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Paradigms for Development of Spatial Data Infrastructures

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Paradigms for Development of Spatial Data Infrastructures
Introduction - Proposed paradigms

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PhD course, September 24. - 26. 2007

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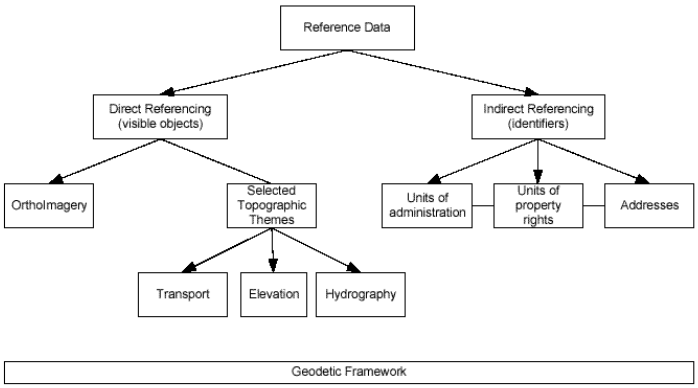
Introduction: The basic terms

- Spatial data
- Infrastructure
- Development of infrastructure (in need of a paradigm)
- Paradigm
- Overview 2: Proposing an operational paradigm

Spatial (reference) data



Source: ETeMII Reference Data White paper, 31. July 2001, p 9

Infrastructure, e.g. Groot, McLaughlin (2000) Geospatial Data Inf.

Infra:
Literally (latin): Below. Meaning supporting something *above*

Examples:

- Railway track (spor), embankment (dæmning) supporting *transport*
- Raw material, tools, work force supporting *superstructure* (K Marx,1850s)
- Airfields, oil pipes, ammunition supporting *warfare* (NATO, 1950s)
- Federal investments in transportation, .., energy, environmental pro- tection supporting *economic growth, quality of life* (Clinton, 1994)
- Cadastre+land registry, supporting *real property rights* (ESt, 2003)

Question: Are 'geospatial data' and 'infrastructure' of same kind?

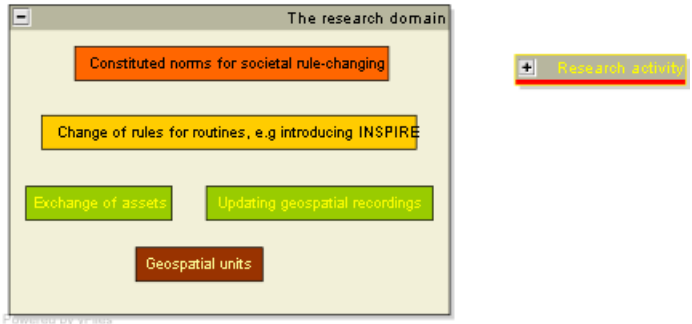
Geospatial data include

- Coordinates, location of terrain objects
- 'Measurements' of physical attributes (areas, floors,.., valuations)
- Names of terrain objects (roads, churches,..), of cadastral parcels
- Rulings and zonings (land use codings, restrictions, ..)

Except for measurements, data belong to the domain of communication among humans.

Infrastructure
an artefact, obeying to the laws of nature + what makes it function

Approaching the notion of 'Paradigm': Not in research domain



The notion of 'Paradigm': Components of scientific work

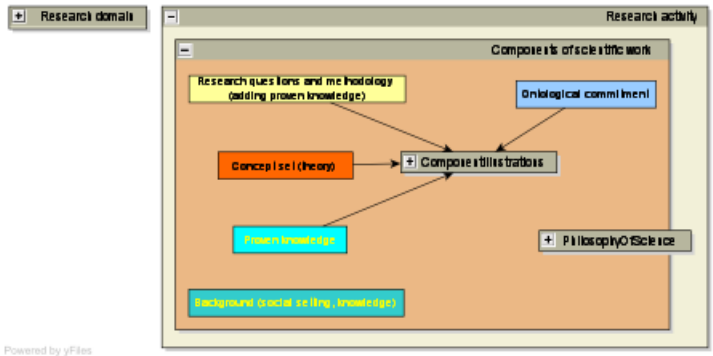
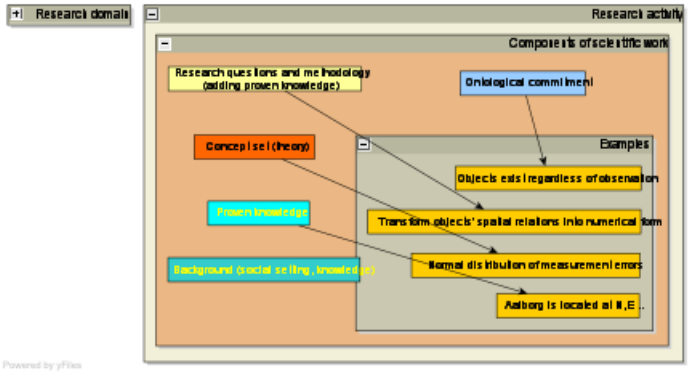
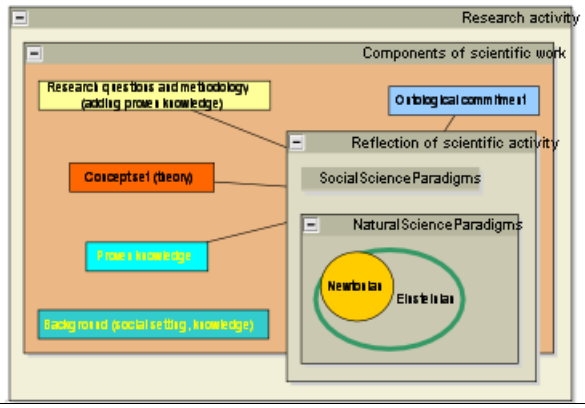


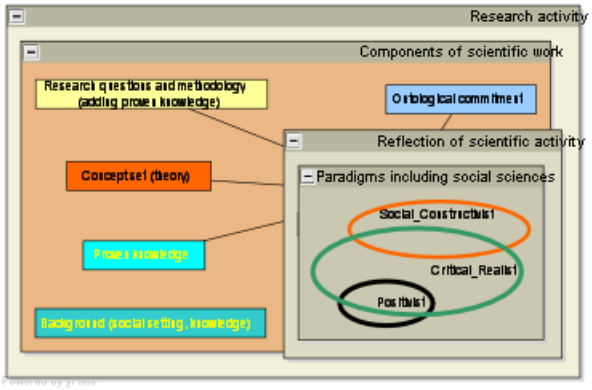
Illustration of components



Paradigms: A configuration of components



Paradigms including social sciences



Components of a paradigm

- Preferred research questions, and prototypical answers
- A set of concepts, theories
- An ontological commitment, e.g. on the possibility of objectivity
- A narrative on the emergence and relevance of the paradigm

Kragh & Andur Petersen (1981: 168f)

Opposing Kuhn (and K,AP), Sayer (1992) argues that conflicting paradigms have a large body of shared concept sets, cf. the overlapping

The paper by Yola Georgiadou, ITC, and Francis Harvey

"A weakness of spatial data infrastructure (SDI) studies has been the limited uptake of research outside of positivist and scientific-technological perspectives." ..

"We review the development of information system research approaches and consider key positions from its diverse ontologies (positivism and interpretivism) and theories (strategic alignment, interactionism and social construction)."

"The interactions among institutions ..need to be considered in terms of a multiplicity of desired outcomes .., and the history of interactions."

G & H: Accounts of info. infrastructure in IS research in 1990s

Information Infrastructure account	Information infrastructure as:	Informed by:	Exemplary proponents:
Positivist	An assembly of technical and human resources; a proxy for competitiveness of the (global) firm	Management science - strategic alignment	e.g. Weill and Broadbent (1998)
Interpretive	An ensemble of social relations (or interactions)	Symbolic interactionism theory	e.g. Star and Ruhleder (1994)
Interpretive	A heterogeneous collage of mutually constitutive technologies, networks, standards to support a diversity of application areas over time and space	Actor-network theory (ANT)	e.g. Ciborra and associates (2000); Nielsen (2006)

Summary so far:

- The scope and basic concepts of the course have been introduced.
- The basic concepts are aligned with recent research positions
- Competing paradigms proposed for consideration:
  - Positivism
  - Actor-network theory (ANT)
  - 'Symbolic interactionism theory'

Overview 2: Proposing a framework for SDI development studies

1. Comments on the proposed ANT and interactionism
2. Reference to more operational paradigms
3. Conclusion

'Symbolic interactionism theory' ???

" ..the technical artifacts and people are de-emphasized. The focus is on relations or interactions, as arguably the only thing that is knowable."

"we [Star & R] hold that infrastructure is fundamentally and always a relation, never a thing."

-

ESt: Simplistic position. Artifacts and people as well as relations among them can and should be considered knowable. (This is an ontological commitment)

Actor-network theory (ANT)

Interpretation of the research domain: A socio-technical network

Example: Cars

- Roads, petrol stations, traffic regulations and highway code, car factories, police, multi-storey carparks, ..
- Technical artefacts, persons, organisations

Ontological commitment by ANT:

- Technical systems tend to determine a development path, e.g. QWERTY (Role of human agency?? ESt)
- Knowledge is (always? ESt) local and socially constructed (Comber, 2003)

Callon, 2001, in Stubkjær, 2004

A concept set (˜ theory), which reflect human agency

Social arena
A place where different communities of actors meet to discuss shared .. projects and concerns, e.g. a committee
Actor
Physical person, representing an organisation
Actor networks, policy issue networks
Rather stable actor interactions, due to acknowledged mutal dependency, e.g. SDI-related committee structures
Agenda
Established, but not controlled by actors in arenas. Actor networks create an 'identity space'. May change over time.

Gärtner & Wagner, 1996; Schneider, 1988, in Stubkjær, 1999
Coleman, 2001; Marsden, 1985; Marin, Mayntz, 1991; in Stubkjær, 2004

Addressing the development path: The role of history

QWERTY: Past technical solutiotions and present practise restrict development options

The 'path of dependency' (North, 1990) applies not only to technology

Consequence: History matters! We know, but it should be reflected also in our research.

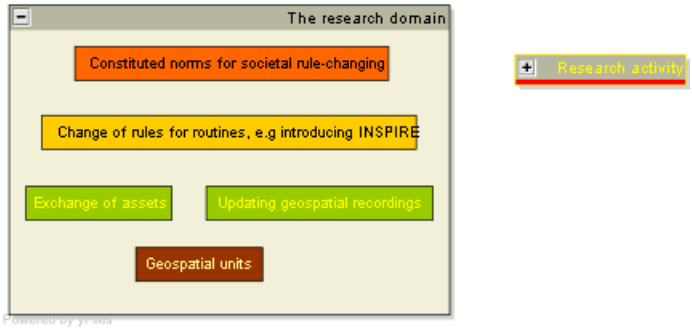
Levels of social analysis according to O. Williamson (2000)

Levels of social analysis L1..L4	Frequency (Years)	Examples
L1: Informal institutions: Traditions, norms; religion	10^2 to 10^3	Proclamation and change of belief systems; reformations.
L2: The institutional environment: Who is authorized to change rules	10 to 100	Constitutional changes. Redesign of government, e.g decentralization. Implementing or changing of property rights, e.g. restitutions.
L3: Governance: Play of the game - changing rules	1 to 10	Change of rules for processes and information flows. New organisations. Institutional transactions
L4: Resource allocation and employment	Continuous	Transactions in assets: e.g. purchase of house; Change of property unit: e.g. subdivision

SDI development in theoretical terms: Institutional transactions

L1+2: Ideas, the institutional setting	Social Values and Norms condition		
L3: Collective transaction in institutions	Organisational *interactions* on change of rules, organisations, information systems: Definition of roles, competency, procedures		
L4: Individual transactions in assets and services	which restrict and enable Transfer of property rights (e.g. sale), subdivision, etc.		
Material objects	Persons	Terrain objects	Databases

A theory-supported structuring of the research domain



Summary

- The scope and basic concepts of the course were introduced.
- The basic concepts were aligned with recent research positions
- Competing paradigms were proposed for consideration
- An operational set of concepts, suggested by prominent scholars, was finally proposed:
  - Actor, Policy network, ..
  - Levels of social analysis, transactions, .. NIE
- but alternative proposals are indeed welcomed ;-).

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