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

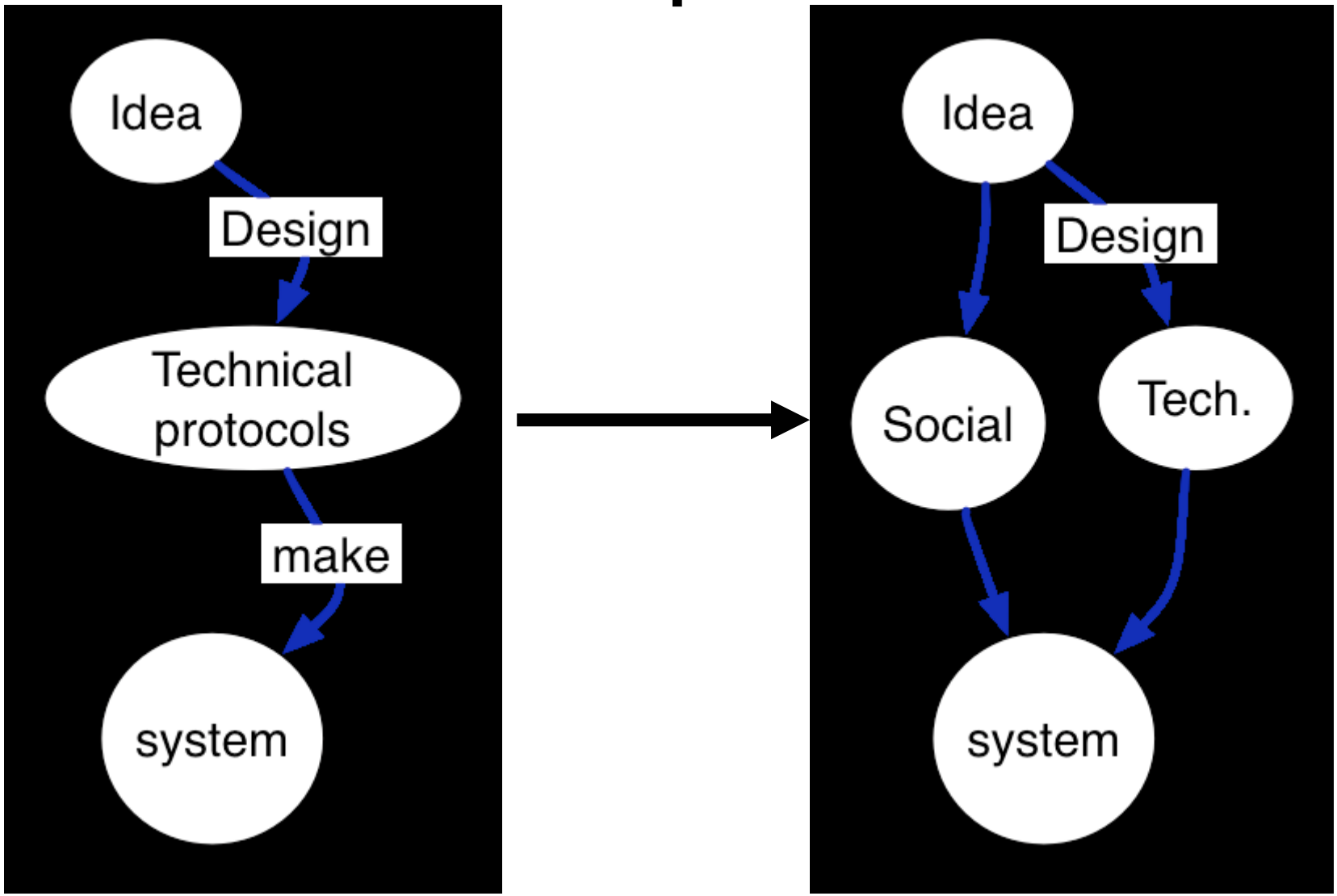
The Significance of the Divide(s)

- 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

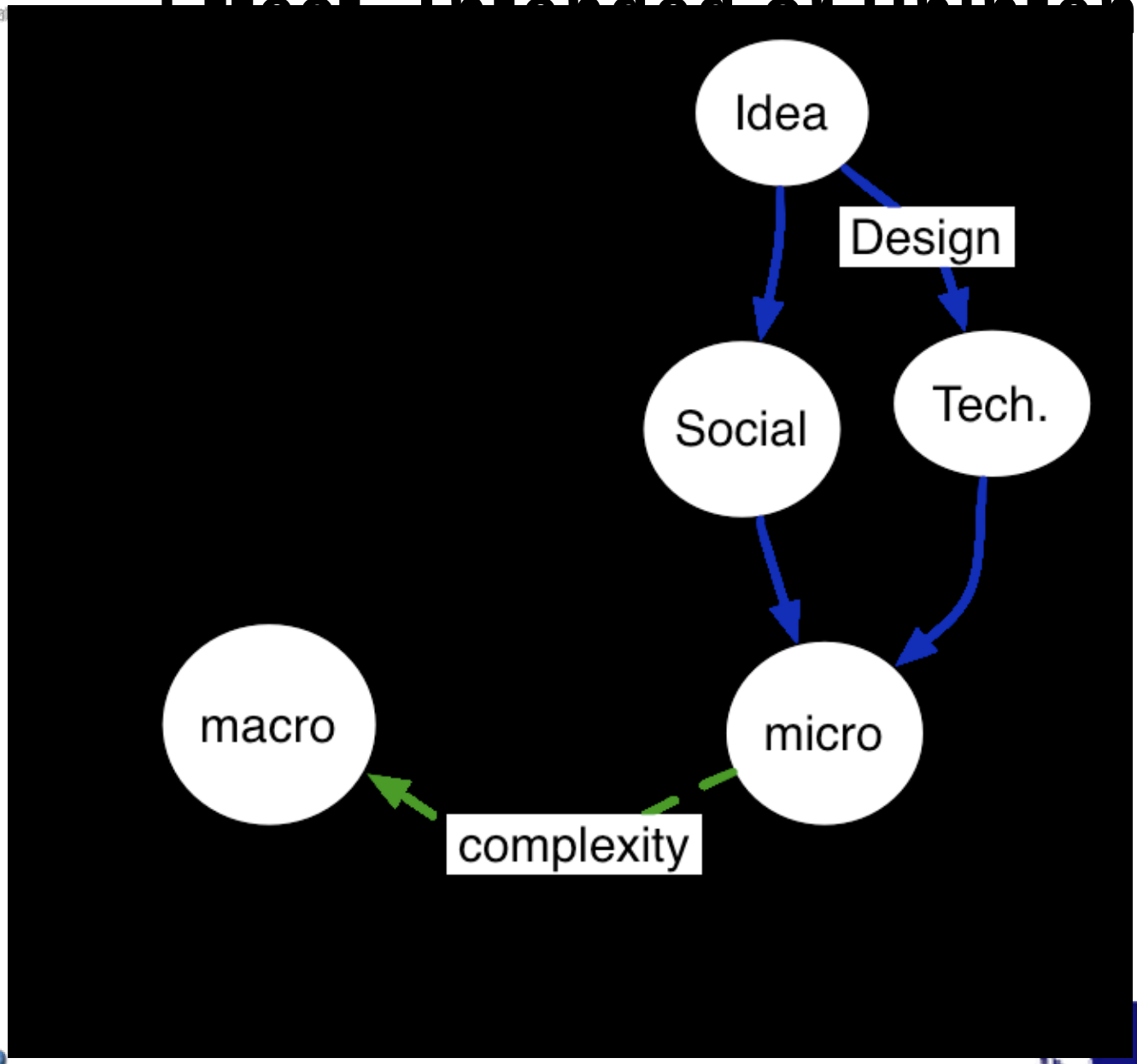
- There is a clear need for social science expertise and techie expertise
  - Need to understand society
  - Need to understand computer engineering
  - Need to understand users
  - Need to understand economics
  - Need to understand network effects at high scale
- Different solutions may be required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

System Design Makes Assumptions About Use

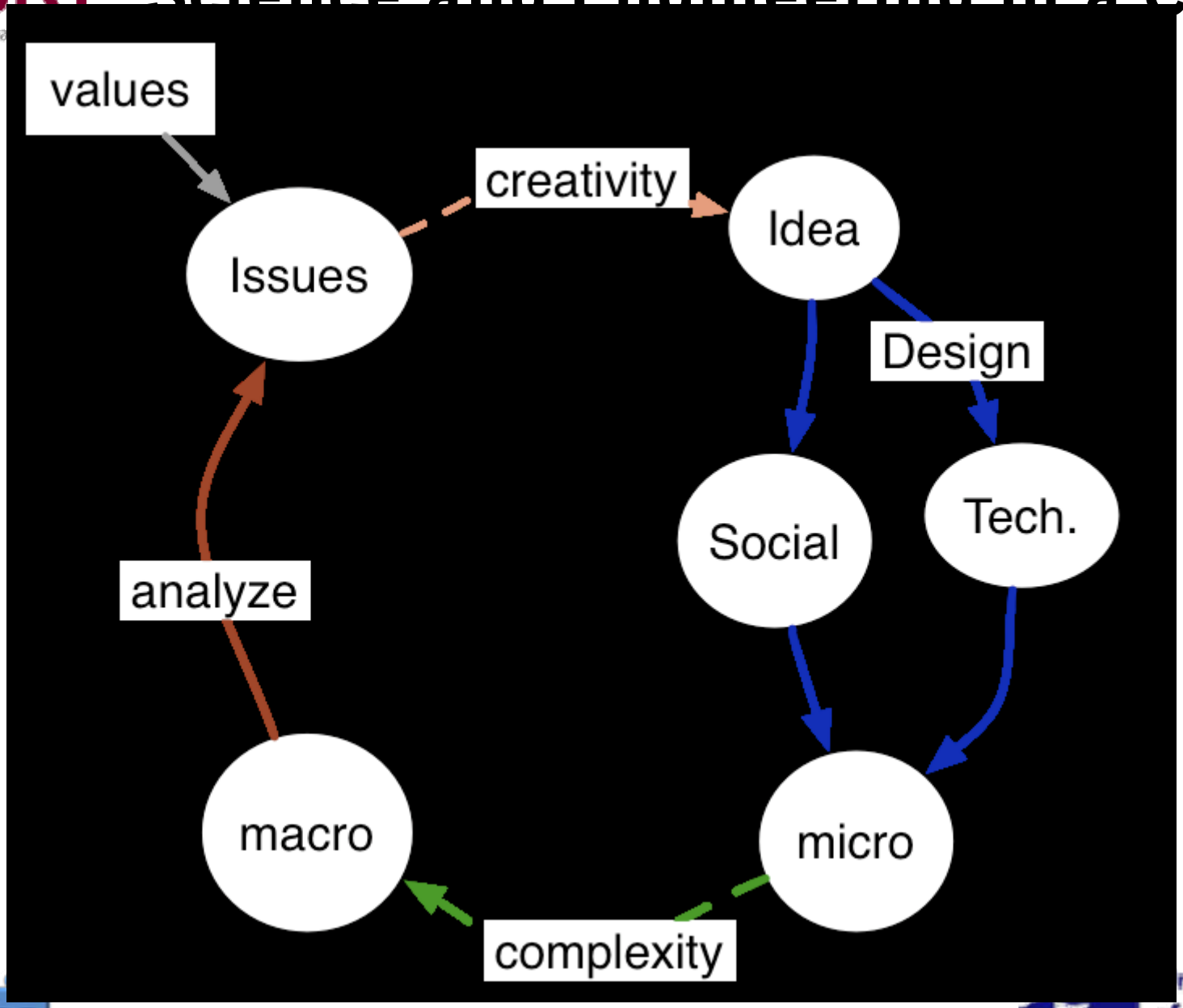


Graphics from Tim Berners-Lee, inaugural lecture, University of Southampton, 2007

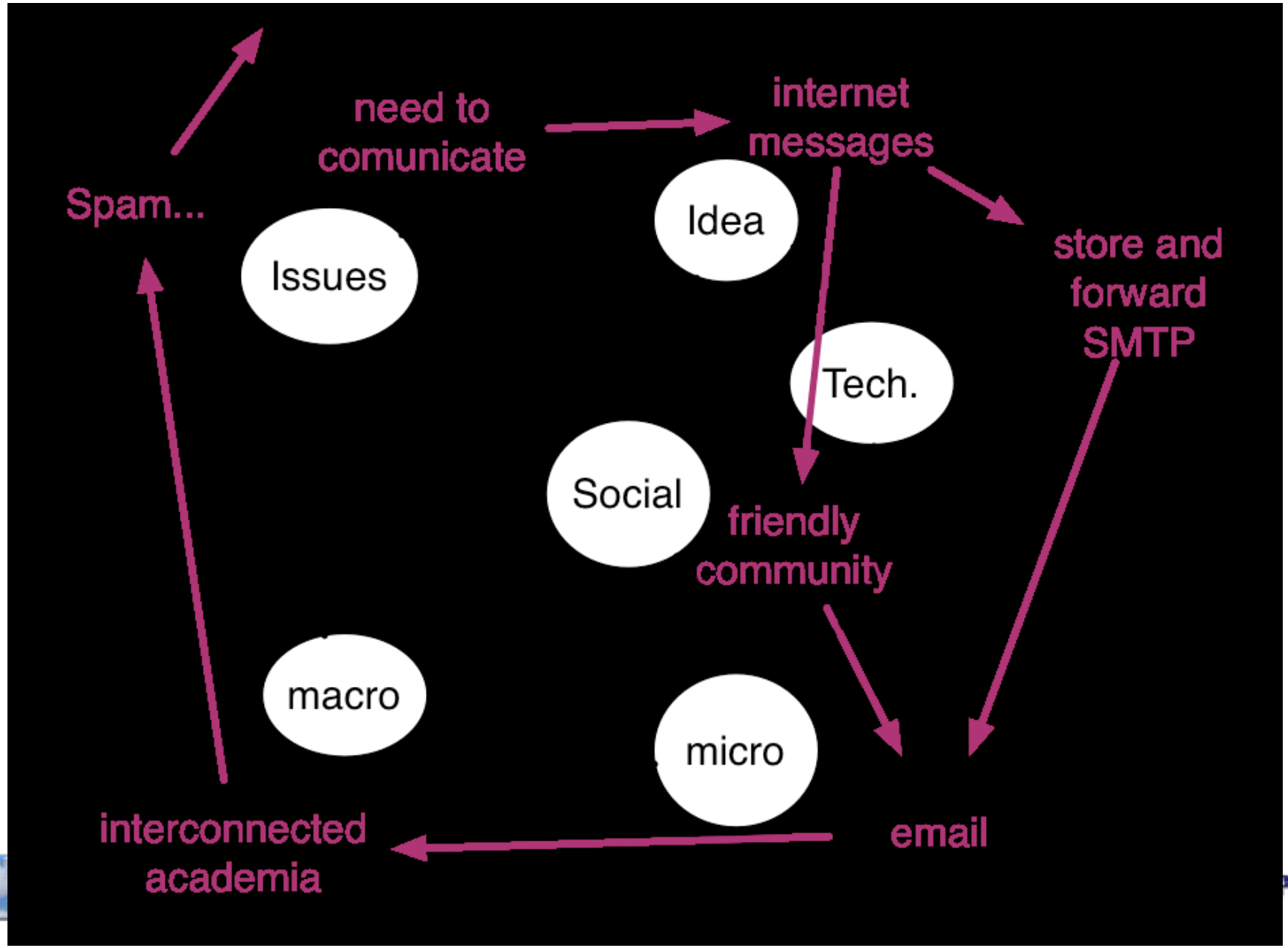
Result can be an Emergent Macro Effect, Intended or Unintended



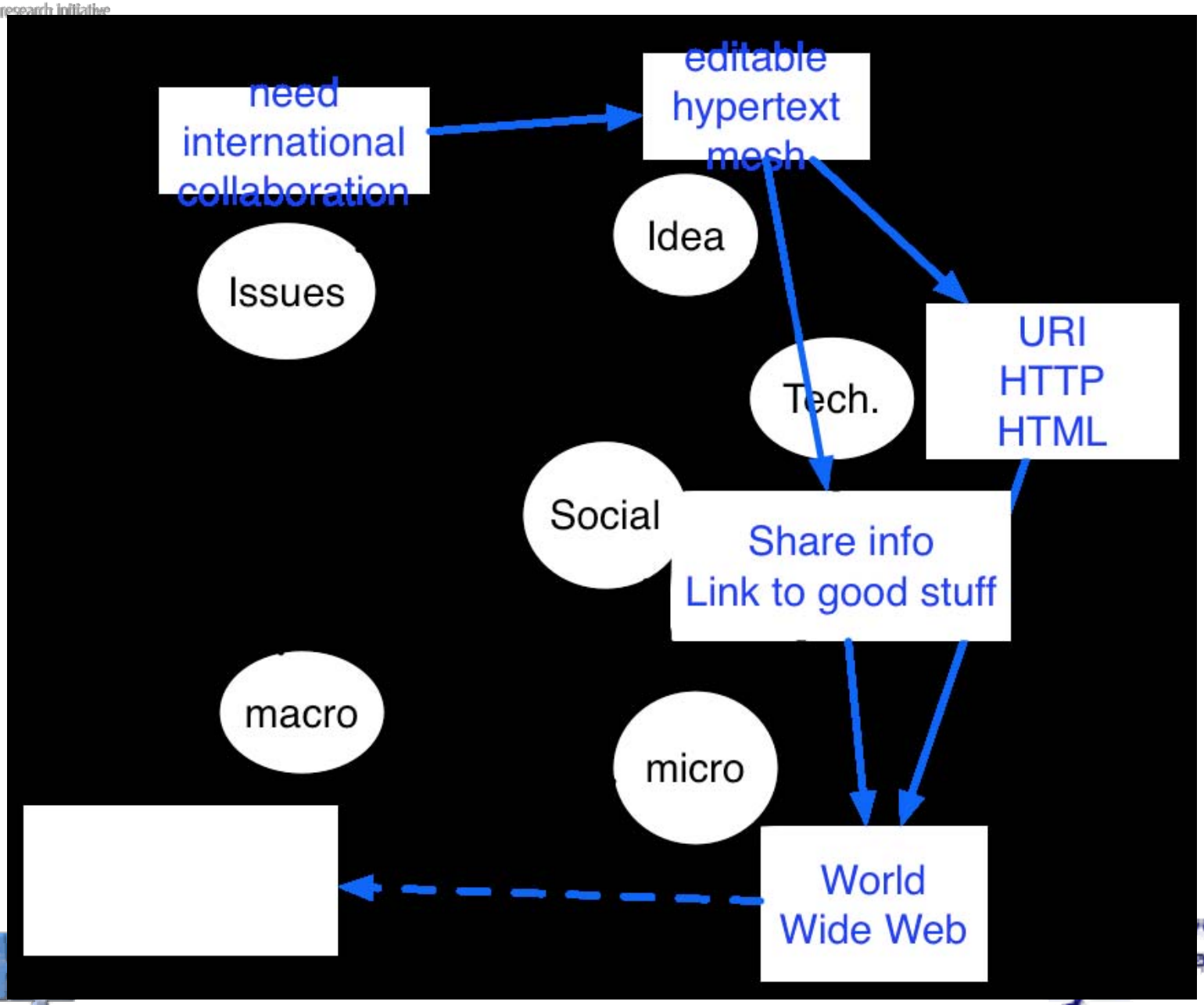
Science and Engineering in a Cycle



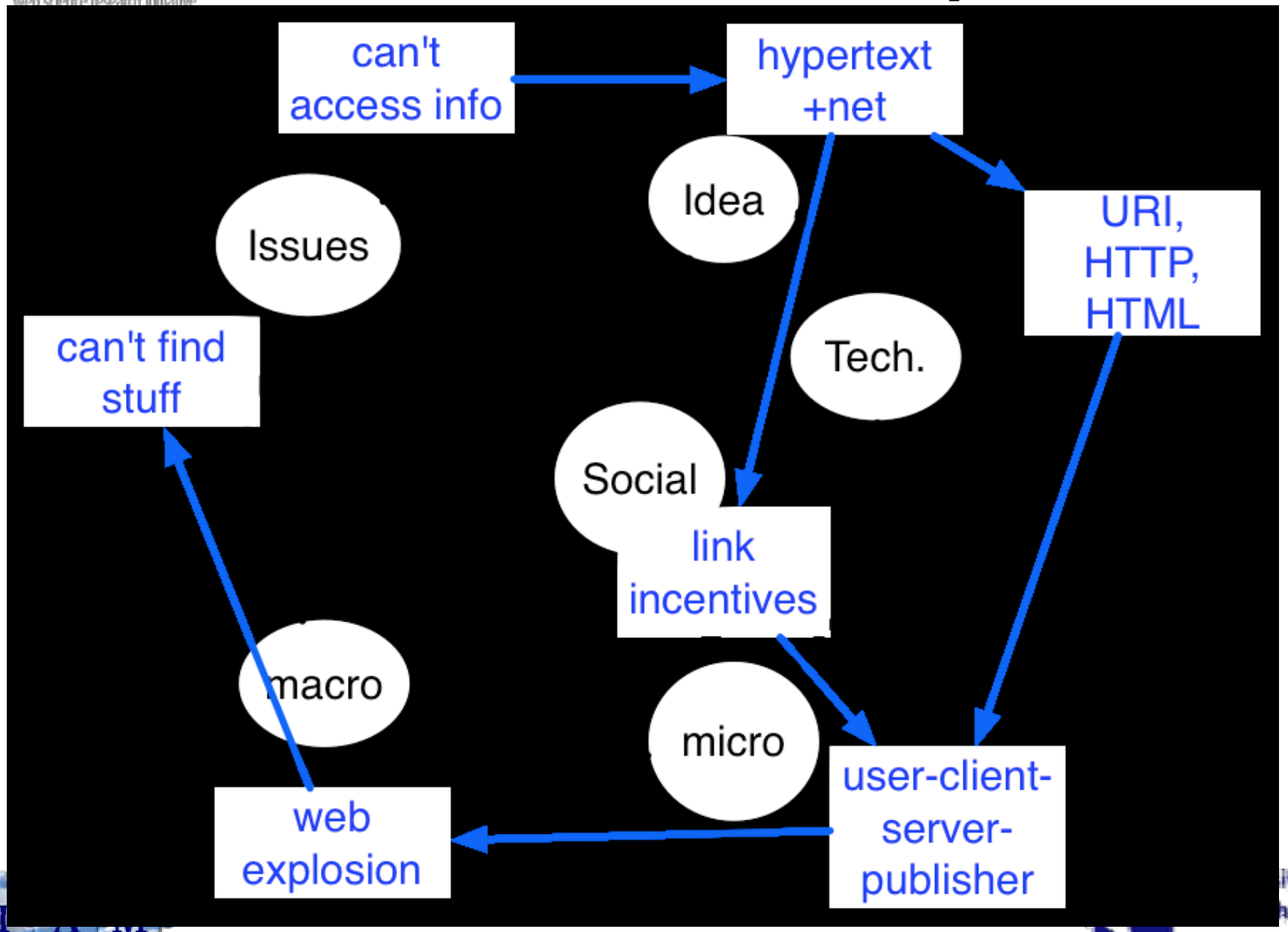
Example: Email



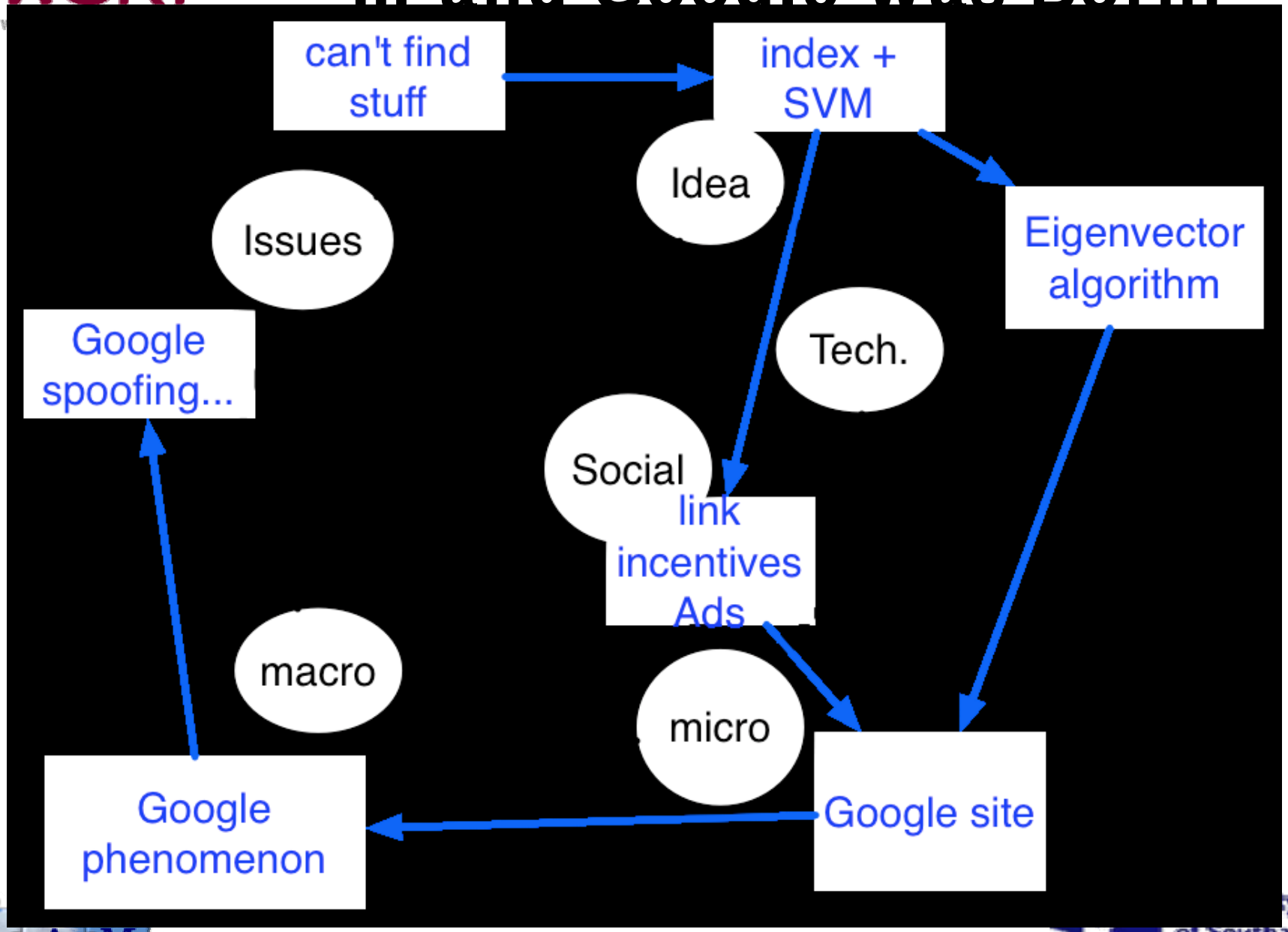
The WWW Itself …



… a Constant Spiral …



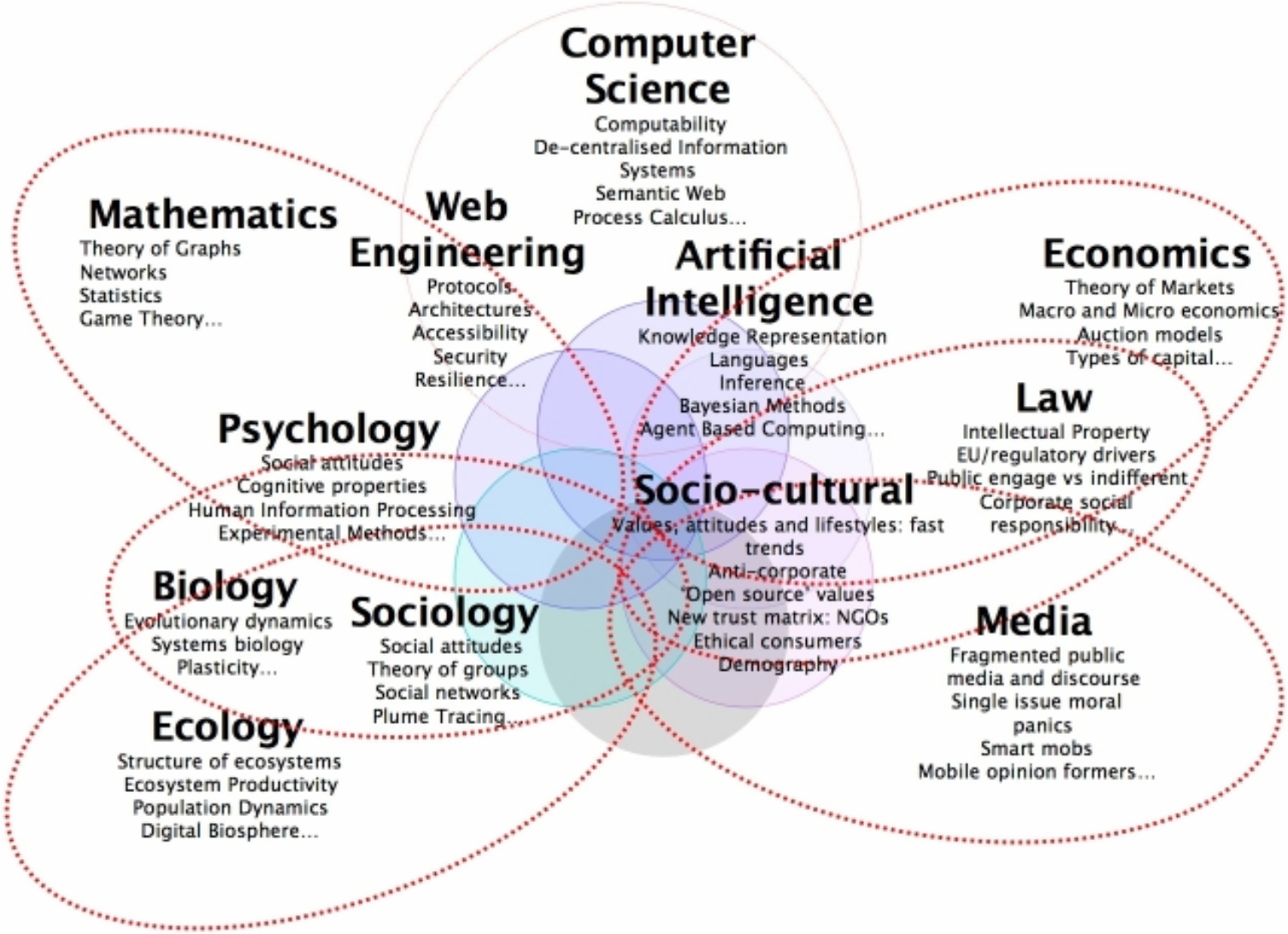
... and Google was Born!



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



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.”