



THE AUSTRALIAN NATIONAL UNIVERSITY

# The Need for Theory in Design Science

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# Argument

1. Academic Research **MUST** contribute to theory
2. Are different types of theory
3. Ultimate goal of applied disciplines (including Information Systems) is *Theory of Design and Action*

# Need for theory

Requirement for PhD theses and journal articles.

Must “make a significant original contribution to knowledge”

What does this mean?

Knowledge = generalizable knowledge = some type of theory

## What theory does:

- analyses and describes
- explains
- predicts
- gives prescriptions for action (special case of prediction)

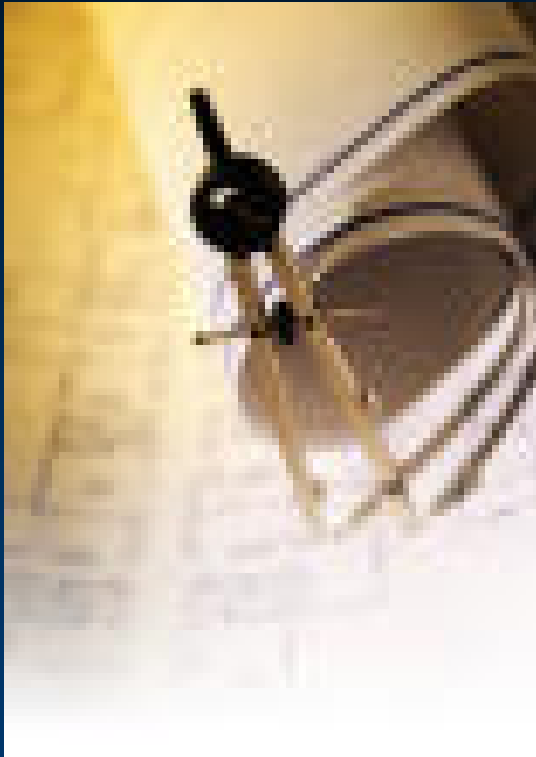
# Types of theory

Gregor, S. (2006). The Nature of Theory in Information Systems, MISQ, 30(3), 611-642.

## Different types:

- I – Theory for analysing
- II – Theory for explaining
- III – Theory for predicting
- IV – Theory for explaining and predicting
- V – Theory for design and action

# Type 5: Theory for Design and Action



The unambiguous specification of design knowledge as theory gives a sounder basis for arguments for the rigour and legitimacy of Information Systems as an applied discipline. A craft can proceed with copying of one example of a design artifact by one artisan after another. A discipline cannot.

Gregor and Jones, 2007, The Anatomy of a Design Theory, *JAIS*, 8,5,312-335

1. Many researchers & journals still rely on natural science (normal science) paradigm
  - Don't accept design theory as "theory" – think theory belongs to normal science (eg see March, Hevner et al view of design science)
  - More focus on observing behavior of artifacts rather than evaluating design theory itself – often in an artificial and reductionist way
2. Prior work by Walls, Widmeyer and El Sawy (1992) on Inf Systems Design Theories was good but had some omissions

# New proposal – structure of ISDT

(Gregor & Jones, 2007)

## Core components

1. Purpose & scope
2. Constructs
3. Principles of form and function
4. Artifact mutability
5. Testable propositions
6. Justificatory knowledge

## Additional components

7. Principles of implementation
8. Expository instantiation

# Types of artifacts

- **Products** e.g. databases, algorithms, electronic markets, KBS/DSS/KMS
- **Processes** e.g. management interventions, development methodologies, project management methodologies

# Example

## Example of the skeleton of a design theory (from Codd, 1970, 1982)

Article details	The design theory anatomy
<p>The introduction says better database technology is needed to increase human productivity. (Motivation is also provided: This need is significant because current approaches are failing.)</p>	<p>The <b>purpose and scope</b> of the theory are stated.</p>
<p>The relational database model has principles such as “the order of rows in the tables is arbitrary and irrelevant”.</p>	<p><b>Principles of form and function</b> incorporating underlying <b>constructs</b> (such as “table”) are given.</p>
<p>The argument is made that the relational model allows for relatively simple adaptation and change to the base tables, while user views appear unchanged</p>	<p><b>Artifact mutability</b> is addressed.</p>
<p>Statements are made such as “A relational database can perform as well as a non-relational database”.</p>	<p>These statements are <b>testable propositions</b>.</p>
<p>It is shown how the relational model works, by reference to underlying set theory and also human cognitive processes.</p>	<p><b>Justificatory knowledge</b> (kernel theory) is provided.</p>
<p>Guidelines are given on how to produce a relational database through normalization procedures.</p>	<p><b>Principles of implementation</b> are given.</p>
<p>An illustration of working relational databases is provided.</p>	<p>An <b>expository instantiation</b> is given.</p>

# Conclusions

- Always need to contribute to theory
- Ultimate goal in IT/IS/CS/SE is design theory
- Should acknowledge legitimacy of this type of theory and work within this paradigm

# Conclusions & questions



- Gregor, S. and Jones, D. (2007). The Anatomy of a Design Theory. *Journal of the Association of Information System*, 8, 5, Article 2.
- Gregor, S. (2006). The nature of theory in information systems. *MIS Quarterly*, 30(3), 611-642.