OCAD UNIVERSITY

OCAD University Open Research Repository

Faculty of Design

2014

Design research methods in systematic design

Jones, Peter

Suggested citation:

Jones, Peter (2014) Design research methods in systematic design. In: The Third Symposium of Relating Systems Thinking and Design (RSD3), 15-17 Oct 2014, Oslo, Norway. Available at http://openresearch.ocadu.ca/id/eprint/382/

Open Research is a publicly accessible, curated repository for the preservation and dissemination of scholarly and creative output of the OCAD University community. Material in Open Research is open access and made available via the consent of the author and/or rights holder on a non-exclusive basis.

The OCAD University Library is committed to accessibility as outlined in the Ontario Human Rights Code and the Accessibility for Ontarians with Disabilities Act (AODA) and is working to improve accessibility of the Open Research Repository collection. If you require an accessible version of a repository item contact us at repository@ocadu.ca.

Design Research Methods in Systemic Design

Peter Jones, OCAD University, Toronto, Canada

Abstract

Systemic design is distinguished from user-oriented and service design practices in several key respects: The expansion and negotiation of system boundaries to frame the design situation, the intentional embrace of sociotechnical complexity, and strategies of systemic integration rather than market differentiation. Systemic design is concerned with higher-order socially-organized systems that encompass multiple subsystems in policy, organizational or product-service contexts. By integrating systems thinking and its methods, systemic design brings human-centered design to complex, multi-stakeholder service systems as those found in industrial networks, transportation, medicine and healthcare. It adapts from known design competencies - form and process reasoning, social and generative research methods, and sketching and visualization practices - to describe, map, propose and reconfigure complex services and systems.

The recent development of systemic design as a research-based practice draws on long-held precedents in the system sciences toward representation of complex social and enterprise systems. A precedent article (Jones, 2014) established an axiomatic and epistemological basis for complementary principles shared between design reasoning and systems theory. The current paper aims to establish a basis for identifying shared methods (*techne*) and action practice (or *phronesis*).

Keywords

Systemic design, Design methodology, Design principles, Social systems design

Introduction

Contemporary systems science has evolved a set of preferred theories for system description (or explanation), prediction (or control), and intervention (change). Jackson (2010) has traced the development of systems thinking and mapped the predominant schools of thought to:

- Hard systems and system dynamics (control system oriented),
- Soft systems and postmodern systems thinking (learning oriented)
- Emancipatory (social change oriented)

Three other branches can be located in complexity science - complexity theory, network science and organizational cybernetics. However, design applications, and the contributions of traditional design disciplines of industrial, information or service design, have remained marginal in the system sciences. The relationship of design to systems thinking has been developed theoretically, as a fusion of design science and system sciences (Pourdehnad, Wexler, and Wilson, 2011, Banathy, 1996), but defining the practices and methods acknowledged between the fields has been elusive. “Design” is typically presented as a process of *system* design, but has not been explicitly developed as a praxis, or as a discipline of academic study. The relationship of design as a practice for system design has remained ill-defined across all generations of design and systems methods and theories. The

abstract and theoretical approaches of systems thinking and cybernetics have not been taught in design schools and are not presented in texts and papers as adaptable to most accepted design contexts. The descriptive languages between the two fields of practice sound similar, but are widely differing in practices.

The integration of systemics to enrich design methodologies and practice has now become imminent. Philosophies (epistemological stances) of *design* methods can be characterized as rational, pragmatic, critical, generative, and phenomenological**.** These influences initially gained adherence as design methods "generations" but have blended with each other over the years, so that their unique contributions are deeply embedded in design thinking. An emerging consensus in design thinking represents a fourth generation of design methods, based on a transdisciplinary *episteme*, a *techne* of generative and participatory design methods (Sanders and Stappers, 2013), and a *phronesis* (practical wisdom) of co-creation. This recent turn in design methods resonates with the social systems school of systems science.

Social systems design provides the template for design thinking in the systems sciences to date. Social system design provides models for system analysis and collective inquiry for engaging stakeholders in the activities of designing organizational and planning outcomes. As acknowledged by Banathy (1996), Gharajedaghi (2011), and Metcalf (2010) social systems design becomes in practice a guideline for systems thinking in complex social applications. It is a multidimensional inquiry, not a "studio" practice as engaged by design firms or taught in design schools. In practice, social systems are not "designed" with a prescribed set of design methods or a toolkit (such as IDEO's Human-Centered Design). Since the social system is a social entity or service ultimately defined by its stakeholders, the methods and strategies adopted for systemic design must be accepted and understood by these stakeholders. Relevant design research methods might then draw upon all four intentions:

- *Explanation* by social research
- *Prediction* by process evaluation and system design,
- *Change* by stakeholder engagement
- *Design* by design research methods

In a previous paper (Jones, 2014) I identified a set of systemic principles shared between design practice and systems theory, which might guide design thinking and perhaps assess the systemic reasoning of design proposals. These relevant design principles call for the discovery of methodological relationships between systems theory and design – an initial theory of systemic design methodology.

Systems thinking identifies methods that contribute to design by reconfiguring boundaries, subsystems, and intervening in system functions. However the various schools of systems thinking do not promote the function of design as enhancing relevant human-centred interactions and experience. And we also find no acknowledgement that the notion of "intervention" is both a) an admission of system objectification and b) a position on the necessity for a design process that explicitly recognizes human-centred design in systems.

Systemic Design Principles

Ten systemic design principles shared between design and systems disciplines were proposed in Jones (2014), based on meta-analysis of concepts selected from system sciences and design theory. Design principles were selected that afforded significant power in both design and systems applications, and were sufficiently mature and supported by precedent to be adapted in general contexts.

1. Idealization
2. Appreciating complexity
3. Purpose finding
4. Boundary framing
5. Requisite variety
6. Feedback coordination
7. Generative emergence
8. Continuous adaptation
9. System ordering
10. Self-organizing

Mapping design principles to practice

The ten design principles represent a series of challenges faced by most design projects, whether a commercial product, a healthcare service, or a complex social policy. If we accept the relative validity of the temporal model's orientation to processing decisions and risk from Strategy to Deployment, the design principles can be associated with risks or concerns faced by the design team (as a whole). Figure 1 illustrates the arrangement of these design principles recognized along the conceptual design model.

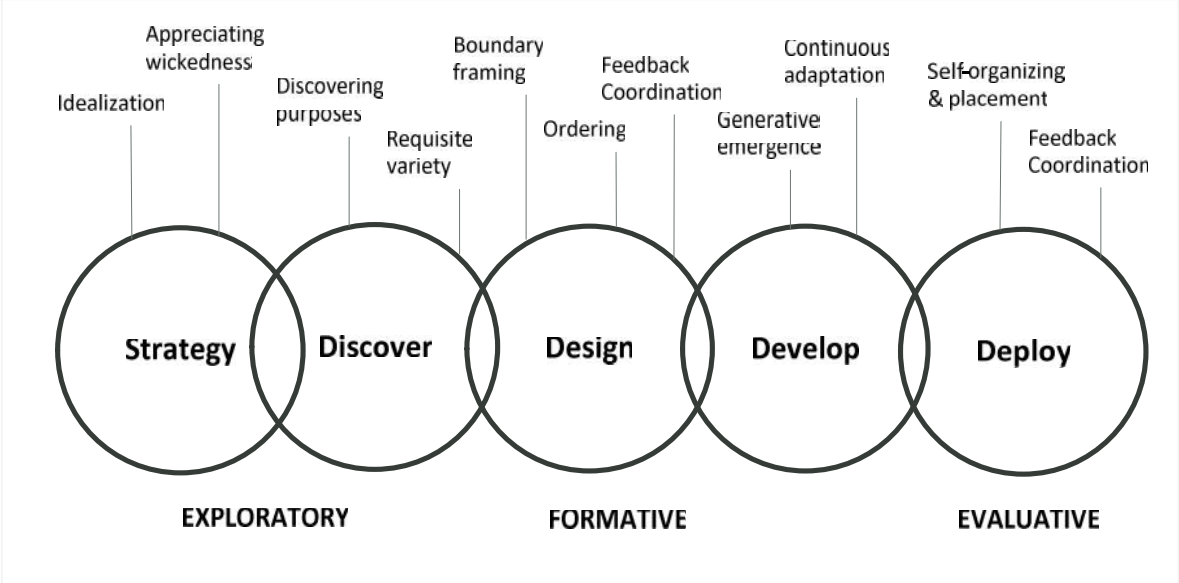

Figure 1. *Design principles mapped to design model*.

Systemic Design Methods

Figure 2 portrays a range of commonly cited (hard and soft) systems thinking methods. These methods are organized around the four intents of systems practice (understanding or prediction research outcomes, design or change design outcomes). These four methodological intents (based on the 3 from Braa and Vidgen, 1997, adding Design) are relevant to the evaluation and selection of research and design methods, whether in human-centred or systemic problems. This model incorporates systemic design methods representing selections for research and design in the four outcomes.

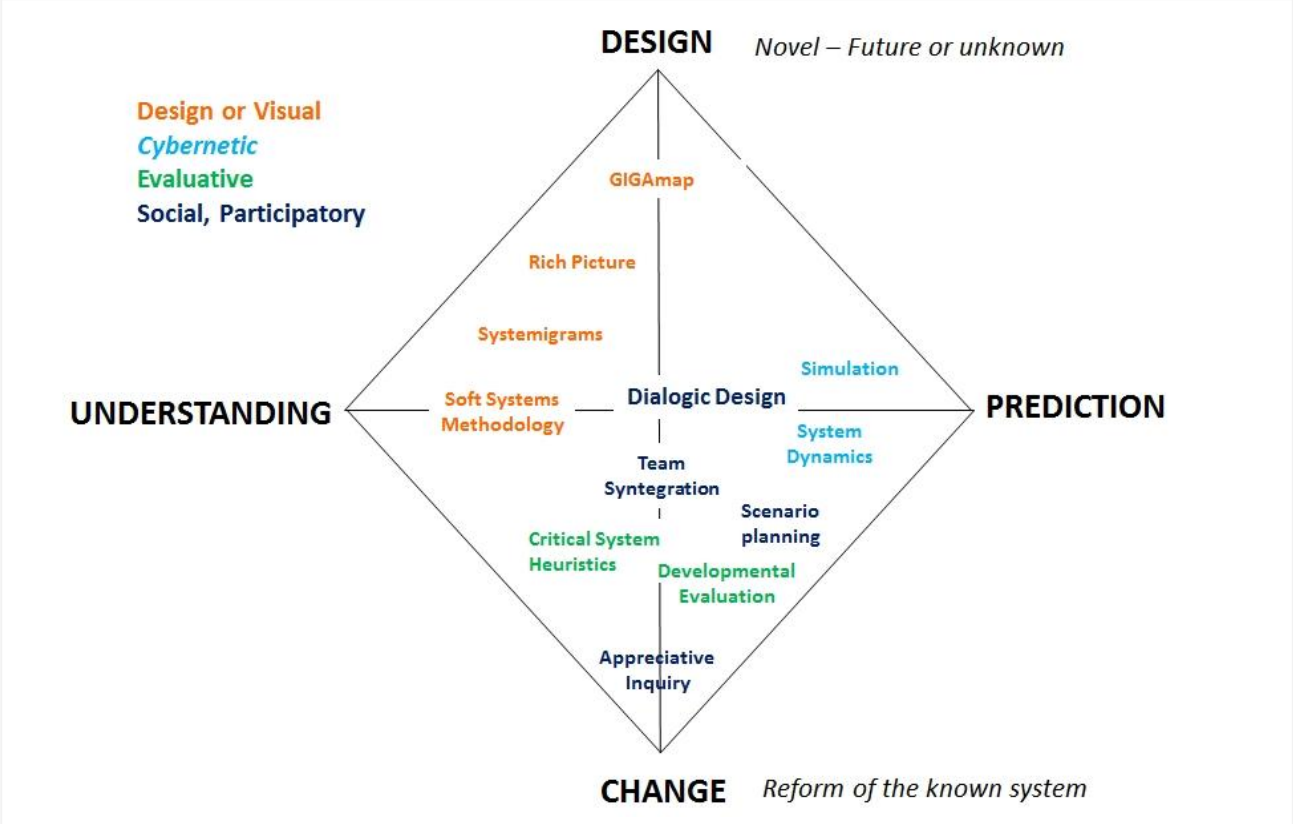

Figure 2. *Systemic design methods by research intent*.

Four design modes are indicated in the model. Design/Visual modes are identified (in orange) as relevant to the intentions for human understanding and system design. While also useful in change and prediction intents of systemic research, design/visual models have more direct utility in these two (i.e., visual methods such as the GIGAmap are designed to enable shared understanding of systems for design purposes). Four participatory methods are identified, typically associated with *change* (action research and organizational development). Evaluative methods (green) are related to system change, while simulation and modeling methods (light blue) can be considered both cybernetic and quantitative reasoning modes, useful for enabling prediction and forecast planning. In systemic design, any or all four intents may emerge in a relevant research application. In some cases at least one of each intent – associated with the sequenced stages in research - may be appropriate.

A selection of general design methodologies (a set of related methods associated with a theory or research approach) may be drawn from reviewed sources and case studies. The first set (Table 1) represent design methodologies associated with the ten systemic design principles developed in Jones (2014). Each of these methodologies may include numerous techniques adapted by designers in research and design programs for accomplishing the goals of the principle.

Table 1. *Design techniques associated with systemic design principles*.

	Principle	***Design* Methodologies**
1.	Idealization	Iteration
2.	Appreciating Complexity	Sensemaking, Sketching
3.	Purpose finding	Saliency - Meaning-making
4.	Boundary framing	Provocation and strange-making
5.	Requisite variety	Multiple perspectives
6.	Feedback coordination	Modeling
7.	System ordering	Structuring, Information architecture
8.	Generative emergence	Future projection
9.	Continuous adaptation	Multiple reasoning modes (Abduction, Induction)
10.	Self-organizing	Co-creation

If we specify systems methodologies we can recognize significant differences between design thinking and system thinking approaches. Table 2 shows 10 systemic methodologies commonly employed to obtain the desired effects of the design principle. For example, as Idealization is indicated in Table 1 as achieved by *iteration* of proposed future states toward a collective objective (design approach), the systemic methodologies supporting this mode might be idealized design (Ackoff, 1993) or dialogic design (Christakis and Bausch, 2006). Associated with Appreciating Complexity, the design methodologies of *sensemaking* processes are entailed for understanding the complex relationships in a problem. As a systemic methodology, the *problematique* can be seen as an effective complementary research mode.

Table 2. *Systems methodologies associated with systemic design principles*.

	Principle	***Systemic Design* Methodologies**
1.	Idealization	Dialogic design, Idealized design
2.	Appreciating Complexity	Problematique
3.	Purpose finding	Function hierarchy
4.	Boundary framing	Critical system heuristics
5.	Requisite variety	System modeling
6.	Feedback coordination	System dynamics
7.	System ordering	Process models
8.	Generative emergence	Cellular automata
9.	Continuous adaptation	Intervention (leverage points)
10.	Self-organizing	Dialogic design, Developmental Evaluation

Placements of these methodologies within a canonical service design process may be associated with the five stages as shown in Figure 3.

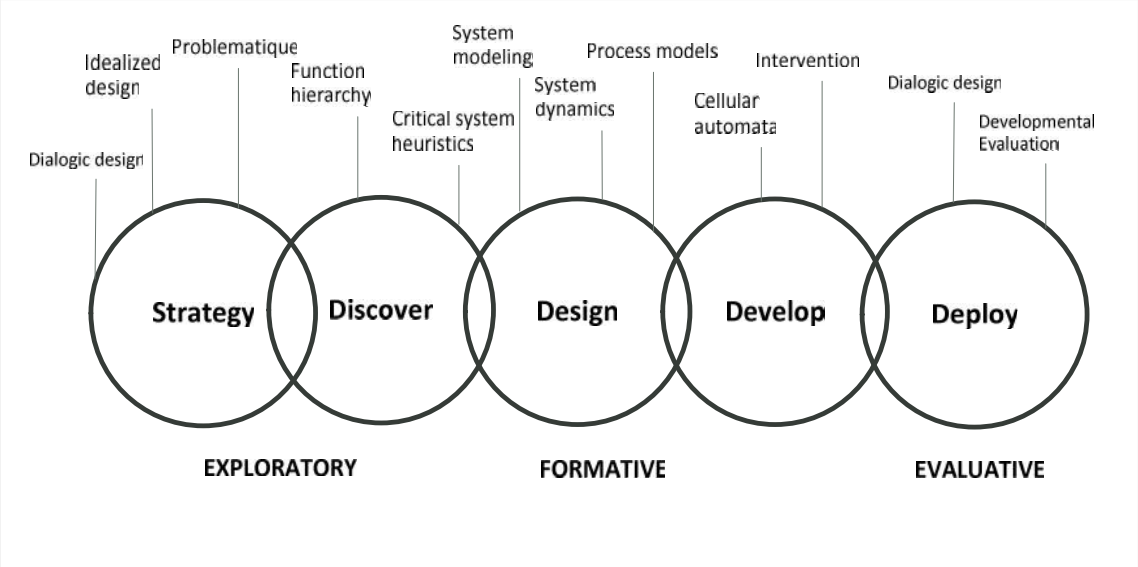

Figure 3. *Systemic Design Methods Mapped to Design Model*.

Note that visual practices have been largely excluded from these assignments. Visual design and sketching can be employed in all stages, enabling the comprehensive integration of artefacts across nearly all principles. The assignment of "visual system mapping" or any of the defined techniques (e.g., GIGAmap, Rich Picture) to any one principle would overly relate it to a single intent.

Contributions from systems-oriented design practice such as the GIGAmap (Sevaldson, 2010) have led to a revival of the rich picture and information models as highly-integrated representations of design research and social system design proposals. In many cases GIGAmaps are serving as final research artefacts and outcome representations, and are adopted by stakeholders as primary research artifacts. The continuing development of dialogic design (Weigand, et al, 2014, Christakis and Bausch, 2006) supports a new generation of design methods for normative planning and multi-perspectival engagement for policy and social system design.

Conclusion

The current paper presents a model for integrating systemic methods with design research across a common design lifecycle. While extending previous work (Jones, 2014) on systemic design principles, the purpose of this proceedings paper is to inspire further development and thinking about the contribution of systems methods to design practice and design theory. While it might be possible to assign a large variety of other methods to principles and design process based on an exhaustive analysis of documented methods, these illustrations are presented within a theoretical context of shared principles and shared methods between systems and design thinking. These relationships between design methods and systemic principles are well-supported by current practices and might be developed through applications discussed in further research.

References

Ackoff, R. (1993). Idealized design: creative corporate visioning. *Omega, 21* (4), 401–410.

Banathy, B. (1996). *Designing social systems for a changing world*. New York: Plenum Press.

Braa, K. & R. Vidgen (1997). An IS research framework for the organizational laboratory. In M. Kyng and P. Mathiassen (eds.), Computers *in context: Joining forces in design*. Cambridge, MA: MIT Press.

Christakis, A.N. and Bausch, K.C. (2006). *How people harness their collective wisdom and power to construct the future in co-laboratories of democracy*. Charlotte, NC: Information Age Publishing.

Gharajedaghi, J. (2011). *Systems thinking managing chaos and complexity: a platform for designing business architecture*. Burlington, MA: Morgan Kaufmann.

Jackson, M. (2010). Reflections on the development and contribution of critical systems thinking and practice. *Systems Research and Behavioral Science, 27*, 133 -139.

Jones, P.H. (2014). Systemic design principles for complex social systems. In G. Metcalf (ed.), Social Systems and Design, Volume 1 of the Translational Systems Science Series, pp 91-128. Springer Japan.

Metcalf, G. S. (2010). Service as mutualism: A question of viability in systems, *Service Science, 2* (1/2), 93-102.

Pourdehnad,, J, Wexler, E.R, and Wilson, D.V. (2011). Systems & Design Thinking: A Conceptual Framework for Their Integration. *Proceedings of the 55th Annual Meeting of the ISSS*, July 17-22, Hull, UK.

Sanders, E.B.N., & van Stappers, P-J. (2013). *Convivial toolbox: generative research for the front end of design.* Amsterdam: BIS Publishers.

Sevaldson, B. (2011). Gigamapping: Visualization for complexity and systems thinking in design. Helsinki: Nordic Design Research Conference.

Weigand, K., Flanagan, T.R., Dye, K.M.C., and Jones, P. (2014).Collaborative foresight: Complementing long-horizon strategic planning. *Technological Forecasting & Social Change, 85,* 134–152.