Informasjons Infrastructures

Arild Jansen Institutt for Forvaltnings Informatikk, UiO 22.08.2003

Informasjon Infrastructures An introduction

Issues:

- Why infrastructures some different perspectives
- A brief overview of the course
- What is an infrastructure 1
- The economics of infrastructures
- Infrastructures in Norwegian public sector # public infrastructures

Background literature:

- » Hanseth, Ole:
 - http://www.ifi.uio.no/~oleha/Publications/ib_ISR_3rd_resubm2.html Monteiro, E. http://www.idi.ntnu.no/~ericm/IP.final.dobbel.htm
- » Ciborra et al: From Control to drift, kap. 2,4 and 5

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22.08.03/1

22.08.03/3

Some questions

- What do you understand by infrastructure
 - » Give examples of (information) infrastructure
 - » Similarities between physical and electronic infrastructur
- What is the difference between an infrastructure and an information system
- Why do you think infrastructures are important?
- Hvilke spesielle utfordringer er knyttet til å utvikle og vedlikeholde en infrastructure
- What specific challenges is tied to developing and maintaining an infrastructure?

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22.08.03/2

Why talk about II

- Define /describe a set of entities having the same characteristics
 - » Open, enabling, generic, standard,
- Help us understand their specific characteristics
- Help us develop and maintain them
- Can explain the history/trajectory of previous dev.
 » Internet, OSI,SAP,...
- Can (possible) predict about future II building:
 - » EPR, UMTS, PKI,..

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Infrastructure - a misleading concept?

- Legacy from the industrial society:
 - » Emphasizes the physical and material underlying basis
 - » Stable, heavy, difficult to modify/slow changes
 - » Closed, limited in space (and time?)
- The new information society
 - » Global
 - » Flexible, dynamic
 - » Everything is changing, increasing speed
 - » Open, unclear boundaries,
 - Ecologies of infrastructures
 - » Changes implies learning learning implies changes

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Information systems or infrastructures

Information systems - the traditional approach:

- » Management is control
- » Business strategy \rightarrow Top-down strategic alignment
- » Claims that IT and infrastructure are flexible
- » Installed base are neglected
- » Standards are either neglected or taken as granted
- » Assumes centralised control
- » More complex IT-processes and standards
- » Implementations → Surprises, side effects unexpected outcomes of technology and organisation
- » Compromises \leftrightarrow installed base

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2.08.03/5

What characterises an infrastructure

The US Government when building an Nat II: (based on McGarty among others

- Shared (sharable)
- Enabling
- Standardized
- Open and common
- Socio-technical
- HeterogeneousInstalled Base
- Instance

• Enduring

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22.08.03/6

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What characterises an infrastructure-2

Star Ruhleder (Steps to an ecology of knowledge)

- Embeddedness
- Transparency
- Reach of scope
- Learned as part of membership
- Links with conventions of practice
- Embodiments of standards
- Built on an installed base
- Becomes visible upon breakdown

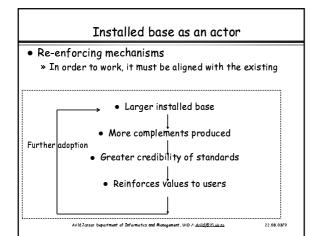
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Installed base

- Infrastructures are never designed from scratch(?)
- Something always exist
 - » We cannot bypass the history
 - → Can only be modified and extended
- The installed base includes:
 - » Nodes in the network; equipment and software, vendors,...
 - » Protocols, standard and standard bodies, documentations,
 - » Operations and support, documentations,
 - » Knowledge and experience, textbooks
- → The installed base as a heterogeneous actornetwork

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22.08.03/8



Universialism and installed Base

Is universal design possible and desirable

- Examples: OSI-protocols (X.25, X.400), EDIFACT, SAP, electronic patient-journal
 - » Top-down development,
 - » Uniform and standardized network on all levels
 - » The goal is the perfect solution including most facilities
 - » 'Closed world
 - » Centralized control
 - » Monolithic organization

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22.08.03/10

An alternative strategy: The Internet model

- The TCP/IP approach:
 - » Need to connect different networks
 - Connectivity at meta-level
 - Best efforts approach
 - » Balancing standards and flexibility
 - Openness,
 - Duplication, gateways
 - » Minimal standards
 - Incompleteness, gradually improvement
 - » What aspects are relevant
 - Technical
 - Humans
 - » Internet has gained momentum and become an actor that influences society at all levels
 - Serves many different user communities,...

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The case of Internet-some basic characteristics

- The idea of packet switching and datagrams (Kleinrock)
 - » Distributed, digital and redundancy (Baran)
 - » IMPs: how to avoid n*(n-1)/2 (Kahn)
 - » Symmetric protocols (NCP, SMTP. FTP....)
- Open Architecture Networking
 ** TCP/IP and black boxes: routers/gateways (Cerf, Kahn)
 - » Open network of independent network and No global
 - » Best offer service transmit and retransmit
 - » End-to-End responsibilities for error check, flow control
 - » Domain Name System
- Incorporation of TCP/IP in Unix BSD
- WWW: URL, HTTP and HTML

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Basic ideas -2

- Its roots in academic tradition and basic research philosophy
- The openness: free flow of ideas and innovations
 Open access to all documents
 RFC (Request for proposals)
- The public funding of the development (and diffusion)
 - » Academic and research network infrastructures like NSFnet, HEPnet, JANET, NordUNet,...
- The formation of open communities
- Peer institutions as IAB, IETF, W3C
- Open source movement
- The gift economy

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22.08.03/13

Strategies

- Flexibility
 - » Flexible standards and technical solutions
- Modularisation and encapsulation
 - » E.g. The Internet IMPS and layered structure
- Minimal solutions
 - ightarrow E. g Internet versus OSI-protocols
- Gateways
 - » From $N^*(n-1)$ to M (= different protocols or subnets)
- Transitions strategies

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22.08.03/14