INF 5210
Information Infrastructures
&
Complexity

Assemblage Theory &
Complexity Science

Sociomateriality

- Socio-technical
- ANT, Agential Realism, Critical Realism, AT, ..

Assemblage Theory

- Assemblages of assemblages
- Properties, tendencies, capacities to interact
- Material-expressive roles
- Stabilizing – de-stabilizing processes

Complexity

- Complexity: Socio-technical (Internet, globalization)
- Complexity (-ies) = Number of types of components*number of types of links*speed of change
- Key issues: emergence, ***side-effects*** (=history), incomplete knowledge, unpredictability, out-of-control
- Complexity theories
  - Actor network theory:
    - Socio-technics
    - Order's disorder
  - Complexity Science: self-reinforcing processes, driven by side-effects (network externalities)
  - Reflexive Modernization: Self-destructive processes
  - Assemblage Theory: stabilizing and destabilizing processes

Examples

- Emergence
  - of order
- Interacting, accumulation of side-effects
- New species: Panda with thumb
- Order in a beehive
- De-facto standard (TCP/IP, Windows, QWERTY ..)
- Arab spring
- Financial crises
- Climate change

Complexity & Control/Risk

- Complexity = limited knowledge/understanding = risk
- Charles Perrow: Normal Accidents Theory
  - Chemical plants, air traffic control, nuclear power plants, ..
  - Tight couplings
  - Interactive complexity
- Risk management/mitigation = reducing complexity

- Internet resilience

Complexity Science

- Origin: Natural sciences, economic (history)
- Autonomous systems
- Emergent order (not designed)
- Non-linearity
- Network externalities
- Increasing returns/Attractor
- Path dependency
  1. Diffusion of standards, competition
  2. Change of standards: Backward compatibility
  3. Chain of events
- Lock-ins

- Historical evolution

- Installed base as complex system

A self-reinforcing installed base

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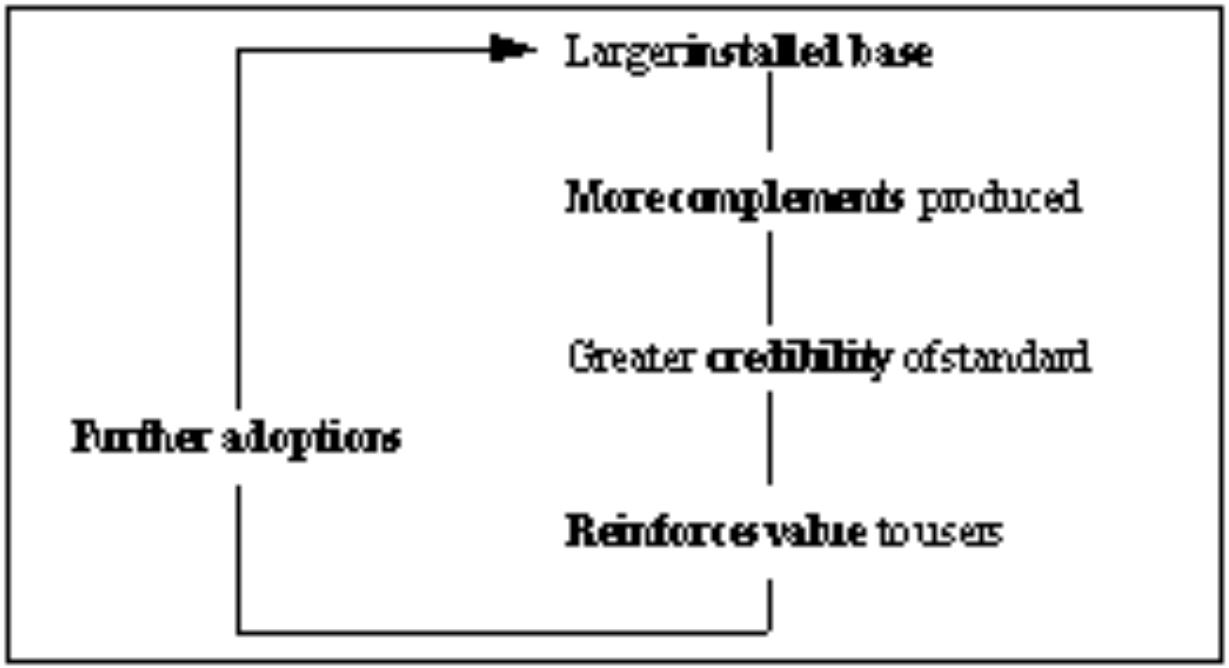

’Multidimensional’ critical mass

- Granovetter’s pedestrians: distribution of individual preferences.
- Diversity of users (motivation, knowledge, style, …)
- Heterogeneity of use areas and of technologies.
- Networks of networks

Design dilemmas

- Take-off
- Lock-in

Design challenges

- Internet, EDI/message exchange:
- Corporate infrastructures
  - Groupware: Take-off & lock-ins
  - Application portfolios: Lock-in
    - From proprietary (IBM, Microsoft,..) to open (Linux, Internet, ..)
    - The legacy systems problem

Some examples

- Internet
- Internet standards
- Windows and Microsoft
- Google
- Standards wars
  - OSI (X.25) – Internet (TCP/IP)
  - Netscape - Explorer
- Ecology wars: Apple, Google, Nokia/MS