DHBW Stuttgart

„Positioning and Presenting Design Science
Research for Maximum Impact"
–
A review of the paper by Gregor & Hevner (2013)

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Short introduction

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Agenda

- What is Information Systems about?

- What is design science research (DSR)?

- The research process in DSR

- Types of knowledge in and contributions to DSR

- Publication schema for DSR

- Publication opportunities and reasons for acceptance

- Conclusion

What is Information Systems (IS) about?

- "Information Systems is the study of the understandings people require so they can create new value, and of the analysis, design, development, deployment, operation, and management of systems to inform these understandings." (Nunamaker & Briggs, 2011, p. 20:3)

- "Information systems are implemented within an organization for the purpose of improving the effectiveness and efficiency of that organization." (Hevner et al., 2004, p. 76)

What is design science research (DSR)?

- Two paradigms in IS research: (Hevner et al., 2004, p. 75)
    1. Behavioral science: "[D]evelop and verify theories that explain or predict human or organizational behavior"
    2. Design science: "[E]xtend the boundaries of human and organizational capabilities by creating new and innovative artifacts"

- "An IT artifact, implemented in an organizational context, is often the object of study in IS behavioral-science research." (ibid., p. 77)

- "Design science […] creates and evaluates IT artifacts intended to solve identified organizational problems." (ibid.)

- "In IS, DSR involves the construction of a wide range of *socio-technical* artifacts such as decision support systems, modeling tools, governance strategies, methods for IS evaluation, and IS change interventions." (Gregor & Hevner, 2013, p. 337)

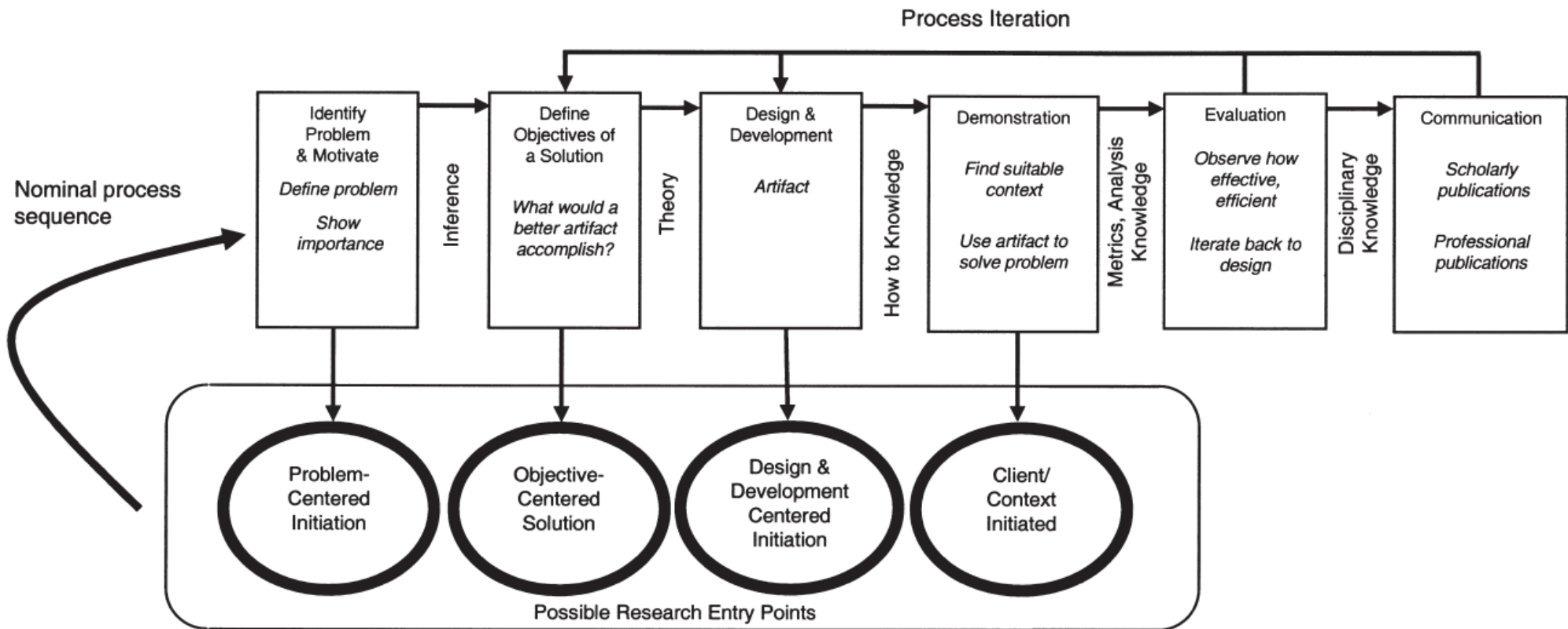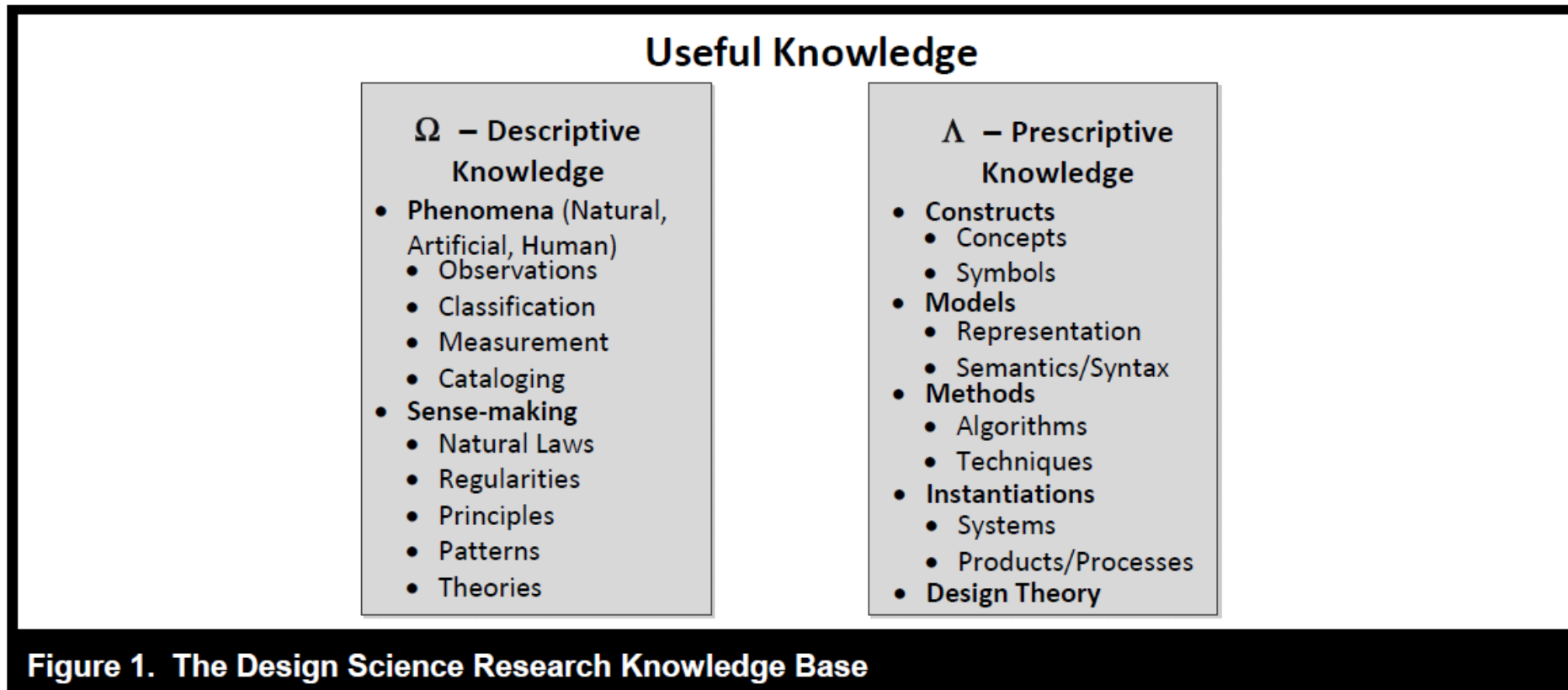# How does the research process in DSR look like?
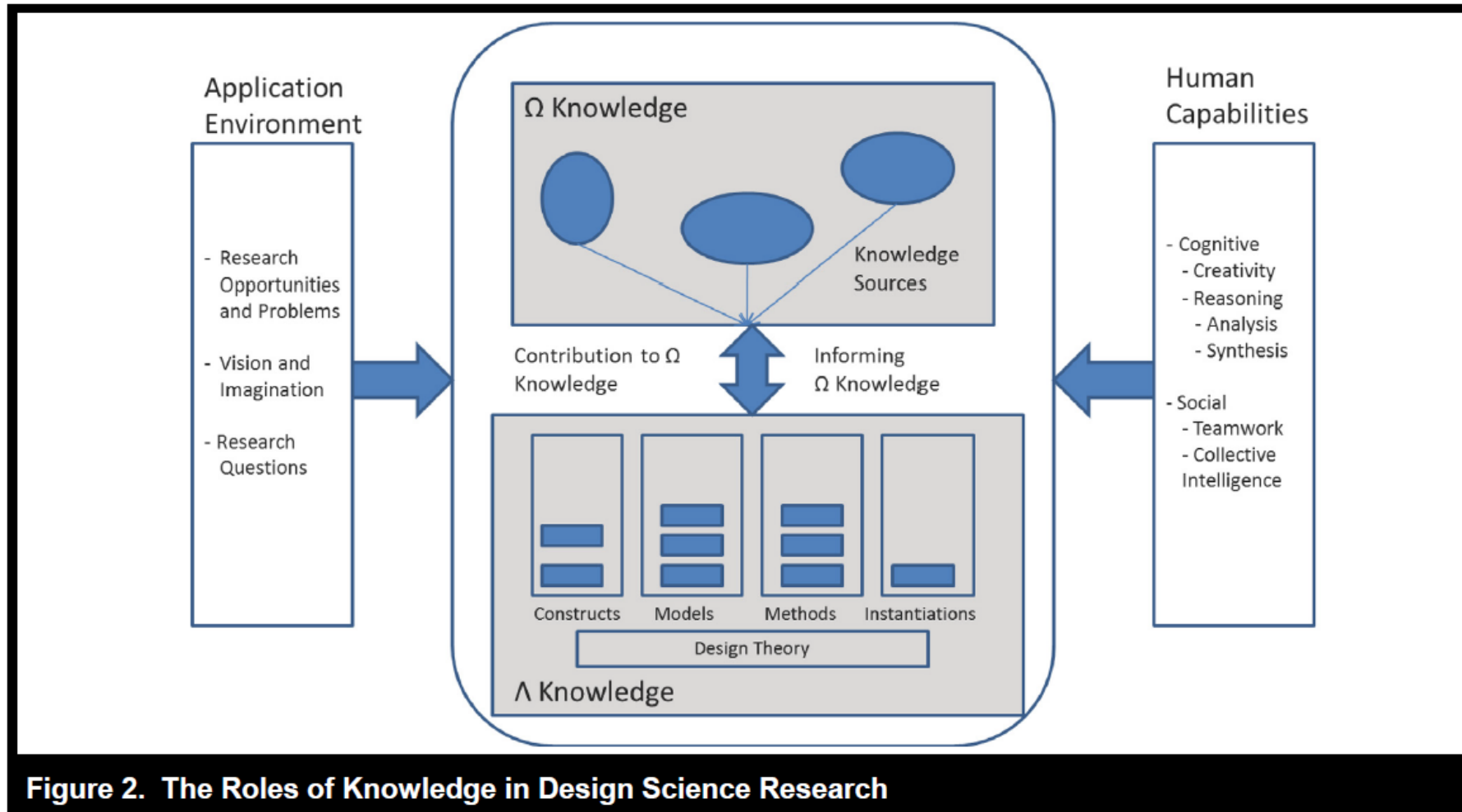

Figure 1. DSRM Process Model

Types of knowledge in DSR (1/2)

- There are two interlinked types of knowledge in DSR, both which form the knowledge base for DSR

    - Ω - Decriptive Knowledge $\rightarrow$ behavorial science research

        - "is the "what" knowledge about natural phenomena and the laws and regularities among phenomena"

    - Λ - Prescriptive Knowledge $\rightarrow$ design science research

        - "is the "how" knowledge of human-built artifacts"

- Both knowledge types are used to inform and ground the research process

Gregor & Hevner (2013), p. 343

Types of knowledge in DSR (2/2)

Useful Knowledge

Ω – Descriptive Knowledge

- **Phenomena (Natural, Artificial, Human)**
  - Observations
  - Classification
  - Measurement
  - Cataloging
- **Sense-making**
  - Natural Laws
  - Regularities
  - Principles
  - Patterns
  - Theories

Λ – Prescriptive Knowledge

- **Constructs**
  - Concepts
  - Symbols
- **Models**
  - Representation
  - Semantics/Syntax
- **Methods**
  - Algorithms
  - Techniques
- **Instantiations**
  - Systems
  - Products/Processes
- **Design Theory**

Figure 1. The Design Science Research Knowledge Base

How do these knowledge types work together?

Figure 2. The Roles of Knowledge in Design Science Research

What kinds of DSR contribution types are there?

Table 1. Design Science Research Contribution Types

	Contribution Types	Example Artifacts
More abstract, complete, and mature knowledge	Level 3. Well-developed design theory about embedded phenomena	Design theories (mid-range and grand theories)
↕ ↕ ↕ ↕	Level 2. Nascent design theory—knowledge as operational principles/architecture	Constructs, methods, models, design principles, technological rules.
More specific, limited, and less mature knowledge	Level 1. Situated implementation of artifact	Instantiations (software products or implemented processes)

Gregor & Hevner (2013), p. 342

DSR knowledge contribution framework: maturity of artifacts versus maturity of problem context

Figure 3. DSR Knowledge Contribution Framework
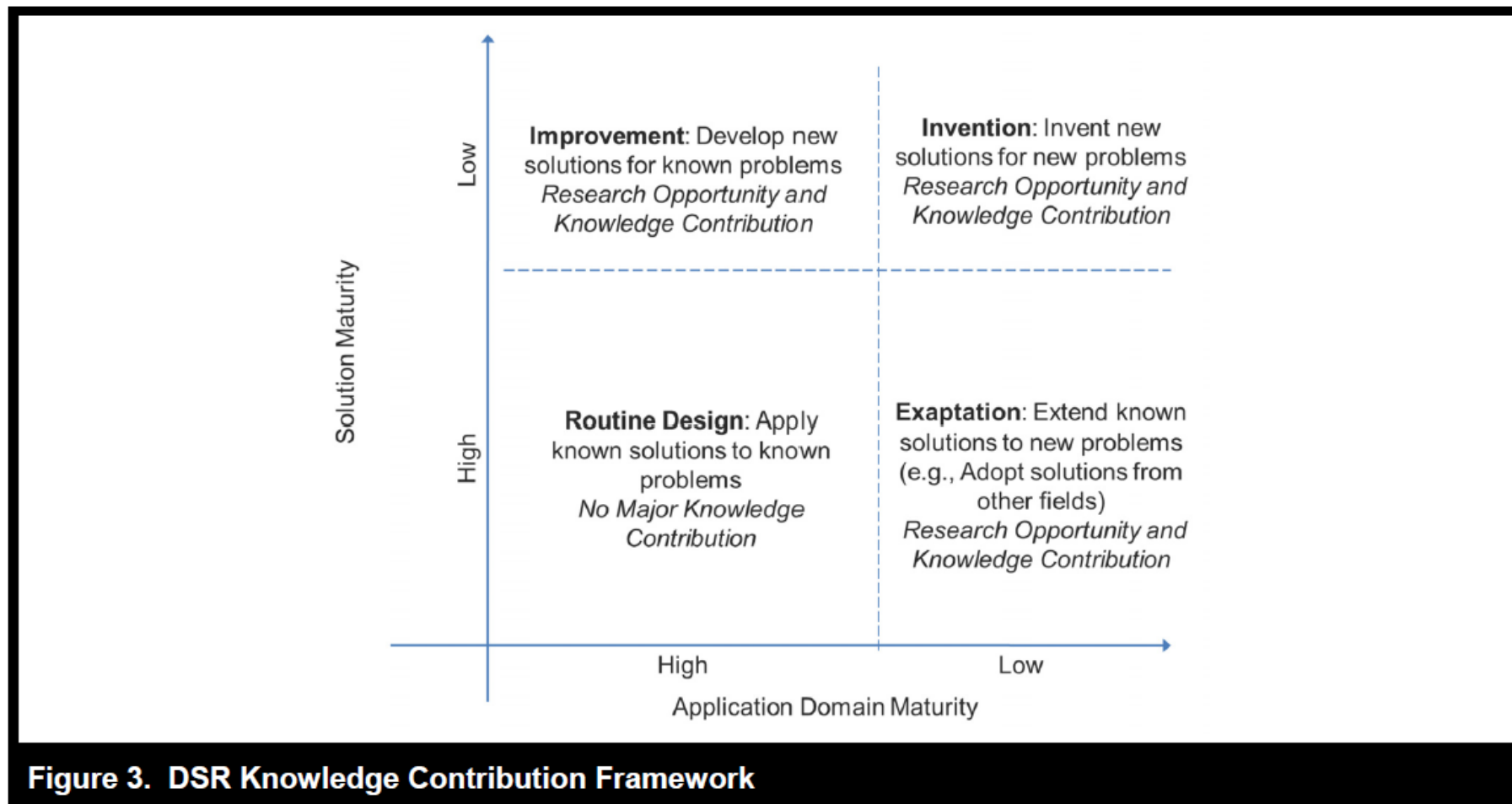
For which knowledge contributions are there publication opportunities?

Table 1. Design Science Contributions to Knowledge: Problem-Solution Space			
Problem Domain Maturity	**Solution Maturity**	**Knowledge Contribution**	**Publication Opportunity in MISQ**
Known Problems	Known solutions	Routine design None to research	No
Known Problems	New solutions	"Improvement" Research contribution	Yes
New Problems	Adopted solutions from other domains	"Exaptation" Research contribution	Yes
New Problems	New solutions	"Innovation" Research contribution	Yes

How should a DSR publication be structured?

	Section	Contents
Table 3.	**Publication Schema for a Design Science Research Study**	
1.	Introduction	*Problem definition, problem significance/motivation, introduction to key concepts, research questions/objectives, scope of study, overview of methods and findings, theoretical and practical significance, structure of remainder of paper.* For DSR, the contents are similar, but the problem definition and research objectives should specify the **goals** that are required of the artifact to be developed.
2.	Literature Review	*Prior work that is relevant to the study, including theories, empirical research studies and findings/reports from practice.* For DSR work, the prior literature surveyed should include any prior design theory/knowledge relating to the class of problems to be addressed, including artifacts that have already been developed to solve similar problems.
3.	Method	*The research approach that was employed.* For DSR work, the specific DSR approach adopted should be explained with reference to existing authorities.
4.	Artifact Description	A concise description of the artifact at the appropriate level of abstraction to make a new contribution to the knowledge base. This section (or sections) should occupy the major part of the paper. The format is likely to be variable but should include at least the description of the designed artifact and, perhaps, the design search process.
5.	Evaluation	Evidence that the artifact is useful. The artifact is evaluated to demonstrate its worth with evidence addressing criteria such as validity, utility, quality, and efficacy.
6.	Discussion	*Interpretation of the results: what the results mean and how they relate back to the objectives stated in the Introduction section. Can include: summary of what was learned, comparison with prior work, limitations, theoretical significance, practical significance, and areas requiring further work.* Research contributions are highlighted and the broad implications of the paper's results to research and practice are discussed.
7.	Conclusions	*Concluding paragraphs that restate the important findings of the work.* Restates the main ideas in the contribution and why they are important.

Wrapping-up: What are overall reasons for paper acceptance in IS Journals?

	Table 2. Ten Reasons Why Top Journals Accept Your Paper		
	A paper is accepted at a top journal because…		
Required Elements	1.	Its basic idea is exciting (blue ocean strategy).	
	2.	Its research questions are nontrivial.	
	3.	It hits themes that are popular.	
	4.	It sufficiently uses or develops theory.	
Enhancing Elements	5.	It follows a recognizable formula.	
	6.	It covers the key literature sufficiently.	
	7.	It is clean (grammatically, typographically, appearance).	
	8.	It effectively uses or applies new methods.	
	9.	It does not vehemently contradict the work of major movers and shakers.	
	10.	It has a respectably large field sample (empirical, quantitative-positivist work).	

Concluding summary

- DSR is about knowledge contributions in terms of socio-technical artifacts
- DSR has a defined research process
- Two interlinked types of knowledge in DSR (descriptive and prescriptive)
- Knowledge contributions can be of different kinds (improvement, invention, exaptation, routine)
- Defined publication schema for DSR
- Required and enhancing elements for IS paper acceptance

References

- Goes, P. B. (2014): Design Science Research in Top Information Systems Journals. In: MIS Quarterly, 38 (1), pp. iii-viii

- Gregor, S.; Hevner, A. R. (2013): Positioning and Presenting Design Science Research for Maximum Impact. In: MIS Quarterly, 37 (2), pp. 337-355

- Hevner, A. R.; March, S. T.; Park, J.; Ram, S. (2004): Design Science in Information Systems Research. In: MIS Quarterly, 28 (1), pp. 75-105

- Nunamaker & Briggs (2011): Toward a Broader Vision for Information Systems. In: ACM Transactions on Management Information Systems, 2 (4), pp. 20:1-20:12

- Peffers, K.; Tuunanen, T.; Rothenberger, M. A.; Chatterjee, S. (2008): A Design Science Research Methodology for Information Systems Research. In: Journal of Management Information Systems, 24 (3), pp. 45-77

- Straub, D. W. (2009): Editor's Comments: Why Top Journals Accept Your Paper. In: MIS Quarterly, 33 (3), pp. iii-x