The systemic turn: Leverage for world changing

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Connecting the Social, Technological, Ecological, and Practical

The twenty-first century challenges human societies, settlements, and economies. This era confronts us with continuous wicked problems on a planetary scale, and it has done so since the tumultuous century began. Since at least 2005, we have seen a series of new approaches to design, from transformation design to service design, from transition design to DesignX. Each approach addresses a range of critical challenges oriented to a point of view. Each approach trials practices and methods in search of the disciplinary confidence to address the macro-level problems that people everywhere face. Climate change, distressed migration, equitable economy, housing, public policy, and health care top the lists of shared complex problems that we face. As designers we genuinely hope that new approaches to design can transform some of these problems to a better future than we face today.

Systemic design considers these macro-scale issues from a different direction. Much like transformation design, systemic design bubbled up from the crucible of millennium problematics and higher-order design. But rather than claiming a purchase on problem solving – always a risky proposition – systemic design took a realist path. It aims for aspirational change for service systems and societal projects through better-fit processes and practices. Systemic design has influenced design education, scholarship, research, methodology, and it has developed design practice, all at the same time. This theme issue of *She Ji* touches on each of these. After several years of development at a deliberate pace, those of us who work in systemic design can show work that begins to fulfill the promise we wait to achieve.

Design as a Whole Systems Practice

The ultimate aim of systemic design is to co-design better policies, programs, and service systems with the participants in those systems. The methods and principles that enable systemic design are drawn from many schools of thought in systems and in design thinking. The objective of systemic design is to affirmatively integrate systems thinking and systems methods to guide human-centered design for complex, multi-system, and multi-stakeholder services and programs across society.

Societies and governments today face deeply entangled sets of problems in ecological, social, economic, and governance systems. These have evolved to become interconnected wicked problems, and have become impervious to conventional change campaigns. Years before the now-ubiquitous portrayals of wicked problems, Hasan Özbekhan[1] stated that these conditions are too complex to address with any single discipline or problem structuring method. These problems require a normative rethinking of the possibilities of future existence. We now refer to these

1 Hasan Özbekhan, *Toward a General Theory of Planning* (Philadelphia: Management and Behavioral Sciences Center, University of Pennsylvania, 1969).

http://www.journals.elsevier.com/she-ji-the-journal-of-design-economics-and-innovation
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issues as Sustainable Development Goals, among other frames.[2] The Sustainable Development Goals involve 17 global problems identified by the United Nations and adopted at a global summit of world leaders in 2015. While all these problems have been visible for many years, previous generations have failed to address them for successful change. While this failure has been evident since at least the 1960s, this does not daunt human optimism. Even so, we are concerned over the fact that design practices are not visibly engaged in strategic design for the Sustainable Development Goals.

Systemic design has developed highly integrative modes of research and praxis to address the complex challenges facing our societies today. So far, we have addressed many macro-level problems in emerging technology, social change, policy and governance, climate change, and bio-ecosystems with superficial approaches. These are often design experiments that we deliver within short-term funding cycles. As designers, we often see well-formed design solutions for large-scale problems that target an envisioned need without understanding the complex social ecology of use. The One Laptop Per Child program is an example of this.

Any design practice that aspires to transforming systemic problems effectively must draw on systems approaches. However, rather than narrowing that approach to systems thinking, sociotechnical systems, or complex adaptive systems, we take all schools as possible sources. In the systems context, design emerges as a practice of ultimate pragmatism. Design thinking and advanced practice integrates and learns from all disciplines through collaborative inquiry, sensemaking, and form giving. We see design as a universal, integrative approach to systemic inquiry and formative intervention. These are the kinds of goals that general systems theory[3] was unable to achieve following the original vision of a systems theory approach that could integrate the sciences by defining the isomorphisms – systematic regularities – of phenomena across disciplines.

Where is the System in Systemic Design?

Harold Nelson's concept of design as shared inquiry provides us with an axiom of the aims that he and Erik Stolterman suggest for design as a mediative judgment toward change. This requires changing systems as a matter of desired outcomes.[4] Perhaps the first complex system problem we face in making sense of the field is, "What is the system to be changed?" We must confront the very basic idea of the system in design thinking.

It may appear that there is no system in systemic design. That is often – but not always – the case. A predominant orientation to constructivist epistemology circumvents the issue of representation by understanding that all systems are defined by agreement rather than by their objective presence. Our past approaches to design and traditional design methods tended to treat systems as things, rather than human interaction or interfaces.

We might also well ask why a system design discipline was never established in the three (or four, depending on your definition) past approaches to design. Systemic design has grown from stakeholder-informed approaches to design. These include research programs focusing on system-oriented design (Oslo School of Architecture and Design[5]), social systems design (OCAD University[6]), and socioecological design (Politecnico di Torino[7]) rather than systems design or engineering. In these schools of thought, the concept of the system at issue is one in which the boundaries and form of the system are co-constructed with system participants.

Let us reach back fifty years to Christopher Alexander's[8] conception of systems in design thinking. Alexander makes a simple distinction between the *whole system* and systems as a *kit of parts*. A whole system is defined, in language, as an agreement among stakeholders of the system boundaries. As a result, this involves

2 "Sustainable Development Goals: 17 Goals to Transform Our World," the United Nations, accessed December 13, 2017, http://www.un.org/sustainabledevelopment/sustainable-development-goals/.

3 Ludwig von Bertalanffy, *General Systems Theory: Foundations, Developments, Applications* (New York: Braziller, 1972).

4 Harold G. Nelson and Erik Stolterman, *The Design Way: Intentional Change in an Unpredictable World* (Cambridge, MA: MIT Press, 2012).

5 System Oriented Design, Oslo School of Architecture and Design, Norway, http://systems-orienteddesign.net.

6 Strategic Innovation Lab, OCAD University, Toronto, Canada, http://slab.ocadu.ca.

7 MSc Systemic Design, Politecnico di Torino, Torino, Italy, https://didattica.polito.it/laurea_magistrale/design_sistemico/en/presentation.

8 Christopher Alexander, "Systems Generating Systems," in Christopher Alexander, *Systemat* (San Francisco: Inland Steel Products Company, James Robertson, 1967).

framing the design problem itself. Automakers and handset manufacturers who defined their whole system as a product within a dealer network lost their franchises to the strategic positions of transportation services and digital telecom ecosystems. Alexander's kits of parts are also revealed in these whole systems. These are systems of parts, logistics, support networks, code frameworks, and modular platforms. These are systems designed for sustaining whole systems, and they are the more traditional locus of designing.

Systemic design aims to change whole systems through skilled mediative means. This project requires power tools that move beyond the quotidian tools of the design trade. As designers and educators, we search for an interdisciplinary anchoring point that connects systems theory and its principled practices with design praxis and methods. Systemic design answers this search with deep reasoning principles. These include, for example, C. West Churchman's inquiring systems;[9] complexity frameworks, such as soft systems;[10] models of behavior, including anticipatory systems;[11] alongside its history of powerful modeling methods, ranging from system dynamics and interpretive structural modeling to system mapping.

Perhaps it is time for design to take systemics seriously as a basis for design argument as well as a basis for professional service practice. We should recall that even human factors faced a reluctant introduction to most design schools as recently as the 1990s. Today, the influence and knowledge of human factors has been internationally translated to industrial and interaction design curricula, albeit inconsistently. Unlike other design practices, systemic design starts from a formulation of a higher-order design placement. In Richard Buchanan's[12] terms, this means locating formative contexts in services, systems, and environments.

A conventional design prospectus discovers the positions for system redesign by working upward from the products and services that matter to an organization. Systemic design frames a whole system from a human perspective and connects knowledge and insights from our learning in a social system to the human activities (placements) in product, service, and artifact design proposals. Accordingly, we might also recognize the significant position for design research informed by distributed cognition with systems in this interface, occupied by activity theory[13] and actor-network theory (ANT).[14] In the current issue, Tim Tompson advances a design language for actor-network theory as an infrastructuring framework for urban design studies, through a novel visual articulation of movements and functions in actor-network theory.

Some propose that systems thinking and theory might satisfy the demand for the elusive theory base underpinning design. Given the pluralist integration of influences over the history of design, design studies have tested approaches to design theory based on ideas and approaches borrowed from the social sciences, critical theory, media theory, behavioral economics, cognitive science, and ecological psychology. Past attempts to locate systems theory never really fit the design practices of the times. Even cybernetics – so influential in engineering and design theory – has largely enlightened us intellectually without leading to wider adoption in design practice. (I will note the brilliant exceptions of Klaus Krippendorff's[15] contributions to second-order cybernetics in communication, Paul Pangaro and Hugh Dubberly's[16] contributions to service and conversation design, and the influence of Ranulph Glanville's[17] ideas across design thinking. Even so, these ideas remain underdeveloped in design education and design practice.) The inventive craft core of design has largely resisted the engineering-led processes of systems design, and few design schools outside of Ulm, the Institute of Design at Illinois Institute of Technology, and the University of California at Berkeley worked in the systems-design interface until recently.

9 C. West Churchman, *The Design of Inquiring Systems: Basic Concepts of Systems and Organization* (New York: Basic Books, 1971).

10 Peter Checkland, "Soft Systems Methodology: A Thirty Year Retrospective," *Systems Research and Behavioral Science* 17, no. S1 (2000): S11.

11 Robert Rosen, *Life Itself: A Comprehensive Inquiry into the Nature, Origin, and Fabrication of Life* (New York: Columbia University Press, 1991).

12 Richard Buchanan, "Wicked Problems in Design Thinking," *Design Issues* 8, no. 2 (1992): 5–21, DOI: https://doi.org/10.2307/1511637.

13 Victor Kaptelinin and Bonnie A. Nardi, *Acting with Technology: Activity Theory and Interaction Design* (Cambridge, MA: MIT Press, 2006).

14 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005).

15 Klaus Krippendorff, "The Cybernetics of Design and the Design of Cybernetics," *Kybernetes* 36, no. 9/10 (2007): 1381–92, DOI: https://doi.org/10.1108/03684920710827364.

16 Hugh Dubberly and Paul Pangaro, "Cybernetics and Service-Craft: Language for Behavior-Focused Design," *Kybernetes* 36, no. 9/10 (2007): 1301–17, DOI: https://doi.org/10.1108/03684920710827319.

17 Ranulph Glanville, "Researching Design and Designing Research," *Design Issues* 15, no. 2 (1999): 80–91, DOI: https://doi.org/10.2307/1511844.

From Conference to Context, Evidence, and Practice

The studies in this issue fuse various schools of thought across a fascinating range of social design factors: human system interaction, social system behavior, institutional change, communication practices, and complex system dynamics. The annual symposium that seeded these articles, Relating Systems Thinking and Design (RSD5), demonstrated a maturing point in the discourse. We see several viable new directions emerging here: applied design theory (design for resilience), adaptive service system design, graduate pedagogy, and advanced participatory stakeholder design methods.

Relating an Author Summary

The five articles in this theme issue of *She Ji* report on significant topics in contemporary systemic design practice and education for practice. Each is a blend of theory, method, and case outcomes. The applications are complex social systems primarily involving public sector challenges. Three articles describe social infrastructures as conceptual systems within larger community services, including social infrastructures for support services, as networks for community habitation, and as structures for urban social service delivery. Health applications include patient-centered innovation to healthcare service, rethinking mental health services, and mapping a national-level clinical cancer system. Several innovations to social services are also developed, including self-mobilization for asylum seekers and primary school education.

The evolution of the field shows that these are typical applications for systemic design. These problematic arenas require situating a system design proposal within larger sociopolitical, ecological, or policy systems, which regulate organizations, actors, and their activities. These problem areas require design sensitivity to cultural history, peripheral participants, and larger "containing" systems. In all these cases, design researchers become deeply implicated in the social relationships and politics of the work domains.

In these articles, the scholars also serve as practitioners. They report on the efficacy of design engagements and participatory system methods that are sensitive to their settings. But these practitioners do not take the unambiguous path of becoming domain experts. Rather, the authors reveal the evolution of capacities beyond mere knowledge, perhaps unique to systemic design. In designing for complex social systems, we might serve as program coordinators, technology planners, management consultants, social futurists, policy analysts, business strategists, architects and workflow designers. We often advocate expansive – and expensive – radical stakeholder inclusion to bring power and possibility into the same conversation. We balance creativity with respect for evidence. We balance a focus on human beings with an attempt to understand current science. We also balance two approaches, impartially facilitating participant empowerment for change and skillfully representing value creation in legacy processes. In each of these cases, conventional orders of design fall short. There are no off-the-shelf methods.

The issue opens with Eloise Taysom and Nathan Crilly's[18] exploration of the meanings and loci of the widely misunderstood concept of resilience as a functional criterion in designing for societal infrastructures. Resilience is derived from the bounty of resilience theory in ecology, engineering, and planning. The article yields an integrative view of resilience as comprising one or more of three characteristics: resisting influences (retaining shape), recovering from influences (or shocks), and changing to accommodate influences (adaptation). Analysis yields a surprising insight: these qualities are not always compatible with each other. While some forms of resilience (adaptation and recovery) function as enablers in social systems, they may also interfere with ecological resilience, or organizational behavior. Applying

18 Eloise Taysom and Nathan Crilly, "Resilience in Sociotechnical Systems: The Perspectives of Multiple Stakeholders," *She Ji: The Journal of Design, Economic, and Innovation* 3, no. 3 (2017): 165–82, DOI: https://doi.org/10.1016/j.sheji.2017.10.011.

these forms of resilience to sociotechnical systems requires considering the balance of resiliency attributes that are effective in human-technical-environment systems, or from social, engineering, and ecological perspectives. Taysom and Crilly's project examined the planning and design practices for infrastructures at various system levels for stakeholders in a large university development for affordable housing that is compatible with community goals and values. An engagement and mapping workshop revealed the varying levels and locations of system boundaries across organizations and interests. It also demonstrated that different perspectives on the value of resilience were located within these systems maps. A time-era analysis also yielded further insight into the expected impact of resilience at different timescales for different levels or projects. Readers may find the models in this article applicable to systemic design in large-scale systems and programs such as urban livability, climate change adaptation, and mixed-function economies.

Mieke van der Bijl-Brouwer[19] follows this with a study and systemic model of design for social infrastructures for social services, primarily in municipalities and large organizations. She contends that conventional modes and methods of service design are inadequate for addressing complex systems. Their emphasis on activity and behavioral level design evades key principles of human-centeredness. Van der Bijl-Brouwer argues for a service interface level of design, rather than discrete touchpoints as the service system model. Adapting David Snowden's Cynefin[20] complexity model, she examines services as simple, complicated, and complex challenges. With a focus on complex service systems, including mental health and primary school education, Ralph Stacey's[21] complex adaptive system approach (complex responsive processes) discloses the interaction of responsive relationship patterns in the service system interface. This adaptation of complexity theory sidesteps the linear, modularized service journey model that the service design field uses as a primary description of service provision. Van der Bijl-Brouwer defines a multi-layered social infrastructure for navigating relationships responsive to service requests and value co-creation. In this early stage research, Van der Bijl-Brouwer proposes a model to define needs and aspirations in design innovation as the framework for mapping themes, goals, scenarios, and solutions to the case challenges of mental illness and education.

Two service system projects were developed through a design facilitation methodology study at the Oslo School of Architecture and Design. One involved patient-centered care across multiple institutions. The other was a transformative approach to migrants' services. Manuela Aguirre, Natalia Agudelo, and Jonathan Romm[22] reported on their trials of methods and assessed a systemic design facilitation model through a series of workshops. They reveal several unique contributions to design-led engagement processes that are particularly valuable in large, multi-stakeholder events for complex social services delivery. Their analytical framework enables balancing among the selection of three foci in design participation: human perspectives, experiential approaches, and creative thinking and making activities. Facilitation methods were selected against four degrees of application of each, creating different profiles for workshop interaction depending on session intention, participation goals, and outcomes. Few studies have developed new workshop methods to such a deep extent as this project. Aguirre, Agudelo, and Romm advance both participatory practice and the practice interface with systemic theory for stakeholder co-creation.

Tim Tompson[23] challenges the Smart City discourse through a pragmatist methodology that examines the limits of this global movement toward systemization of urban development. Taking two Australian urban case studies as a basis for the critique and analysis, Tompson's human-centered inquiry upends the technological context of the Smart City to examine its users, purposes, and interests.

19 Mieke van der Bijl-Brouwer, "Designing for Social Infrastructures in Complex Service Systems: A Human-Centered and Social Systems Perspective on Service Design," *She Ji: The Journal of Design, Economic, and Innovation* 3, no. 3 (2017): 183–97, DOI: https://doi.org/10.1016/j.sheji.2017.11.002.

20 David Snowden's Cynefin framework has developed as a major reference in management practice based on complexity science. For more information, see http://cognitive-edge.com.

21 Ralph D. Stacey, *Complex Responsive Processes in Organizations: Learning and Knowledge Creation* (New York: Routledge, 2001.

22 Manuela Aguirre, Natalia Agudelo, and Jonathan Romm, "Design Facilitation as Emerging Practice: Analyzing How Designers Support Multi-stakeholder Co-creation," *She Ji: The Journal of Design, Economic, and Innovation* 3, no. 3 (2017): 198–209, DOI: https://doi.org/10.1016/j.sheji.2017.11.003.

23 Tim Tompson, "Understanding the Contextual Development of Smart City Initiatives: A Pragmatist Methodology," *She Ji: The Journal of Design, Economic, and Innovation* 3, no. 3 (2017): 210–28, DOI: https://doi.org/10.1016/j.sheji.2017.11.004.

Tompson's recruitment of actor-network theory uncovers the complexity of arrangements in the transportation case studies, revealing extensions to pragmatism through actor-network theory to strengthen critical analysis and problem framing. Tompson presents two enormous visualizations of a complex transportation systems case to demonstrate the application of the actor-network theory perspective through symbolic annotations of the maps by stakeholder participants in workshop settings. A specialized visual language annotates human and non-human actants, to distinguish participation in networks. This visual language also clarifies several unique actor-network theory features: translations, inscriptions, passage points, and irreversible steps. The visual language encourages other practitioners to make use of the features for similar analyses that might be translated from urbanism to public services, healthcare, or other activity domains explored in systemic design.

Finally, Peter Jones and Jeremy Bowes[24] of Toronto's OCAD University develop a comprehensive presentation of the synthesis map methodology, an innovation that builds on Birger Sevaldson's[25] Gigamap practice. While function-specific systems methods have been modeled through visual representations for decades, their use in design practice has not been largely effective. This is as much due to design culture as to the necessity for trained instructors to teach and contextualize these methods.

The synthesis map artifact differs from other system maps in its triangulation of component methods to establish a systemic narrative for a social system problem. The unique contribution of the article is the articulation of the graduate pedagogy for training the methods, as well as a summary process outline that helps distinguish and compare methods. We discuss the evolution of pedagogy and the method, and we support our treatment using three recent exemplars from cancer research, social governance, and technology consumption. We are proud to see the student case project selected for the issue cover – it is a rare opportunity for MDes students to be referenced even before graduation.

Conclusion

Both systems thinking and contemporary design practices are insufficient, on their own, to transform the complex continuous problems our institutions have sustained through a rapidly morphing modernism. Leading practitioners in both core disciplines have quite similar motivations for envisioned outcomes in the world. This is clear in projects developed in flourishing communities and organizations, effective human-centered health practices, fully functioning democratic governance, citizen-centered cities and services, and so on. Practice-led research and reflective practice have taught many of us that the silver bullets of recent design ideas, such as multidisciplinarity and human-centricity, are also insufficient to the complexity and scale of these tasks. Systemics lends design thinking an explanatory theory that integrates principles with the power tools of disciplined method. Design lends systems thinking the pragmatic applications of integration, the transformation of human activity, and the surprising power of observing human experience in design research.

While we continue to work toward breakthrough design research and practice excellence, we recognize that we have established few practice guidelines and few original theories. We have not yet established many broadly preferred methods. Many of our early exploratory studies may never quite reach their application goals, yet within an expanding discursive community we can accept many different trajectories for the value of their knowledge translation and expansive learning. We can gain much by learning from transdisciplinary collaboration, open scholarly exchange, and intentional communication across practice communities. The current publication is a welcome addition to the literature that supports these objectives.

24 Peter Jones and Jeremy Bowes, "Rendering Systems Visible for Design: Synthesis Maps as Constructivist Design Narratives," *She Ji: The Journal of Design, Economic, and Innovation* 3, no. 3 (2017): 229–48, DOI: https://doi.org/10.1016/j.sheji.2017.12.001.

25 Birger Sevaldson, "GIGA-Mapping: Visualisation for Complexity and Systems Thinking in Design," in *Proceedings of Nordes 2011: Making Design Matter* (NORDES Digital Archive, 2011), 1–20, available at http://www.nordes.org/opj/index.php/n13/article/view/104.

From Symposium to Design Studies

We selected the five articles in this issue of *She Ji* from the proceedings of the fifth Relating Systems Thinking and Design (RSD5) Symposium in Toronto, Canada, in October of 2016. This ongoing symposium has actively developed the intersection of systems theory and systems methods with design practice, methods, and education in complex design contexts. Other scholarly or practitioner conferences have not addressed the relationship of systemics and design – and the spaces between them. In my observation, these two fields have drifted apart.

Many in both disciplines invoke the language of systems and designing. Even so, they do so without the intellectual or educational investment required for understanding the theories and thinkers, controversies, core methods, and contributions from each of the two disciplines to the other. The most significant recent attempt to promote such a designerly discourse was the articulation of the DesignX[26] statement and the contributions hosted by this very journal. Systemic design has generally followed disciplined approaches to designing for social complexity. It shares many of the aims and concerns for adapting design education and practice to the ever-increasing sociotechnical complexity typified by the problems that DesignX considers.

The development of new scholarly work inspired by RSD has increased significantly in recent years. The articles in this issue cross over several directions we have observed in the symposia and the emerging relationships. The conference proceedings published papers from forty-two of the symposium presentations.[27] The Norwegian design journal FORM Akademisk,[28] is the RSD symposium's home journal, having published special issues from RSD2, RSD3, and in press for RSD4. Another edited volume from RSD4, in Springer's Translational Systems Sciences series, is in press for publication in early 2018.[29]

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Peter Jones
Guest Editor

26 Donald A. Norman and Pieter Jan Stappers, "DesignX: Complex Sociotechnical Systems," *She Ji: The Journal of Design, Economics, and Innovation* 1, no. 2 (2016): 83–106, DOI: https://doi.org/10.1016/j.sheji.2016.01.002.

27 Proceedings of RSD5 are available online at https://systemic-design.net/rsd-symposia/rsd5-2016/.

28 For example, the leading papers from RSD I were published in *Form Akademisk* 7, no. 3 (2014), the TOC of this issue is available at https://journals.hioa.no/index.php/formakademisk/issue/view/118/showToc; the leading papers from RSD II were published in *Form Akademisk* 7, no. 4 (2014), https://journals.hioa.no/index.php/formakademisk/issue/view/124/showToc; and the RSD III were published in *Form Akademisk* 10, no. 1 (2017), available at https://journals.hioa.no/index.php/formakademisk/issue/view/235/showToc.

29 Peter Jones and Kyoichi Kijima, eds., *Systemic Design: Theory, Method and Practice* (Tokyo: Springer Japan, forthcoming).