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A theory of systemic design

Ryan, Alex

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Alex J. Ryan

1.0 Introduction

Over the last two decades, concepts from complexity theory, systems thinking, design, strategy, and philosophy have been synthesized within the Israeli Defense Force, the Australian Army, and the U.S. Army and Joint Force to produce a theory and practice of systemic design (Ryan 2011). Although this conceptual evolution has taken place within a military context, the theory developed has general applicability to the challenges of designing at scale in complex environments. The purpose of this paper is to present the pure theory of systemic design as developed by Western militaries, abstracted away from its military context, in order to facilitate applications to societal, governmental, and business design challenges. By making the theory accessible to civilian designers, it is hoped that they may benefit from the cross-pollination of ideas that have evolved in the highly competitive crucible of contemporary conflict.

In section 2.0, I provide a framework for systemic design consisting of three levels: methods, methodology, and, mindset. The uses and abuses of methods are discussed first. Next, the logic for a systemic design project is outlined and developed as a flexible methodology for developing deeper understanding and constructing novel interventions. Then, the mindset of the systemic designer is characterized as a set of values and habits. Any systemic design project proceeds at all three levels simultaneously, with the levels mutually reinforcing and reciprocally influencing one another. In section 3.0, I discuss meta-concerns for systemic design. They include the rationale for systemic design, design of the systemic design team, and mediation of cognitive tensions.

2.0 Three Levels of Systemic Design

There are at least three levels of awareness that a systemic designer must attend to during a systemic design project. They are the level of method, methodology, and mindset. A method is a discrete procedure for facilitating group process that specifies how group members should work together to generate and externalize ideas. A methodology provides a logic for combining methods in a coherent sequence to move between deepening understanding of the challenge and generating actions to improve the situation. Each school of systems / design practice tends to promote a signature methodology as a key point of differentiation. Despite this variance, a large number of methodologies for innovation have been successfully mapped into a generic framework with four main activities: Discover and orient; Define and conceptualize; Optimize and plan; and Execute and measure (Van-Patter and Pastor 2013). Mindset defines the values and habits the systemic designer brings to the challenge, which guide judgment during the application of methodology and shapes selection of methods. These three levels are interrelated, as depicted in Figure 1. Each new systemic design experience creates opportunities for co-evolution of the practioner's mindset, methodology, and methods.

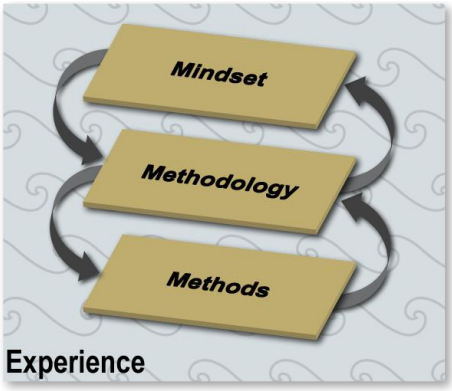

Figure 1. Three levels of systemic design.

2.1 Systemic Design Methods

Systemic design is a practice, and methods are the essential tools of the trade. Common systemic design methods include brainstorming, affinity diagrams, rich pictures, systems maps, GIGA-maps, and prototyping. As tools, methods provide a set of constraints on task performance, which yields improved control both in terms of outcome and structure of performance of the task (Baber 2003). Systemic design methods amplify or augment natural human capacities to facilitate collaborative reasoning, visualizing, and making. When systemic design projects involve co-creation with stakeholders who may be unacquainted with the principles of systems thinking or design, methods are especially useful to encourage patterns of engaging with collaborative work that may be unfamiliar to many participants. Systemic design methods are also an important vehicle for distilling and sharing techniques among systemic design practitioners.

An over-reliance on methods can undermine the whole point of doing systemic design. Systemic design is intended to help us to see a complex challenge in a different way, and to translate this "new seeing" into novel interventions. Taken to its extreme, the methods movement reduces all reasoning to a sequence of highly constrained procedures. If we apply the same procedures in the same order to each new challenge we face, we should not expect to deliver either new seeing or innovation. This is why the mindset is such a critical complement to methods and methodology. Any systemic design inquiry must maintain enough unstructured space for exploration, iteration, and divergence for surprises to emerge and be exploited. A systemic design mindset encourages a fast and loose approach to the application of design method: break it, stretch it, bend it, crush it, crack it, fold it (Mau 1998). Misuse of a tool in a context it was not intended for is a valid source of exaptation.

2.2 Systemic Design Methodology

Methodology is meta to the level of method: it is about method (Checkland 2000). Whereas a method is applied by particular users in a particular situation, methodology is an abstract logic that encompasses an entire class of systemic design applications. This means that no methodology is ever directly tested through its application. Only the specific methods applied in a specific sequence are tested in a single use of a systemic design methodology. This lack of direct testability explains why there tend to be as many different methodologies as there are schools: without a way to empirically evaluate 'better' or 'worse', it is difficult to convert adherents of one methodology to a competing approach. Methodologies can be compared on the basis of the presuppositions they make about the world, the nature of the design challenge, the relationships between and roles of stakeholders, and the anticipated outcomes of a systemic design inquiry. Unfortunately, methodologies rarely declare their most significant presuppositions to their audiences.

The methodology I present here is an evolution from my own practice of systemic design, which is heavily indebted to Shimon Naveh's theory of systemic design (Naveh, Schneider and Challans 2009). My methodology for systemic design is composed of six main activities: framing, formulating, generating, reflecting, inquiring, and facilitating. The methodology is nonlinear and iterative in application; however there is also a logic that connects these activities into a coherent learning system, which is shown in Figure 2 below.

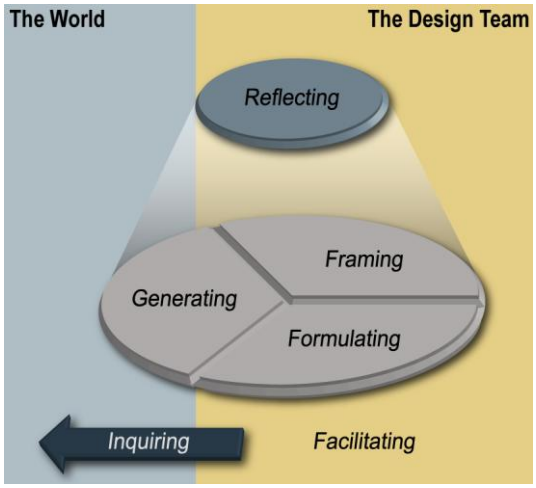

Figure 2. A methodology for systemic design.

Framing is "a way of selecting, organising, interpreting, and making sense of a complex reality so as to provide guideposts for knowing, analysing, persuading, and acting. A frame is a perspective from which an amorphous, ill-defined problematic situation can be made sense of and acted upon" (Schön and Rein 1994). A shared frame of reference is a prerequisite for shared meaning and shared understanding among a systemic design team. A shared frame can be constructed through iterative cycles of discourse, mapping the problematic situation, frame reflection, and reframing by choosing to shift the perspective for the systemic design inquiry. Participants often find this process frustrating and confusing, because they are not used to examining their own or others' frames. Yet genuine reframing is impossible until the current frame is surfaced, and the inheritance of legacy frames within the current frame is acknowledged, and an alternative perspective is chosen. We frame in order to reframe – to see the same situation from a new perspective. Reframing enables us to appreciate potential to improve the situation that was obscured from within the old frame.

Formulating shifts the focus of designing from understanding what is, to prescribing what ought to be. As a normative activity, formulating declares a reference system of values that we seek to enhance by acting within the situation. Based on a shared frame, the systemic design team ideates on ways to exploit the potential in order to preserve and cultivate those things we value. Throughout the activity of formulating, the design team progressively gives form to ideas by making them tangible. Through drawing and making, the systemic design team transforms abstract concepts into concrete forms with discrete and particular extensions in space and time.

Generating takes artifacts produced within the design team and injects them into the world outside the project room. This generative act has multiple purposes. It is intended to improve the situation, but it is also intended to stimulate learning. Because the world is continually changing, and the systemic design team's understanding is imperfect, action to improve a complex situation will never produce only the intended results. The gap between expected and actual outcomes presents the opportunity to learn, even if the initial intervention appears to be a failure. This learning can be fed back into future iterations of systemic design.

Reflecting is the touchstone for all other activities within systemic design. It is through reflection on action that design teams achieve a deeper understanding of what they have done, and what they were thinking that led them to act in one particular way and not in others. Reflection enables reframing, reformulating, and learning from generative actions. Reflection differs from introspection in that reflection requires a certain distance and a foil for reflection: an external reference that through its difference enables a more critical awareness of the self. A reflective practice is capable of self-transformation and continuous improvement. Reflection is therefore the most critical activity for systemic design to operate as a learning system.

Inquiring reaches outside the existing knowledge base of the systemic design team to bring external references into the design discourse. This can include stakeholder ethnography, literature surveys, questioning subject matter experts, and field trips. As new questions are raised throughout the systemic design project, inquiry is ongoing and ensures the design team does not close itself off from its environment. Inquiring is not just about gathering information. Its most important role is to expose external perspectives and different world views that provide opportunities for reframing.

Systemic design is a team sport, and team performance is enhanced by good facilitation. Facilitation regulates how the team moves between each of the other activities, as well as managing the process by which each individual activity is performed. Facilitation is defined broadly to include setting and policing norms for participant behavior, selecting the number and size of sub-groups for each activity, deciding which systemic design methods to employ when and for how long, and documenting the outputs of the project. The project is documented with both visualizations and a narrative that tells the story of the project. The facilitation role is ongoing, and is often performed by more than one team member.

These six activities combine in a fluid and dynamic mix to constitute the systemic design methodology. The core cycle of framing, formulating, and generating is punctuated by regular reflection, which often results in modifications of the direction and process of the systemic design project. Inquiring and facilitating are ongoing activities, which allow the team to connect with their context and maintain internal cohesion. Together, these six activities enable the systemic design team to develop a deeper and broader appreciation of the challenge, design and inject novel artifacts and actions into the real world situation, learn from generative interactions, and feed these lessons back into future iterations of systemic design.

2.3 Systemic Design Mindset

The systemic design mindset describes a set of values and habits that enable the practitioner to employ methods and methodology in a manner that is consistent with the philosophy of systemic design. Our system of values guides us in determining which actions to take within a systemic design project. Habits are routines of behavior acquired through previous repetition of a mental experience. Both values and habits share the characteristics of being resistant to change as well as slow to change. The systemic design mindset cannot be taught directly. It is only through repeated systemic design experiences that individuals can, through reflection and behavior modification, choose to enact new values and form new habits. Not everybody should be a systemic designer, and the choice to modify one's own mindset should not be made under external coercion.

In my experience, the best systemic designers are inquiring, open, integrative, collaborative, and centered. Bruce Mau's "An Incomplete Manifesto for Growth" is a brilliant attempt at articulating a mindset which is consistent with systemic design. He captures the five characteristics I have identified in the following way (Mau 1998):

> **Ask stupid questions.** Growth is fueled by desire and innocence. Assess the answer, not the question. Imagine learning throughout your life at the rate of an infant.
>
> **Allow events to change you.** You have to be willing to grow. Growth is different from something that happens to you. You produce it. You live it. The prerequisites for growth: the openness to experience events and the willingness to be changed by them.

Organization = Liberty. Real innovation in design, or any other field, happens in context. That context is usually some form of cooperatively managed enterprise. Frank Gehry, for instance, is only able to realize Bilbao because his studio can deliver it on budget. The myth of a split between "creatives" and "suits" is what Leonard Cohen calls a 'charming artifact of the past.'

Collaborate. The space between people working together is filled with conflict, friction, strife, exhilaration, delight, and vast creative potential.

Keep moving. The market and its operations have a tendency to reinforce success. Resist it. Allow failure and migration to be part of your practice.

Slow down. Desynchronize from standard time frames and surprising opportunities may present themselves.

Don't be cool. Cool is conservative fear dressed in black. Free yourself from limits of this sort.

Note that the last three items are all aspects of remaining centered. This list is incomplete, but a systemic designer who is curious, open-minded, embraces the indeterminate space between polarities, works well with others, and continually strives for balance will approach complex challenges with both courage and humility. They will be able to add to a collective understanding of a situation that is too complex to be fully understood from a single perspective. They will contribute to the capacity of the team to continue to adapt to a changing environment.

3. Meta-Methodology and Systemic Design

In this section, I briefly discuss three issues that sit outside of the systemic design methodology, but are important contributors to the success of a systemic design project.

3.1 The rationale for systemic design: When and why

Systemic design is not universally applicable to all challenges. Many important problems organizations face are routine problems, where stakeholders share common values, important variables can be quantified, and solutions from prior occurrences of the problem remain applicable. There are still other problems that reside within the purview of a single department or within a single academic discipline. There are more efficient approaches to routine problem solving and problems requiring deep subject matter expertise.

Systemic design is intended for situations characterized by uniqueness, value conflict, and ambiguity over objectives. There is no single person in charge and no single department or discipline that can resolve the problematic situation alone. However, there must be a client or sponsor who is willing to invest time and effort in a systemic design inquiry. The client must be open to reframing: initial assumptions of what actions will be required and what the issues really are will likely be challenged during the inquiry.

When there is a qualified client with a non-routine, pluridisciplinary challenge, systemic design can be of value. Systemic design can engage with value conflicts between stakeholders to develop broader, shared frames of reference and new ways of seeing existing challenges. New perspectives can unlock new potential for substantial innovation and discontinuous improvement. Systemic design rapidly transitions creative breakthroughs into tangible actions to improve the situation, and sets processes in place to proactively adapt to a changing context. Systemic design helps a client to make substantial progress on their most complex challenges.

3.2 Design of the systemic design team

There are few factors that affect the outcome of a systemic design project more than team composition. Despite its importance, there is little research into team composition and often no explicit process for selecting team members. Most often teams are formed from volunteers or the voluntold.

An ideal systemic design team would be composed of people with systemic design experience and a real stake in the problematic situation. They would share the systemic design mindset described above but be maximally diverse in all other respects. The design team would be small (five to nine people) while representing the interests of all stakeholders.

Unfortunately, the ideal team will never exist. The design team leader will have to bring together stakeholders with no systemic design exposure and systemic designers with no stake in the challenge. The team will be larger than desired but still missing the most marginalized voices. There will be team members who will resist the systemic design methodology because they have their own agenda or are uncomfortable with the cognitive and social demands of the process. The leader must be able to make the most of this situation, by coaching, mentoring, and motivating the team to perform in spite of these constraints. Even if the leader has less influence than she would like over team composition, she can still control who performs what roles, and when the team works as one large group or breaks out into sub-groups, as well as who is assigned to which sub-group.

3.3 Mediation of cognitive tensions

In Section 2.3, I argued for the importance of a 'centered' systemic design mindset. This concept requires some elaboration. As the team proceeds through a systemic design project, a number of cognitive tensions will emerge around the direction of the project. A de-centered approach would react to this polarization by driving the design process towards one pole at the expense of the other. A centered approach seeks to recognize the tension and then mediate between opposing forces, using the tension as a source of creative energy within the systemic design process. A centered approach to systemic design acts like a gyroscope, providing stability and orientation through continual iterative, cyclical movement about an axis.

The cognitive tensions systemic design mediates are not specific to a particular project, but recur across many different projects. This is why I consider mediating these tensions as a meta-methodological issue. A list of cognitive tensions is provided in Table 1 below, along with suggestions on how to mediate these tensions. The list is not comprehensive, but they are the tensions that have been most dominant in my own practice.

Table 1. List of cognitive tensions that must be mediated in systemic design.

Cognitive Tension		How Systemic Design Mediates the Tension
Inquiry	Action	Systemic design is inquiry for action. Deeper understanding informs right action, while action stimulates new understanding.
Interiority	Exteriority	Systemic design brings marginal perspectives to the center of organizations. Rather than homogenize the system, SD diversifies the centers where design decisions are made.
Becoming	Existing	Systemic design maps situations dynamically to account for their history, current state, and potential futures. Projecting back and forwards in time enables a more critical appreciation of the

		present.
Epistemology	Ontology	Systemic design surfaces and often reframes boundary judgments. The systems maps we draw tell us at least as much about our own frameworks and biases as they tell us about the situation of interest.
Top-Down	Bottom-Up	Systemic design maps situations at multiple scales to understand the individual, the collective, and how they are related. Top-down and bottom-up sources of organization are considered and leveraged.
Learning	Transforming	Systemic design actions are generative: they are intended both to transform the situation for the better and to continue to learn about it.

An experienced systemic designer will continually look for signs of these tensions within a project. If tension is absent from the project, this may indicate either a collective cognitive bias in the team, or that important issues are being bypassed and covered up. The goal should be to deliberately control the level of cognitive tension in the team, which can be thought of as the 'temperature' of the discourse. If the discourse is too cool, participants will disengage. If the discourse is too heated, trust will break down. In between, there is a sweet spot where differences of perspective are maintained, without those differences overwhelming the collaborative spirit of the endeavor.

4.0 Conclusion

Systemic design is intended to help organizations and societies meaningfully confront their most complex challenges. These challenges are characterized by uniqueness, value conflict, and ambiguity over objectives. Systemic design allows diverse teams to develop an elevated perspective of the challenge and translate novel insights into decisive action. Action taken to improve the situation also accelerates organizational learning through an iterative cycle of framing, formulating, generating, reflecting, inquiring, and facilitating. The systemic design methodology is supported by a suite of systemic design methods and enacted by teams that share a systemic design mindset. The mindset is inquiring, open, integrative, collaborative, and centered. Centered design mediates creative tensions and regulates the temperature of the systemic design discourse. This theory of systemic design takes time to learn, and experience to master. It is not easy. But we can no longer expect to resolve the challenges facing our organizations and societies with simplistic prescriptions and cookie-cutter solutions.

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