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DesignX: Complex Sociotechnical Systems

Abstract This paper is a follow up to DesignX, a position paper written in 2014, which introduced the design challenges of complex sociotechnical systems such as healthcare, transportation, governmental policy, and environmental protection. We conclude that the major challenges presented by DesignX problems stem not from trying to understand or address the issues, but rather arise during implementation, when political, economic, cultural, organizational, and structural problems overwhelm all else. We suggest that designers cannot stop at the design stage: they must play an active role in implementation, and develop solutions through small, incremental steps – minimizing budgets and the resources required for each step – to reduce political, social, and cultural disruptions. This approach requires tolerance for existing constraints and trade-offs, and a modularity that allows for measures that do not compromise the whole. These designs satisfice rather than optimize and are related to the technique of making progress by "muddling through," a form of incrementalism championed by Lindblom.

Keywords
Sociotechnical systems
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Complex Sociotechnical Problems

In the fall of 2014, a number of us found ourselves in Shanghai as advisors to the newly formed College of Design and Innovation at Tongji University. We asked ourselves how design could address the complex issues that the world currently faces. The issues are not new: many have grappled with them for some time. But how can designers play a role? And how should design professionals be educated to prepare for that role?

Complex societal systems such as healthcare, transportation, government policy implementation, and environmental protection have many components – technical and otherwise – whose interactions are critical to the system's overall behavior. Many different fields contribute to the efficiency of these systems, including in recent years, design. Fulfilling this role is very different from producing the traditional craftwork that originally characterized the design profession. With the advent of human-centered design methods and design thinking, many designers and design consultancies have started to work in complex sociotechnical arenas.

Do the current methods taught in design education, especially considering its emphasis upon traditional craft, prepare designers for work in and with complex sociotechnical systems? What can design add, and what needs to be added to design? The emphasis on perfecting craftsmanship using a variety of materials would seem no longer necessary, while enhancing problem-finding and observational skills, and cultivating an ability to manage iterations of prototyping and testing do seem relevant.

The 2014 DesignX position paper described the nature of these issues, and offered a framework for designers to address them.[1] We didn't know what to call the kind of design that might be associated with our approach, and after many iterations of the name, we simply called it 'X' – as in the algebraic variable traditionally used to represent an unknown value. The authors of the position paper do not claim to be the first to tackle these issues; the field of sociotechnical systems (STS) has long grappled with them.[2] The Systemic Design Network, and its series of conferences on Systems Thinking and Design,[3] and the Transition Design program at the School of Design at Carnegie Mellon University – among others[4] – are addressing many of these same concerns. Many individual designers have also, of course, considered these issues.[5]

The aim of the present work is to build upon the foundations laid in the 2014 DesignX paper. Our writing has been informed by the passage of time, and the input of a large number of researchers, published works, and conferences – including a DesignX two-day workshop at the College of Design and Innovation at Tongji University, Shanghai, in October 2015. That workshop produced a number of case studies and a lively discussion that we seek to continue here. This paper reflects our learnings from all these encounters, but only represents the opinions of its two authors, and thus should not be taken to represent the conclusions of the workshop or any other participant. Our goal is to provide readers with a piece that provokes thought and stimulates discussion.

DesignX Problems: An Example

Abstract principles require concrete examples. The Design Lab at the University of California, San Diego (UCSD) has recently started several major projects in collaboration with the UCSD Health Sciences departments and university hospital system to examine and – ideally – enhance the care of cancer patients receiving radiation treatment (Radiation Oncology).

Administration of radiation oncology treatment typifies the complexity of DesignX tasks. At least twelve different medical specialties are involved. A typical

1 Friedman, Ken, Yongqi Lou, Don Norman, Pieter Jan Stappers, Ena Voûte, and Patrick Whitney, "DesignX: A Future Path for Design," *jnd.org*, last modified December 4, 2014, accessed November 11, 2015, http://www.jnd.org/dn.mss/designx_a_future_pa.html, also available at http://tinyurl.com/designx-statement; Donald A. Norman, "Why DesignX? Designers and Complex Systems," *Core77* (blog), December 6, 2014, http://www.core77.com/posts/27986/why-designx-designers-and-complex-systems-27986.

2 According to one definition, STS is "an approach to complex organizational work design that recognizes the interaction between people and technology in workplaces." See "Sociotechnical system," *Wikipedia*, last modified November 12, 2015, cited version accessed October 19, 2015, https://en.wikipedia.org/w/index.php?title=Sociotechnical_system&oldid=680567062.

3 RSD5 Symposium: Systemic Design for Social Complexity: Relating Systems Thinking and Design, accessed November 11, 2015, http://systemic-design.net/.

4 "Transition design," *Wikipedia*, last modified December 5, 2015, accessed October 19, 2015, https://en.wikipedia.org/wiki/Transition_design.

5 For example, see Peter H. Jones, *Design for Care: Innovating Healthcare Experience* (Brooklyn, NY.: Rosenfeld Media, 2013); Peter H. Jones, "Systemic Design Principles for Complex Social Systems," in *Social Systems and Design*, ed. Gary S. Metcalf (Tokyo: Springer Japan, 2014), 91–128.