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Aalto University
School of Engineering

MEC L1001
Design Science
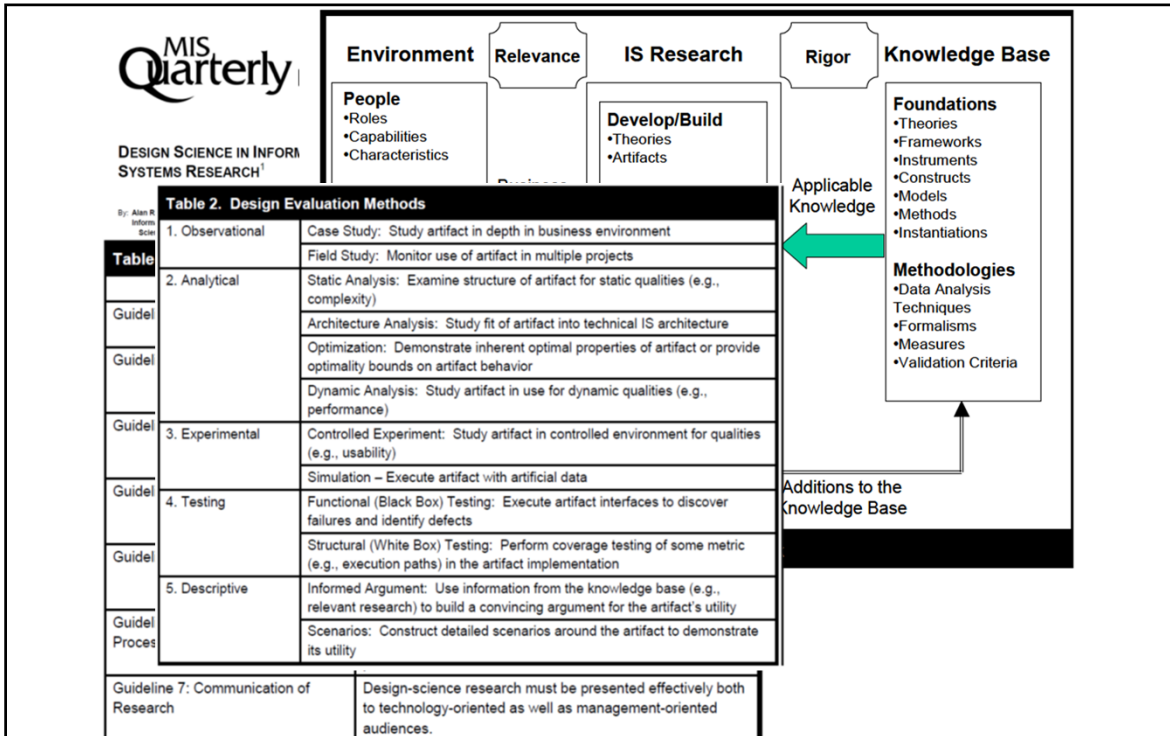
Lecture 2 - Design Science – discuss papers

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Answer 2 of the 3 questions below

1. *List, name or describe a few design theories or models summarized by Chakrabarti & Blessing. OR describe how the article differentiates between a theory and a model.*

2. *Describe two of the Design Science guidelines discussed by Hevner et al.*

3. *Describe any two parts of Hovath's framework of reasoning about categories, domains and trajectories of engineering design research.*

MIS Quarterly

DESIGN SCIENCE IN INFORMATION SYSTEMS RESEARCH[1]

Environment	Relevance	IS Research	Rigor	Knowledge Base
People •Roles •Capabilities •Characteristics		**Develop/Build** •Theories •Artifacts	Applicable Knowledge	**Foundations** •Theories •Frameworks •Instruments •Constructs •Models •Methods •Instantiations **Methodologies** •Data Analysis Techniques •Formalisms •Measures •Validation Criteria

Additions to the Knowledge Base

Table 2. Design Evaluation Methods

1. Observational	Case Study: Study artifact in depth in business environment
	Field Study: Monitor use of artifact in multiple projects
2. Analytical	Static Analysis: Examine structure of artifact for static qualities (e.g., complexity)
	Architecture Analysis: Study fit of artifact into technical IS architecture
	Optimization: Demonstrate inherent optimal properties of artifact or provide optimality bounds on artifact behavior
	Dynamic Analysis: Study artifact in use for dynamic qualities (e.g., performance)
3. Experimental	Controlled Experiment: Study artifact in controlled environment for qualities (e.g., usability)
	Simulation – Execute artifact with artificial data
4. Testing	Functional (Black Box) Testing: Execute artifact interfaces to discover failures and identify defects
	Structural (White Box) Testing: Perform coverage testing of some metric (e.g., execution paths) in the artifact implementation
5. Descriptive	Informed Argument: Use information from the knowledge base (e.g., relevant research) to build a convincing argument for the artifact's utility
	Scenarios: Construct detailed scenarios around the artifact to demonstrate its utility

Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

A Review of Theories and Models of Design

Amaresh Chakrabarti[1] and Luciënne Blessing[2]

Abstract | This paper intends to provide an overview of the rich legacy of models and theories that have emerged in the last fifty years of the relatively young discipline of design research, and identifies some of the major areas of further research. It addresses the following questions: What are the major theories and models of design? How are design theory and model defined, and what is their purpose? What are the criteria they must satisfy to be considered a design theory or model? How should a theory or model of design be evaluated or validated? What are the major directions for further research?

REVIEWS

Design (Designs, Designing): "Design is a purposeful activity aimed at changing existing situations into preferred ones. The word design has two meanings: as verb and as noun. The verb describes the act of designing; the noun specifies its outcomes. A design is taken here as a plan for intervention which, when implemented, is intended to change an undesirable situation into a (less un-) desirable one.

1 Introduction
The purpose of this paper is to provide an overview of the rich legacy of models and theories

2 A Summary of Major Theories and Models of Design
This section provides a summary of some of

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Position your own research on the map

Homework

Readings – Find the following 3 papers, read them and be ready to discuss (Quiz!)

- Note on the Voice of the Customer, John Hauser, MIT Sloan Courseware. http://web.mit.edu/hauser/www/Papers/NoteontheVoiceoftheCustomer.pdf
- Raviselvam, S., Wood, K., Hölttä-Otto, K., et al. (2016). A Lead User Approach to Universal Design-Involving Older Adults in the Design Process. *Studies in health technology and informatics/Universal Design*.
- Tuarob S, Tucker CS. Automated Discovery of Lead Users and Latent Product Features by Mining Large Scale Social Media Networks. ASME. *J. Mech. Des.* 2015;137(7):071402-071402-11. doi:10.1115/1.4030049**.**

For project purposes, BUT NOT for class discussion, you may wish to choose an alternative to the above e.g. by same authors. Especially Tuarob and/or Tucker have several alternatives to looking for something other than lead users.