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# Never the Twain... Research Methods in (some of) the Computing Disciplines

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International Symposium  
on Research Methods

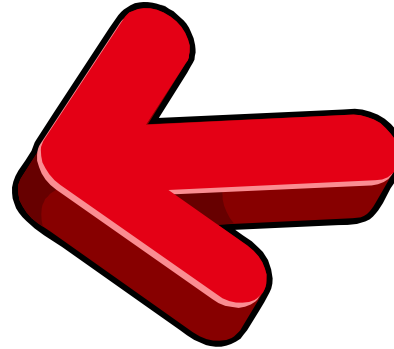


***ISRM 2007***  
***Auckland***

# Context – a personal research journey (1)

Information Science:

- algorithms, formal methods



Information Systems:

- processes, organisations, value... users even!

EE

CE

C

SE

HARDWARE

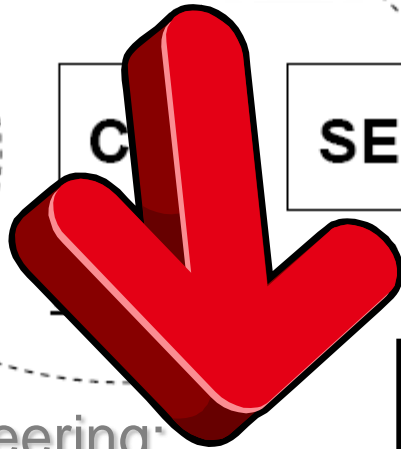
IT

IS

ORGANIZATIONAL  
NEEDS

Software Engineering:

- software, design, tools... and users again



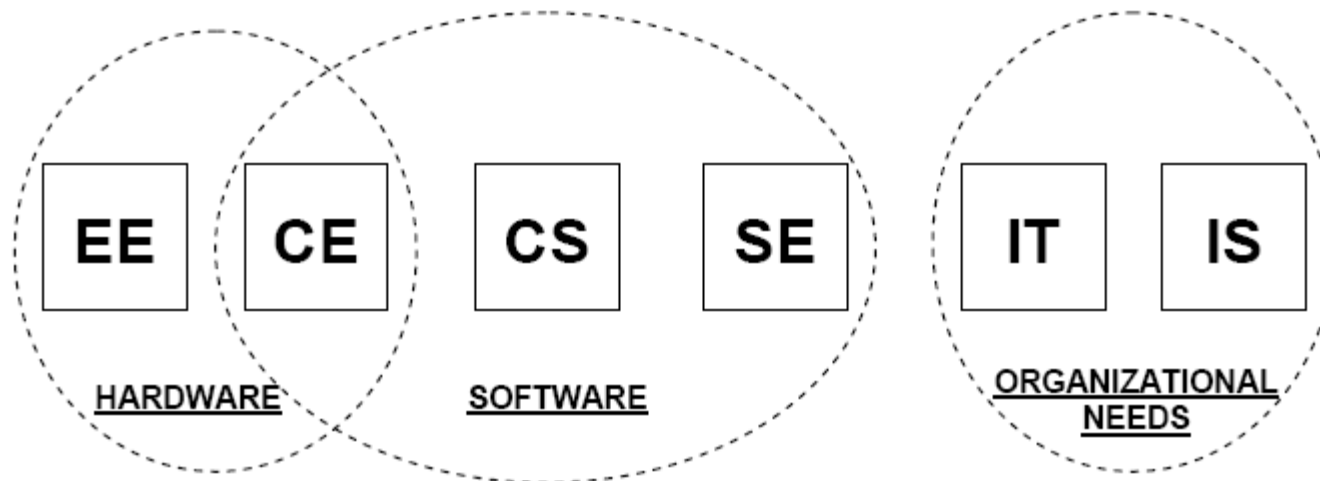
# Context – a personal research journey (2)

## Information Science:

- field test, simulations, experiments, proofs

## Meaning that:

- I have encountered a variety of methods
- I (therefore?) see value in them all



## Software Engineering:

- prototypes, proofs of concept, metrics, 'expert' walkthroughs

## Information Systems:

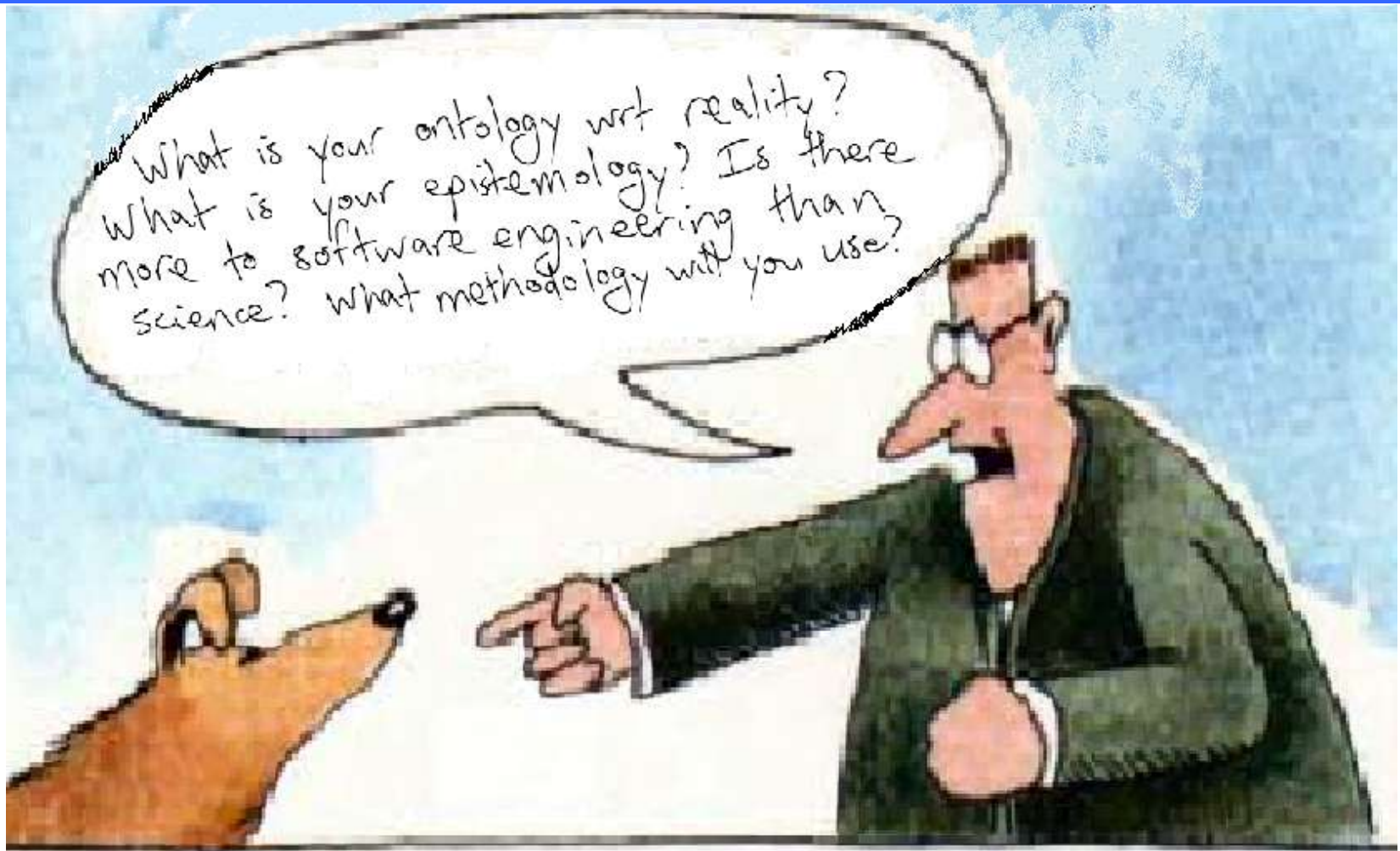
- case studies, qualitative analyses, the odd taxonomy

# In contrast – the ‘one true way’

- For some in computing, valid research can only be undertaken using one particular method
- So knowledge on that method alone is needed
- In software engineering, the ‘one true way’ is akin to atheism, or perhaps agnosticism – i.e. there is no research method in SE, or at least its place is doubtful
- Methodology – what methodology?



# What we say to SE research students...





# What they hear...



# Incremental advances

- Glass *et al.* (2004) reported a review of the computing research literature across CS, SE and IS:
  - Research in SE has been dominated by formulative and descriptive work (86%) rather than evaluative, compared with 33% in IS
  - Research in SE has been dominated by conceptual analyses and concept implementations (71%); in IS, methods are more varied:
    - conceptual analyses and implementations 28%, field studies 25%, lab experiments with human subjects 16%, case studies 13%
  - Towards 'better' research in software engineering...



"I may be onto something, so I'm writing it up for the *May Be Onto Something Journal*."

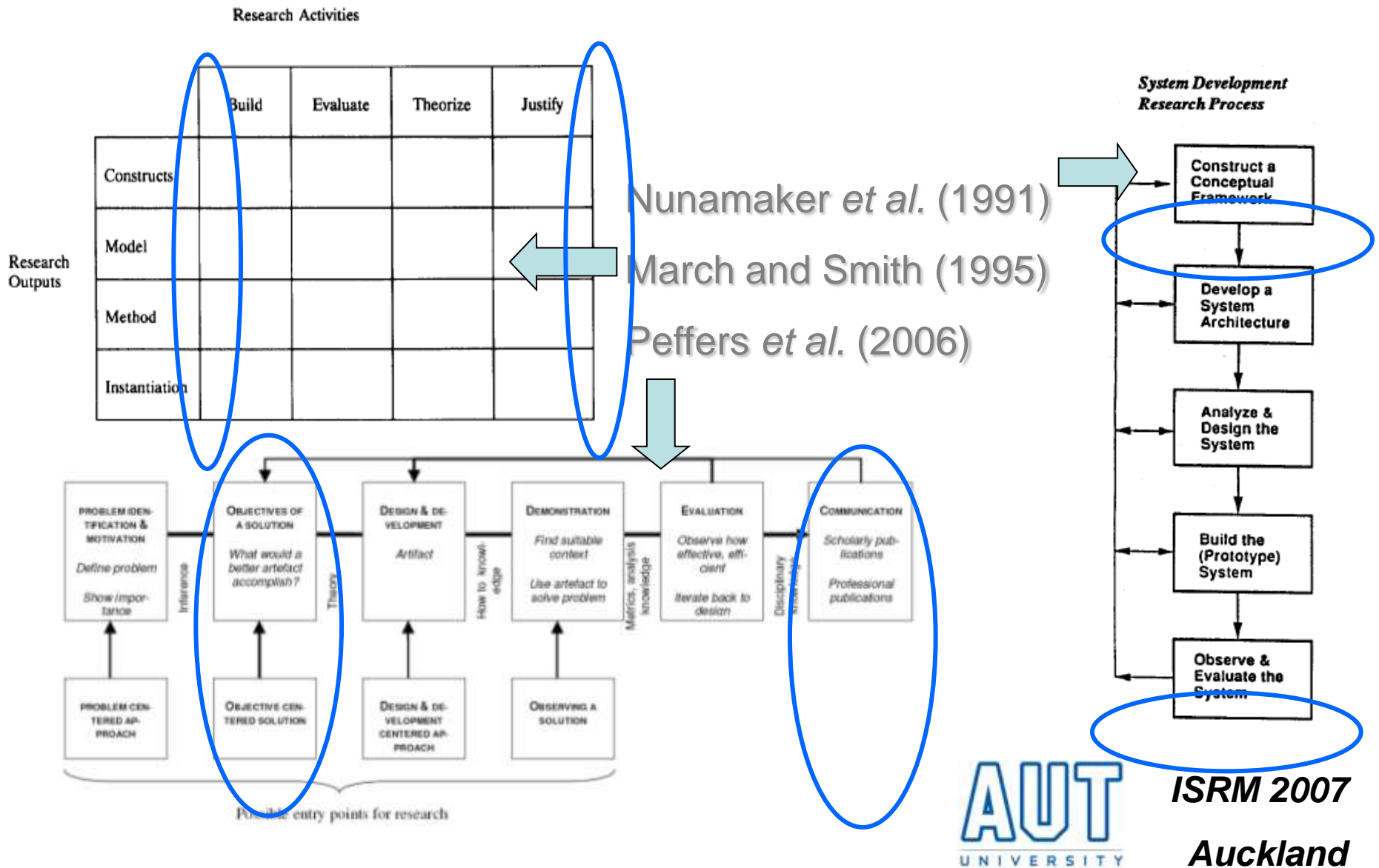
# Current initiatives

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- Increasing attention being paid to design science methods
  - 👉 adds legitimacy to the notion of research through the production of artifacts
  - 🤔 tends to treat the basis of production and evaluation as something of a given, something self-evident
- Significant effort to promote and adopt evidence-based software engineering
  - 👉 a more evaluative approach to SE research outcomes
  - 🤔 dominated by the medical research model that relies primarily on the scientific method



# Augmenting design science...



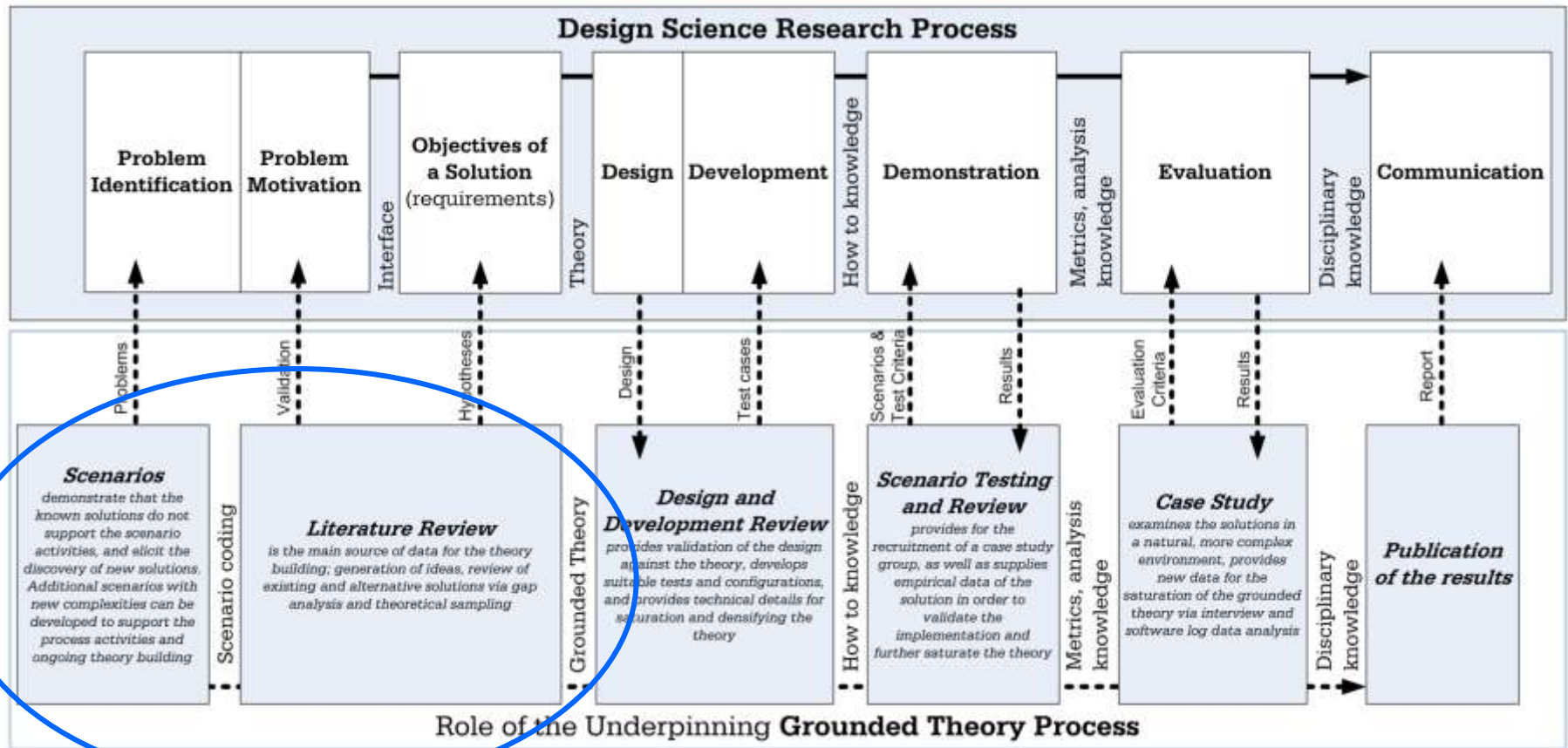
# ...to address weaknesses...

Table 1 Design and design science process elements from IS other disciplines and synthesis objectives for a design science research process in IS.

Objectives for a design science research process model	Archer (1984)	(Takeda et al. 1990)	Eekels and Roozenburg (1991)	Nunamaker et al (1991)	Walls et al (1992)	(Rossi et al. 2003)	(Hevner et al. 2004)
1. Problem identification and motivation	Programming Data collection	Problem enumeration	Analysis	Construct a conceptual framework	Meta-requirements Kernel theories	Identify a need	Important and relevant problems
2. Objectives of a solution			Requirements				Implicit in "relevance"
3. Design and development	Analysis Synthesis Development	Suggestion Development	Synthesis Tentative design proposals	Develop a system architecture Analyze and design the system. Build the system	Design method Meta design	Build	Iterative search process Artifact
4. Demonstration			Simulation, Conditional prediction	Experiment, observe, and evaluate the system			
5. Evaluation		Confirmatory evaluation	Evaluation, Decision, Definite design		Testable design process/product hypotheses	Evaluate	Evaluate
6. Communication	Communication						Communication

From Peffers *et al.* (2006)

# ...using grounded theory



# Closing comments

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- Conviction with respect to method(ology) is vital, but fanaticism can be unhelpful
- Absence of a theoretical framework does not mean absence of a theory
- We can do better in software engineering – grounded design science is one option
- Does the multi-method approach have a chance?
- Perhaps this is another opportunity for the two research communities to learn from one another