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Systemic design: Two Canadian case studies

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Always design a thing by considering it in its next larger context – a chair in a room, a room in a house, a house in an environment, an environment in a city plan —Eliel Saarinen[1]

A systems approach begins when first you see the world through the eyes of another —C. West Churchman[2]

Design is the future of systems methodology —Russ Ackoff[3]

Design is about unlocking the possibilities that lie within multiple perspectives. That design is about solving a complex problem with multiple constraints – John Maeda[4]

Introduction

The currently fragmented state of 'systems + design' praxis is curious in light of the affinities between the two interdisciplines, as emphasized in the quotations above. To explain why designers and systems thinkers have not been talking to each other, we may look to their differences. Design as evolution of craft has been characterized as "thinking with your hands" and as such is rooted in an epistemology of practice.[5] In contrast, the systems movement began with Ludwig von Bertalanffy's General System Theory, which placed systems thinking above the disciplinary sciences, in order to provide a non-reductionist foundation for the unity of science.[6] Whereas the designer learns by doing in concrete situations, the systems thinker's knowledge accrues by abstracting away from the particular details of any specific instance of practice.

But if this genealogy is sufficient to account for the lack of dialogue between and synthesis of systems + design, then the two interdisciplines are on a collision course. Since the mid-20th Century, design has followed a trajectory of increasing abstractness, migrating from the design of objects, to the design of services, identities, interfaces, networks, projects, and discourses.[7] The emergence of the term 'design thinking' acknowledges this more abstract application of design, often at organizational and societal scales. At the same time, systems thinking has all but abandoned its ambitions to provide a unity for science. Instead, a diversity of systems approaches have flourished as forms of reflective practice, grounded in the methods of action research. Action research, an

[1] Quoted by his son Eero Saarinen, *Time*, 2 June, 1977.
[2] C. West Churchman, *The Systems Approach* (New York, NY: Delacorte Press, 1968), 231.
[3] Quoted in Jamshid Gharajedaghi, *Systems Thinking: Managing Chaos and Complexity: a Platform for Designing Business Architecture* (Amsterdam, NH: Elsevier, 2011), Third Edition, xi.
[4] John Maeda, *The Future of Design Is More Than Making Apple iOS Flat* (Wired.com, June 12, 2013).
[5] Donald A. Schön, *Educating the Relective Practitioner: Towards a New Design for Teaching and Learning* (San Francisco, CA: Jossey Bass, 1987).
[6] Ludwig von Bertalanffy, *General System Theory: Foundations, Development, Applications* (New York, NY: G. Braziller, 1969).
[7] Klaus Krippendorff, *The Semantic Turn: A New Foundation for Design* (Boca Raton, FL: CRC/Taylor & Francis, 2006).

iterative and collaborative process to improve a situation simultaneously with learning about it, firmly places the systems thinker in the realm of practice. This collision of systems + design threatens previously occupied intellectual territories, so it could be violent. Yet it also contains enormous creative potential that might be harnessed to better connect theory and practice to produce actionable knowledge.

The authors of this chapter are approaching the scene of the collision from opposite, but not opposing, directions. One of us is a systems thinker who got involved in the messy business of institutionalizing design within the U.S. military. The other is a business designer who increasingly needs systems thinking to fold design into the core of business strategy development. Although our systemic design methodologies were developed independently,[8] we have found they provide enough similarity to be commensurable, and enough differences to stimulate critical reflection.

In this paper, we will present two new case studies where systemic design was applied with impact to address strategy and organizational challenges. Before introducing the case studies, we briefly define what we mean by systemic design and provide a comparison of our respective methodologies. In the following section, our first case study concerns a public procurement project within the University of Toronto, where design and a systems mindset helped the Central Procurement Department re-envision how public policy is implemented and how value is created in the broader university purchasing ecosystem. Our second case study involves improving the effectiveness of the Clean Energy and Natural Resources Group (CENRG) within the Government of Alberta. Design was used here to reframe the way that the five departments within CENRG work together and to create a learning system for continuous improvement. Next, we perform a comparative analysis of the two methodologies as applied to the case studies introduced above. We conclude the paper by interpreting these case studies as a contribution to knowledge on how systems + design might be synthesized to create a practical approach to systemic design.

The Shape of a Systemic Design Project

Systemic design synthesizes the ideas of design and systems thinking. Systems are models of open, purposeful, complex wholes. Design is a normative, user-centered, iterative approach to innovation. Systemic design creates a learning system capable of adapting to a changing environment through iterative framing and reframing, spanning action and reflection on action.

The two methodologies considered in this paper are shown in Figure 1 below. On the left, Rotman's design thinking methodology is represented as a series of three gears: Empathy and Needfinding; Ideation and Prototyping; and Business Strategy. On the right, the design methodology evolved by the U.S. Army is shown as three activities: Environmental framing; Problem / opportunity framing; and Operational approach. Both methodologies guide the practitioner in moving from deepening and broadening understanding towards taking strategic action to improve the situation.

[8] Our methodology is based on the work of Roger Martin in the business context and Shimon Naveh in the military domain. See Roger L. Martin, *The Design of Business: Why Design Thinking Is the Next Competitive Advantage* (Boston, MA: Harvard Business Press, 2009); Shimon Naveh, Jim Schneider and Timothy Challans, *The Structure of Operational Revolutions: A Prolegomena* (Leavenworth, KS: Booz Allen Hamilton, 2009).

Figure 1. Rotman's Design Thinking Methodology and the U.S. Army's Design Methodology.

Public Procurement Case Study

Senior leadership within the University of Toronto's (UofT) Procurement Division recognized the need to re-examine how they think and what they do as an organization, realizing that current administration practices were resulting in diminishing returns. They wanted to look at their purchasing compliance issues from the perspective of their users in order to help improve the value of publicly funded research dollars and increase adherence to government policy. The department underwent a four month 'deep dive' project to better understand the broader ecosystem of stakeholders and develop more effective solutions with an empathic appreciation of the research community. The design team developed a simplification and engagement initiative that aimed to make purchasing more accessible and efficient while creating a more collaborative relationship with stakeholders. This included the design of a dynamic and negotiable bidding process, user-friendly policies and language, reduction in red tape, shift from technological to relationship competencies, and changes to their strategic model, all with the user ecosystem in mind. These changes were intended to reframe user perceptions of Procurement Services from 'enforcers of policy and regulation' to 'a trusted advisor, on your side.'

An example artifact produced during the project is shown in Figure 2 below. Using design methods including ethnographic field research and collaborative design sessions, the design team uncovered latent needs of end users. Using systems methods such as the activity system map, the design team visualized the procurement touch-points as a system to show how the redesigned system would better meet user needs.

Figure 2. An activity system for better meeting the needs of end users of the University of Toronto's Procurement Services.

As a result of this project, user retention rates for Procurement Services jumped from 40% to 99%. In the first year, the pilot program was estimated to have returned $1.5 million in savings. In 2012, Procurement Services received the CUABO industry award for their innovative negotiable RFP process and the University of Toronto's Excellence through Innovation award.

Clean Energy and Natural Resources Group Case Study

In 2012, leaders within the Government of Alberta stated that there was a need to 'change the channel' on how the departments think about their work, and how they actually operate. The Clean Energy and Natural Resources Group (CENRG) within the Government of Alberta (GoA) chose to undertake a systemic design inquiry in order to improve the efficiency and effectiveness of the GoA's role within the natural resources management system. Starting with an intensive six day design practicum using the U.S. Army's design methodology, the design team developed a deeper understanding of CENRG's role within the natural resources management system, reframed their mindset from 'control of my piece' to 'collaboration with the collective,' and devised an innovative operational approach to improving inter-departmental collaboration.

An example artifact produced during the process is shown in Figure 3 below. Design methods were used to collaboratively construct a shared map of stakeholders, which was then iteratively developed into a systems map. The process of creating this artifact clarified the common purpose of five

government departments which had previously operated in isolated silos.

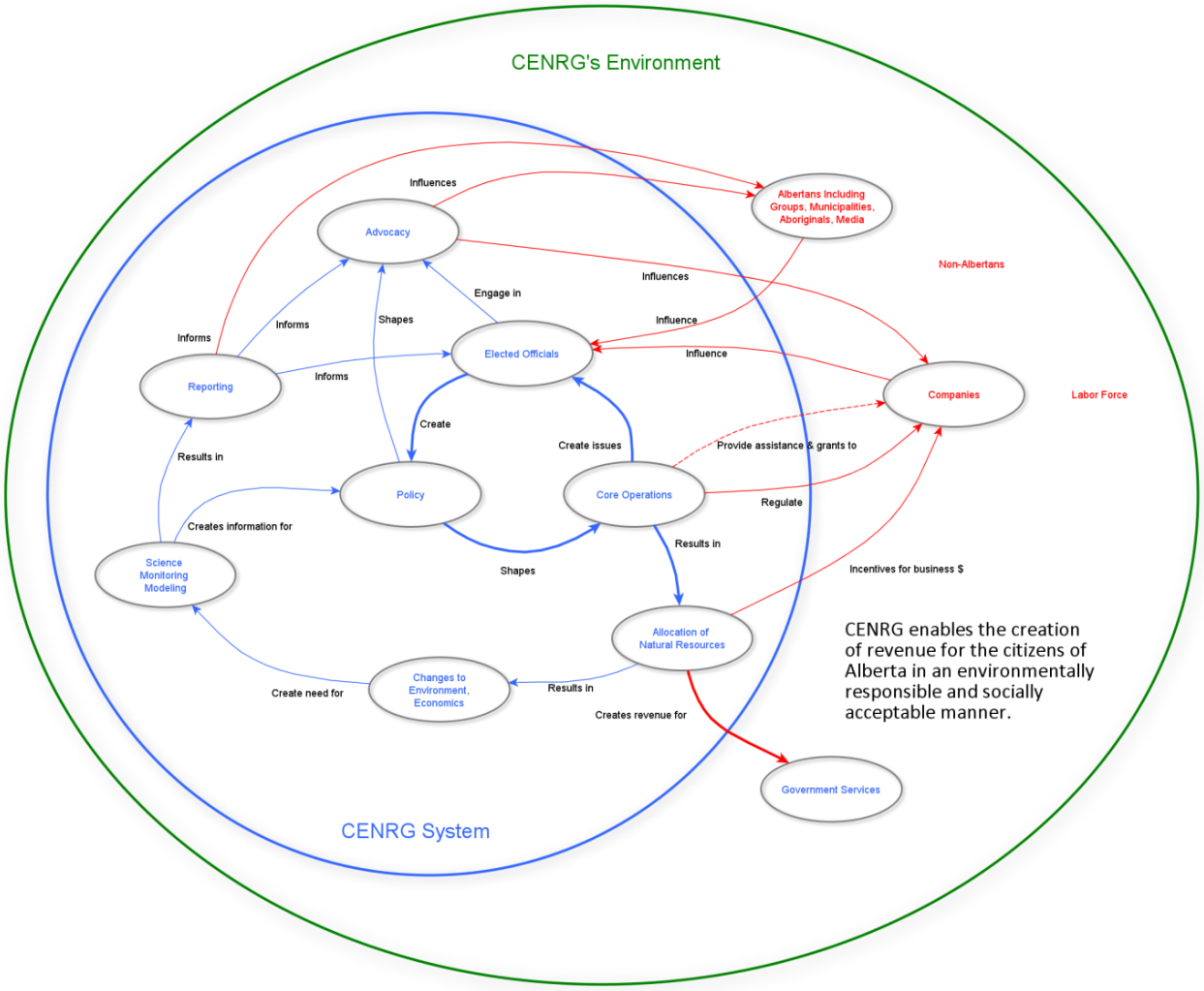

Figure 3. A systems map of the Government of Alberta's Clean Energy and Natural Resources Group.

The project resulted in greater clarity on objectives, a framework for structuring collaboration, and a re-conceptualized mode of engaging with stakeholders that achieves alignment through strategic influence. More importantly, these organizational components were organized into a learning system, capable of continuing to deepen understanding and adapt to a changing environment. The efforts to create the CENRG system in this workshop evolved into a larger effort within the GoA to build an Integrated Resource Management System. As a result of the workshop, the GoA established a standing cross-ministry systemic design team, a systemic design community of practice, and initiated multiple follow-on projects. Follow-on systemic design projects have ranged from the design of an environmental management agency and common risk management framework for the upstream energy sector to early childhood development.

Comparative Analysis

The first insight from a comparative analysis from a systemic design perspective is that neither methodology is evenly balanced. The Rotman approach is a design methodology informed by some systems techniques. The U.S. Army approach is better characterized as a systems methodology that employs some design methods. This is not a criticism: UofT Procurement Services requested human-centered design, while the GoA asked for a systems methodology. However, from the perspective of

the integration of systems + design, neither case study produced a true synthesis that balanced systemic thinking and designerly action.

The following attributes were common across the two projects. Both projects shared:

- A process for exploring diverse worldviews and surfacing mental models of participants;
- A holistic view of the challenge (human, technological, and organizational systems);
- A systemic perspective that helped to reframe the challenge;
- A drive to cut unconventional paths towards goals, as well as to question the goals themselves; and
- A willingness to embrace complexity in order to create new opportunities for profound simplicity.

The following table contrasts some differences between the methodologies as practiced in the case studies.

Rotman Methodology	**U.S. Army Methodology**
Explicit use of empathy	Explicit use of systems maps
Physical prototyping	Genealogy to uncover the roots of mental models
Rapid testing	Theoretical grounding
User feedback	Narrating the journey of learning
Design aesthetic	Integrating education with practice

We believe the similarities of the two methodologies provide a common ground on which to build a more centered approach to systemic design, while the differences provide opportunities for learning and improving both methodologies.

Lessons for Systemic Design

Both the UofT Procurement Services and GoA CENRG case studies demonstrate that systems and design concepts can be successfully integrated. In the UofT case study, systems methods helped the team to better appreciate the user ecosystem and to design an activity system to change end user perceptions of Procurement Services. In the GoA case study, design methods helped the team to better appreciate diverse stakeholder perspectives and to ideate and visualize actions to improve inter-departmental collaboration.

A systems approach provides a broader perspective of the problematic situation from which high leverage areas for intervention can be recognized. Design provides a humanistic perspective of the needs of real users, and craft skills for giving tangible form to abstract ideas. These two approaches are highly complementary, and compensate for one another's weaknesses. Design's ethnographic methods and bias for generative action balances the systems practitioner's tendency to continue to expand system boundaries to broader and more abstract models of the situation. The systems sciences provide a rich body of theory to support design practices that have evolved from craft without rigorous theoretical grounding. A more centered assemblage of Systems + Design could be qualitatively more powerful than systems thinking or design thinking approaches applied in isolation. For today's and tomorrow's most complex challenges, a new synthesis of systemic design is required.