Workshop on e-Governance,
Knowledge Management and e-Learning
April 27-29, 2006
Budapest, Hungary

Quality of Spatial Data for e-Government from an Ontological View

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Outline

- Introduction
- 5-tier Ontology
- Measures of Quality
- Decision Processes
- Consequences for e-Government
- Conclusions

Introduction

- E-Government is one of the priorities of the European Union
- Advantages: User friendly
  - „24/7“ access
  - Reduction of travel time
  - Reduction of interaction time
- Requirement: Predictability

Example

- **Digital access to land register**: Simplifies process of getting data
- **Digital application for registration**: Simplifies registration process

- Only possible if digital archive is complete!
- **Otherwise**: Search necessary or outcome unpredictable

Problem

- Connection between data quality and predictability
- Approach: Tiered ontology

Ontology

- Philosophy: Science of being (Aristotle) ➔ **only one** Ontology
- Computer Science: Explicit specification of a conceptualization (Gruber 1993)
  - Many different ontologies
  - Top-level ontologies provide a framework for these ontologies
  - 5-tier ontology is such a top-level ontology

5-tier Ontology

Tier 0: **Physical reality** – assumes a single physical environment

Tier 1: **Point observations** of tier 0

Tier 2: **World of objects** – set of points with unique properties

Tier 3: **Socially constructed reality** (Searle 1995) – social objects

Tier 4: **Subjective reality** of cognitive agents

Measures of Quality

- Quality: Superiority of a manufactured good/high degree of craftsmanship
- Measures for quality of data necessary due to imperfect observation and classification processes
- Quality of data on social reality
  - Observation: Data quality
  - Classification: Uncertainty

Data Quality

- Observations contain errors
- Described by statistical methods
- List of different aspects (Guptill & Morrison 1995, Wang & Strong 1996, Veregin 1999)
  - Lineage
  - Accuracy
  - Completeness
  - Logical consistency
  - Semantic accuracy
  - Temporal accuracy

Uncertainty

- Object classification is based on concepts
- Concepts with vague boundaries lead to problems in the classification process
- Main aspects (Fisher 1999, 2003)
  - Error
  - Vagueness
  - Ambiguity
  - Discord

Decision Processes

- Data is collected to make decisions
- Decisions may influence tier 2 or 3
- E.g. stabilizing the Leaning Tower of Pisa, subdivision of a land parcel
- Tier 2: Technical system
- Tier 3: Social/legal system

Decisions in technical systems

- Statistical methods to deal with random deviations of observations
- Statistical testing, adjustment computation
- Decision based on specified confidence level
- Can include old observations as well as new observations
- Can **optimize complex systems**
- Problem: Difficult to handle for humans

Decisions in legal systems

- Based on subsumption – transforms the real situation to a social construct
  e.g. *murder* ist the *unlawful killing* of a *human being* with *malice* and *forethought*
- Series of **simple** decision
- Result will not be optimal in a technical meaning
- Problem 1: Room for decisions
- Problem 2: Combinations of technical and legal decisions (Is 3.96m less than 4.00m?)

Consequences for e-Government

- Goal of e-Government: Simplification of administrative processes
- Examples
  - tax declaration
  - application for inscription in land register
  - publication of laws
- Common characteristics: Socially constructed objects only

Example Land Register

- Contains owners, encumbrances, restrictions
- Registration against owner/beneficiary only
- Incomplete/wrong data on owners/ beneficiaries makes result unpredictable
- Frequent problems with predictability may destroy **trust** ➔ e-Government processes may not be used

Conclusions

- Prime concern for e-Government is predictability
- Key elements
  - Clear legal concepts
  - Data accessible for customer and used in process must be the same
- Thus 2 steps to implement e-Government
  - Determine well established, straightforward administrative processes
  - Setup electronic processes for these administrative processes

Thank you!

- Questions?
- Comments?

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