IS: What Is It?

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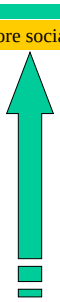
Two *Really* Different Traditions of IS

- **C-IS**
  - Defines itself as branch of Computer Science
  - Computational paradigm, engineering science
  - Focus: representation and construction of IS as designed artefact
  - Perspective: inside IT, inside-out
- **M-IS**
  - Defines itself as branch of business school research
  - Empirical research paradigm, social science
  - Focus: organizational and managerial variables surrounding IT employment
  - Perspective: outside IT, outside-in

KNAW Research Schools, SIKS, IS

- (M)IS as social research
  - → prime reference is external side of IT
- Information (System) Science
  - → SIKS:
  - → (C)IS, with reference to both
    - *(1) IT technology and*
    - *(2) external use [in **this** order in practice]*
- Computing Science
  - → IPA
- Computer Science
  - → ASCI



IS: What are Key Issues in Defining the Field?

- What ***is*** the core object of IS research?
- Is it actually an ***independent*** scientific field?
  - → or just an amalgam of various other disciplines?
- What kind of interesting scientific ***results*** IS may be expected to deliver as a field?
- What are IS' specific epistemic ***foundations*** and scientific methodology?
  - → "Rigour or relevance"?
- Is IS actually ***producing first principles and core theories*** about its subject matter?
  - → If so, what are these key insights?

Images of Science (1/2): Exact Sciences

- **Theory**
- Theory ≈ formal math and its machinery
- Fundamental "first" principles
  - *Axiomatic basis for theory (Euclid as classical role model)*
  - *Conceptual organizational power (parsimony, Occam's razor)*
  - *Contrast with purely empirical, "phenomenological" models*
  - *Abstract; distant from directly observable reality*
  - *Often overlooked: many steps between principles and test in observable reality*
- → Principle-based formal theory as core of scientific approach

- **Experiment**
- Validation by controlled observation & experimentation
  - → Experimental method as core of scientific approach
  - → Simulation as lab experiment

- **Engineering**
- (1) "Just" practical application of existing scientific knowledge
  - *Assumption: knowledge transfer is linear value chain*
- (2) Research using the scientific method, for problem-solving goals related to practice
  - *Assumptions: nonlinear value chain, &*
  - *Goals other than explanation can be part of science*

Images of Science (2/2): Social Sciences

- Natural Science model
- Theory ≈ (ideally) formal math and its machinery
- "Quantitative" approach
  - *Variable networks*
  - *Statistics*
  - *"Objective" stance*
  - *Predictive, explanatory*
- Empirical research:
  - → Validation by controlled observation and experimentation
    - *Experimental method as core of scientific approach*
    - *Separation of context of discovery and justification (confirmation)*

- "Interpretive" Humanities model
- Theory ≈ coherent conceptual system (in natural language)
- "Qualitative" approach
  - *Human as agent, subject*
  - *Knowledge as social construct*
  - *"Subjective" stance*
  - *Explanatory, understanding*
- Empirical research
  - → Interpretation by observation, interview, text/conversation and symbolic (inter)action analysis
    - *Subject/Context-inclusive methodology as core of scientific approach*
    - *Discovery and justification (confirmation) seen as cycle*

The Design Science Discussion

- (C)IS (e.g. RE, Wieringa et al., Akkermans & Gordijn)
  - ➔Engineering cycle is integral to IS
    - *Q: designing itself not part of research? Evaluation?*
    - *A: (1) socio-technical (context); (2) design as claims to knowledge that are to be externally validated*
- (M)IS (e.g. MISQ, Hevner et al.)
  - ➔IS as design idea is novel discussion
    - *Q: But made simply identical with Simon's approach*
    - *A: (1) conceptualization and formalization of goals, business/social context, viewpoints; (2) interactive feedback loops between system and context*

Design Science: What Simon (1969-1996) Says

- Design as (academically respectable) Science
  - *Instead of cookbook, judgmental, just experience*
- Design science as branch of Computing
  - *Start points: OR (utility, decision, optimization), AI*
- Design is (computerizable) Problem Solving
  - *Goal seeking in state/possible world/solution space*
- Specifically: Design is Search
  - *Means-ends analysis & resource allocation*
- Design problem (re-)Representation:
  - *problem solving as representation change*
- Design and Complex Systems Theory
  - *Hierarchy, (near)-decomposability, generate-and-test*
  - *Feedback, cybernetics, adaptive/evolutionary, ….*
- Clients, stakeholders, society: p.m. (?)

Design Science: Why & Where Simon/MISQ Is Right

- Design as Science
  - ➔ Theory-based claims about "possible worlds" that can be computationally, theoretically/analytically, and empirically tested
- Computational theories of design phenomena are possible
- Involves Complex Systems theories
  - ➔ To lead to theories of problem-in-context
- Novel contributions to science in general
  - ➔ Drop unrealistic assumptions (full optimality, rationality)
  - ➔ Still techniques that work (heuristic reasoning, intelligent systems)
  - ➔ Approximating methods that reduce complexity
    - *Hierarchical levelling, near-decomposability, spacetime scale/ ordering , problem re-representation/transformation, etc.*
- To: theories of information as problem-solving-in-context

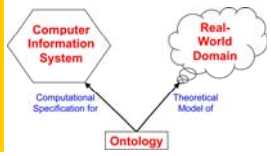
Design Science: Why & Where Simon/MISQ Is Wrong

- Design is NOT (just) Computing
  - *Ignores DOMAIN context + engineering science and its [much more concrete] contributions (e.g. Pahl & Beitz, Hubka & Eder, etc.)*
- Design is NOT (just) Problem Solving
  - *Ignores needs/requirements as Problem Formulation (e.g. Smithers, e3value: problem itself is to be explored extensively)*
- Design is NOT (just) Search
  - *Ignores (1) knowledge-based PSM methods knowledge (2) "holistic" solution knowledge (e.g. patterns, templates, catalogs, …)*
- Design is NOT (just) formal or quantitative methods (OR, social empirical science "variable talk", KR logics)
  - *Ignores qualitative methodology and reasoning (case study, field observation, scientific argument, conceptual/ontological analysis, …)*
- Design science is NOT (just) remote from real people in real world outside science/academia
  - *Client-customer / human factors / etc: Simon/MISQ tend to ignore reflective practice views and issues (e.g. Argyris & Schön)*

Does IS Have Any Real Scientific Achievements?

- List of established principles rather implicit, but can be made
- Social ("soft") factors dominant in success ("hard") IT systems
- IS/IT as "socio-technical" problem analysis and solving
- Complex cross-boundary systems thinking and theory
- Distinction conceptual level vs. computer program level
- Conceptual model-based thinking, ontology
- Value of diagrammatic visual formalisms (ERD etc.)
- Architecture notion, Patterns
- Contributions to innovation, from DB to web SOA

- Also shows the shortcomings of IS as a field
- Many principles OK but very (rather: too) general
- Shallow- & narrowness: lack of specific *and* integrated theory
- Lack of validation in the field
- IS knowledge claims often not actionable enough



Q to Ask to the IS Community: What kinds of results?

- Information representation: syntax (OK) – semantics (yes) – pragmatics (hm): from statics to system dynamics
- Analysis of IS context is essential and central (e.g. requirements)
- Interaction IT technology – social lifeworld researched, but too one-sided in IS (but no other discipline really works on it)
  - ➔ Why is (M)IS so defensive? Will never work
  - ➔ Why is (C)IS so narrow? Idem!
- Science is constructing convincing argument and associated discourse:
  - ➔ Both pure empirical and pure engineering and pure formal research paradigms are inadequate for IS
  - ➔ Liberalize scientific method thinking. More integrating but also tougher
- Information as such is IS core object of scientific research
  - ➔ IT artefact: no, just a part, but computational paradigm yes
  - ➔ **Communicative action and associated reflective practice are central**
- Science as production of claims to knowledge:
  - ➔ yes but should be **actionable** knowledge