

Research Method

Research method

- Master-level courses have a research component:
 - architectures, applications to news, privacy issues
 - framing your programming project as (the start of) a *design science research* project
 - more in INFO300 in the spring
- Two articles in the wiki:
 - Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004).
Design science in information systems research.
MIS quarterly, 75-105 [link in the wiki + paper in mitt.uib.no]
 - Hevner, A. R. (2007).
A three cycle view of design science research.
Scandinavian journal of information systems, 19(2), 4
[pdf in the wiki]



Research method

- Approaches to knowledge:
 - authoritarian, mythical, *rational (formal), and empirical («scientific»)*
 - but also «formal sciences» («formalvitenskap»)
 - empirical approaches:
 - inter-subjective/realist ideals (often quantitative, but not necessarily)
 - empathic/«verstehen» ideals (often qualitative, but not necessarily)
 - *information science* needs to build on both
 - ...also critical traditions (that may reject the above distinctions)
 - objects of study:
 - natural or artificial («sciences of the artificial»)
 - material (alive or not), cognitive, or social («social sciences»)
 - *information science as a social/cognitive study of technical artefacts*

Research approaches

- Purpose:
 - description
 - explanation
 - *prediction*
 - *understanding*
 - exploration
 - *ability*
 - *creation*
- Data:
 - qualitative
 - quantitative
- Extent:
 - intensive (few study units)
 - extensive (many study units)
- Standard types (examples):
 - experiments
 - surveys/interviews
 - archival
 - histories
 - case studies
 - action research
 - *design (science) research*

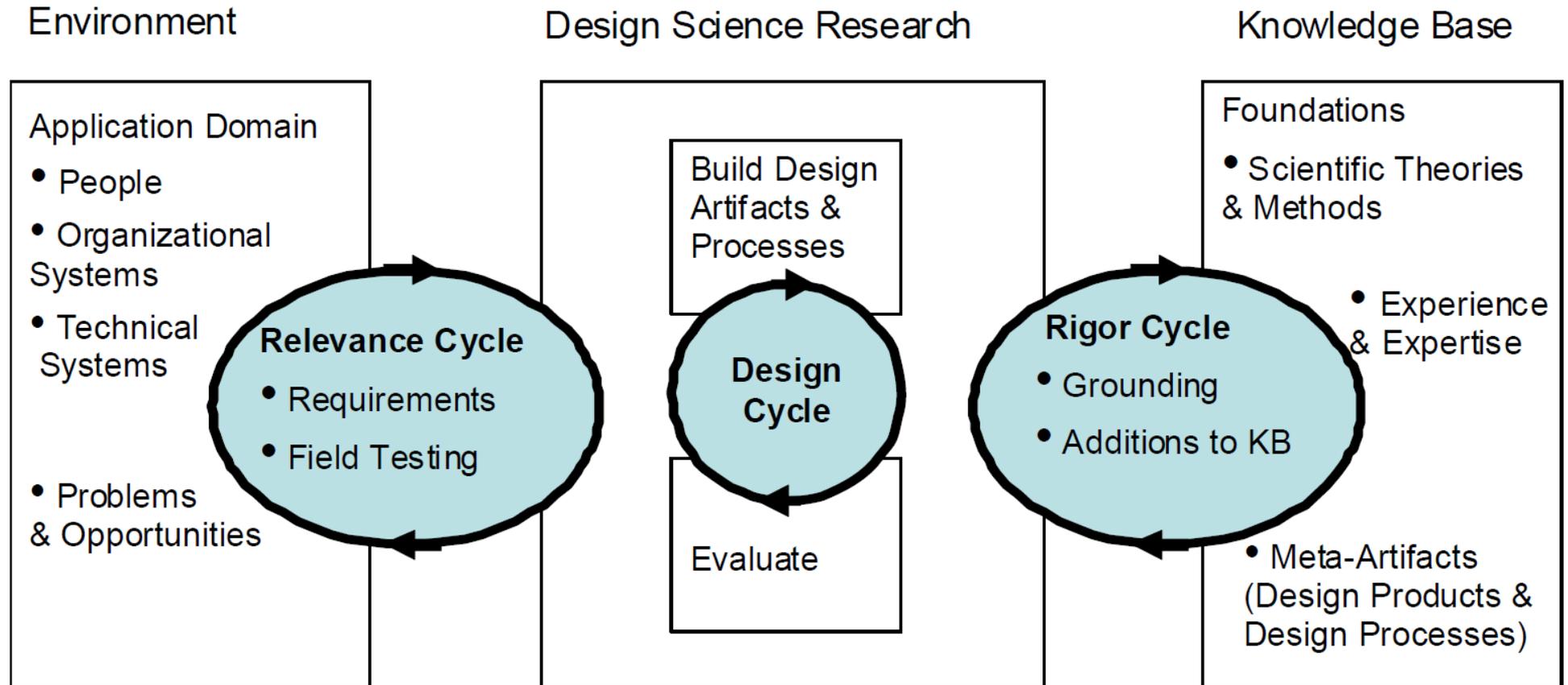
Research cycle (examples)

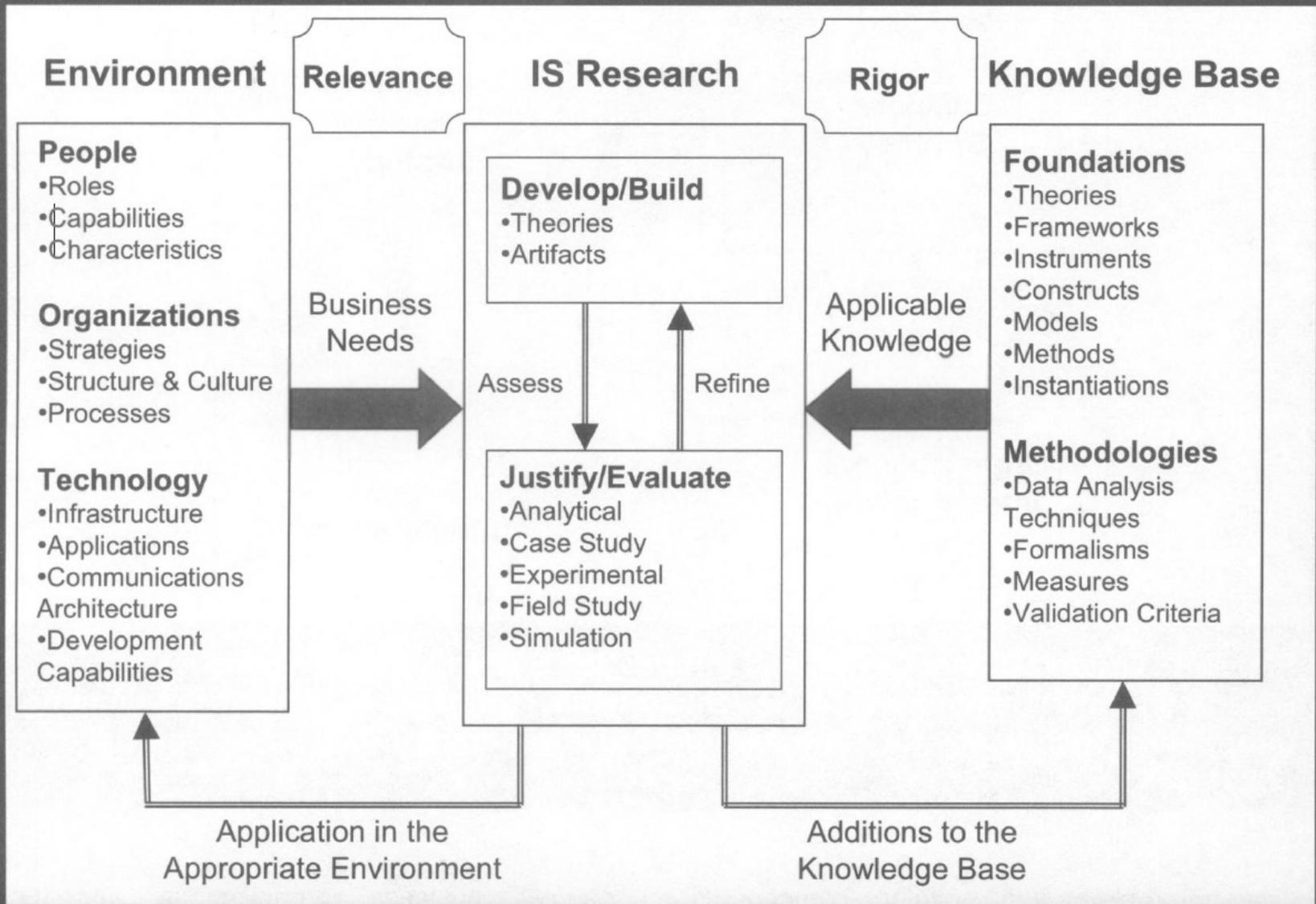
- Theory-before-data:
 - problem
 - existing theory (& practice)
 - propositions (e.g., hypotheses)
 - research method
 - data collection
 - *can involve development*
 - data analysis *possibly iterative*
 - generalisation
 - discussion
- Hypothetic-deductive style
- Data-before-theory:
 - problem
 - surrounding theory (& practice)
 - goals, success criteria
 - research method
 - data collection
 - *can involve development*
 - data analysis
 - theory building
 - discussion
- Exploratory style

Design science research

- Design science research (DSR):
 - involves the *development of (IS/IT) artefacts*
 - typically *iterative*
 - *validates the artefacts empirically* against *clear goals/success criteria*, e.g.,
 - validations against technical goals/requirements
 - evaluations with users in increasingly realistic settings
- Goal:
 - improve the understanding of different parts/aspects of information systems (IS) through developing and evaluating IT-artefacts for use
- Artefacts (and other outputs):
 - can take on different forms depending on research problem/goal

Three-cycle view of DSR





Source:
Hevner et
al. (2004)

Figure 2. Information Systems Research Framework

Artefacts / outputs of DSR

- Instantiations: situated implementations in specific environments
 - can *operationalize* construct, models, methods, other abstract artifacts...
 - or such knowledge can remain *tacit*
- Constructs: the conceptual vocabulary of a domain
- Models: sets of propositions that express relationships between constructs
- Methods: sets of steps used to perform tasks - how-to knowledge
- Frameworks: real or conceptual guides to serve as support
- Architectures: high-level structures of systems
- Design principles: core principles and concepts to guide design
- Design theories: a prescriptive set of statements on how to achieve a certain objective; usually includes other abstract artifacts, e.g., constructs, models, methods, frameworks, architectures, and design principles

Table 1. Design-Science Research Guidelines

Guideline	Description
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Iterations

- Design research is iterative
 - fits well with *iterative systems development*
 - research and development iterations *can be sync-ed*
 - *for example* 6-8 weekly iterations or 3-4 bi-weekly ones
- Minimum viable product (MVP):
 - delivery of each iteration
 - build the minimum number of features that is required for the system to fulfill a (partial) goal
 - evolve iteratively from there (with more and more extensive goals)
 - promotes adaptable systems:
 - fewer but more essential features
 - old features are thoroughly tested before new ones are added

Reporting your iterations

- To report each iteration:
 - name, brief introduction, goals, tools and techniques, project management(?), development process, validation, results
- Final iteration(s):
 - in a "full" research project, final validations(s) would be more elaborate
 - a *broad range of empirical research methods are available* here:
 - technical, interviews, experiments, case study, action research...
- **Your projects** can have simple validations, e.g., running test cases, demonstrating intended behaviours, discussing particular system properties
- **Your essay** can be a more elaborate final evaluation of a particular aspect of your system



Reporting your projects (tentative)

- Things to include in your presentations:
 - your problem/idea
 - why is the problem/idea important?
 - your research question
 - your iterations
 - see the previous slide
 - your final system
 - your group members
 - who has done what?
 - brief mentioning of final evaluations that you will present in your essays
(if some group members plan to do that)

