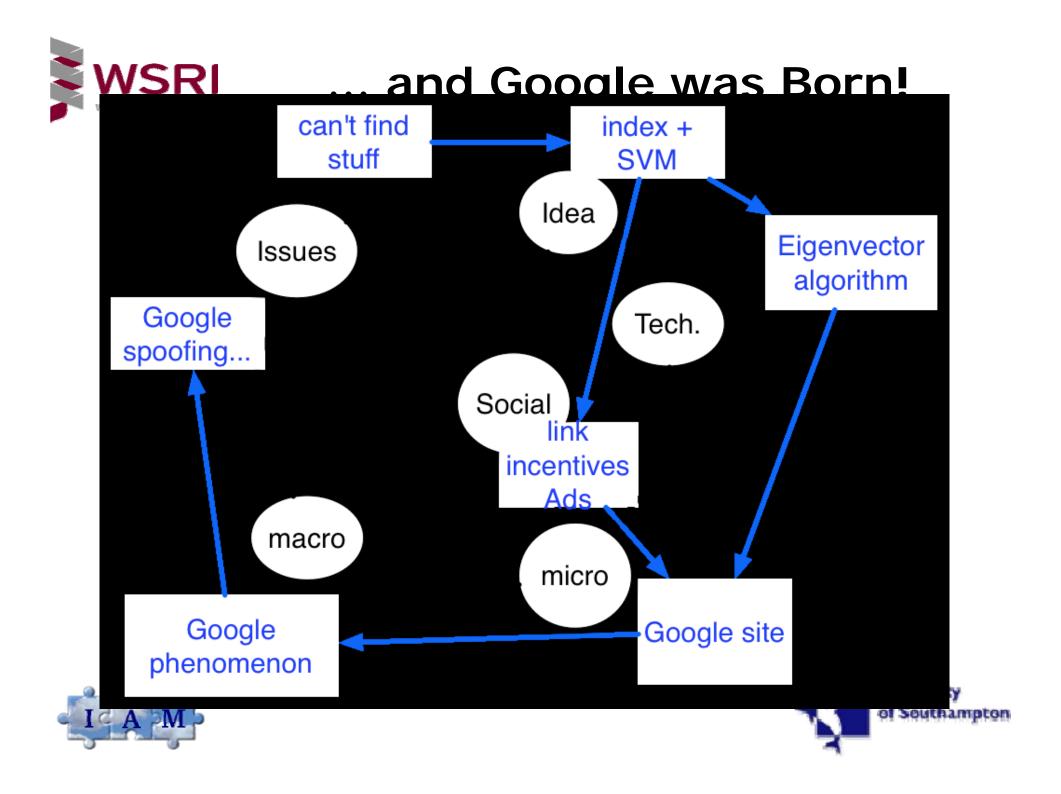
The WWW Itself ...





... a Constant Spiral ...







Lessons

- Web Science is a hybrid of science and engineering
- The Web is open to study and incremental change as:
 - A first class object
 - An endogenous world
 - A decentralised information space
 - Scale + decentralisation = power
 - The most complex piece of technology in history
 - A new idea and an old (cf. Diderot)
 - A combination of information protocols and macro social effects
- Could spam have been predicted from analysis of SMTP (the Simple Mail Transfer Protocol)?
- Could the digital divide(s) have been predicted from analysis of HTTP (the Hypertext Transfer Protocol)?
- Can we map the relation between complex macro effects and micro-scale protocols?







Web Science is Inherently Multidisciplinary

Computer Science

Computability De-centralised Information Systems Semantic Web Process Calculus...

Mathematics

Theory of Graphs Networks Statistics Game Theory...

Engineering

Web

Architectures. Security Resilience...

Psychology

Social attitudes Cognitive properties Human Information Processing Experimental Methods...

Biology

Evolutionary dynamics Systems biology Plasticity...

Ecology

Structure of ecosystems **Ecosystem Productivity** Population Dynamics Digital Biosphere...

Protocols-Accessibility

Sociology

Social attitudes

Theory of groups

Social networks

Plume Tracing.

Artificial Intelligence

Knowledge Representation Languages Inference... Bayesian Methods Agent Based Computing...

Values, attitudes and lifestyles: fast trends Anti-corporate 'Open source' values

New trust matrix: NGOs Ethical consumers Demography

Economics

Theory of Markets Macro and Micro economics ... Auction models Types of capital.

Law

Intellectual Property EU/regulatory drivers Socio-cultural Public engage vs indifferent responsibility

Media

Fragmented public media and discourse Single issue moral panics Smart mobs Mobile opinion formers...







The Web Science Research Initiative

- Joint venture between Massachusetts Institute of Technology and University of Southampton
- Directors: Tim Berners-Lee, Wendy Hall, Nigel Shadbolt & Daniel J. Weitzner
- http://webscience.org/









Conclusions

- Cannot address macro social effects (such as the digital divide(s)) directly
- Must maintain the invariants of the Web experience
 - Decentralisation
 - Reliability of URIs
 - Open standards
 - Neutrality of packets
- But we can change the Web while maintaining the invariants
- We need Web Science
 - Interdisciplinary
 - The Web as a first class object
 - The Web as endogenous
 - Engineering outputs
- Final word from Karl Marx:
 - "The philosophers have only interpreted the world in various ways. The point, however, is to change it."



