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The Construction of Complexity in Design and Public Policy Contexts

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Abstract

This paper explores the nature of complexity and how it is manifest in the practice of design research and public policy given their unique contexts. This comparison is made by examining the tools and approaches that are used in understanding problems and creating outcomes in each field. This paper is based on a recently conducted action research study at a state legislature in the United States and is supported by foundational literature on modern problem theory, decision making, methods, and process in the two fields.

Complexity emerges from the many stakeholders that surround and define our issues, the enigmatic nature of our ill-structured problems, and the multiplicity of variables that confound progress towards one solution. An interdisciplinary opportunity is presented; the study suggests tools are a function of the complexity in any given context and provides examples of varying modes of managing complexity in design and policy environments. By juxtaposing the similarities and differences in how design practice and policy development construe and manage complexity, this paper frames the overlap between the two areas of practice and builds a mutual space for learning and collaboration.

Keywords

Design practice, participatory approaches, politics, policy, human / user-centered design, methods, complexity, decision making, design thinking

Complexity is very familiar to designers and policy makers. It is present as we struggle to generate acceptable solutions for as many people as possible, as we ceaselessly reevaluate the goals of our outcomes and when we carefully seek the sources of the problems our outcomes attempt to address. We look towards broad strategies, ranging from implicit to explicit, like collaboration, interdisciplinarity, data analysis, or brainstorming as a means to apply our thinking in order to acquire a better understanding of our complex environments. Yet, these strategies have emerged out of the distinct cultures and work contexts of design and policy. An assessment of the complexity management strategies from each discipline creates a mutual space for learning and is telling of how our end products are shaped by our approaches and the way they steer complexity.

This paper suggests that the complexity faced in the design process and the policy making process is not merely shaped by an existing complex natural state but also by our modes of management. Complexity emerges from the many stakeholders that surround and define our issues, the enigmatic nature of our ill-structured problems, and the multiplicity of variables that confound progress towards one solution. This paper, based on a survey of literature and an action research study at a state legislature in the United States, actively examines these characteristics in design and policy by investigating policy tools and exploring how design tools might be incorporated in the policy context. The transferability of design methods, and approaches, to the policy making realm has recently achieved great acclaim (DFFN, 2003; Owen, 2007; RED, 2006), yet there is a paucity of research that has explored this topic in its

real-life context. This examination of complexity becomes particularly valuable in the search for better public decisions and decision making.

Research Approach

This study explores complexity as a boundary spanning phenomenon by asserting that the tools employed in design and policy are a function of their respective decision-making contexts and that these tools might be able to be applied across boundary. It weaves together a recently conducted action research study that explored how design methods might be used in state-level policy making with relevant literature on problem theory, decision making, methods and process in the two fields. This mixed approach appropriately poises this research to ask how issues are constructed and what instrumental roles methods play in the definition and resolution of the inherently complex problems across contexts (Meierling, 2009).

The primary research used a state legislature as a case study as per Yin (1994) and directly engaged key stakeholders in the policy process through observation, interviews, and collaborative modeling of political processes. The research strategy for this study combined evaluative and applied methodologies in a qualitative approach. The evaluative study assessed information from a literature review and initial interviews with lobbyists, community members and legislators to analyze the intersections between design methods, legislative methods and citizen issues. The applied study introduced nine representative design tools to eight state legislators in order to explore the relationship to legislative methods. The nine design tools are as follows:

- **Personas** are rich narratives that describe a person's unique experiences.
- **Storyboards** are visualizations that represent a sequence of events and their imbedded relationships.
- **Mind mapping** is a type of diagramming where a person intuitively places related and potentially related ideas around a central concern in order to classify concepts and to generate new ideas.
- **Systems diagramming** helps understand how complex systems work by visualizing networks of interrelated issues, their lifecycles, and how they interact with other inputs
- **Prototyping and evaluation** involves testing an idea before full-scale implementation. This can lead to greater success in the full-scale project.
- **Research frameworks** segment collected information into relevant, pre-established categories; this aids in seeing relationships among many issues and ensures all aspects of a research target have been accounted for.
- **Co-creation workshops** gather a group of people to create their own solutions to problems side by side with expert moderators who keep real-life constraints under consideration.
- **Make kits** allow an individual to show their own experience using words and images without the imposition of another person. After completion, they are returned to the research team for analysis.
- **Visual representation**, as opposed to verbal, facilitates a different understanding of a problem through diagramming and explanation, and is adept at clearly showing relationships.

This phase was also accompanied by in-depth interviews with advocates, interest groups and policy organizations and a number of observations of legislative processes. A dialogue was created that collaboratively explored the potential currency of design tools in the policy context and a path towards design-policy integration.

This paper builds upon established discourse in problem theory and planning. Design and policy making are both planning activities; they are locked into the transition from 'what-is' to 'what ought to be' (Buchanan, 1992; Schön, 1994; Simon, 1969). It is within this discourse that complexity and politics are found to be similarly intrinsic to design and policy (Rittel & Webber, 1969; Dubberly & Rith, 2007). Yet, two different institutions prevail: the design process and the political process, each corresponding to their own unique methods, or set of tools, and unique issue contexts. Robert et al. 's (2002) systems framework suggests that disparate systems can share a common dialectic between the constitution, outcomes, *processes*, actions, and *tools* of each system. By framing design and policy contexts as separate systems, it is possible to compare the manifestation of complexity in design and policy development through an examination of tools.

Problem Complexity as Common Ground

Though little literature explores any sort of collaboration between the design fields and the policy development world, they are frequently paralleled in terms of problems and their solutions. Both areas of practice are involved in the development of knowledge surrounding social interactions, are significantly influenced by the social sciences, and are equally entrenched by the same root issues (Birkland, 2005; Schön, 1994; Owen, 2007). These root issues are best characterized by the ill-defined, wicked problems faced in planning activities (Rittel & Webber, 1969). Different from tractable problems involving measurement and direct relationships, many of the problems that designers and policy makers face are fraught with complexities outside our comprehension, leaving us only with tools, ranging from intuitive approaches to explicit strategies, as vehicles to apply our thinking to complex problems. For both designers and policy makers, complexity is a result of a confluence of multiple variables, the interplay between problem and solution, and diverse, irreconcilable stakeholders (Buchanan, 1992; Schön, 1994).

A Multiplicity of Variables

A multiplicity of variables is central to complexity for designers and policy makers. Subsequently, complexity arises from the level of facility we have in evaluating these variables and our ability to generate solutions sympathetic to those variables. In this case, complexity is often a question of how variables interrelate, coalesce and compound as part of a larger system (Weaver, 1948; Sarewitz, 2000). In fact, the development of systems theory is an indelible result of the identification and recognition of complexity as a phenomenon in our world. Warren Weaver, a founding thinker in complexity science, characterizes it as the predictability of outcomes of the variables within a system (Weaver, 1948). He juxtaposes disorganized complexity, with measurable properties and predictable outcomes, with organized complexity, "dealing simultaneously with a *sizable number of factors which are interrelated into an organic whole*" inherent to physiological, economic and political pursuits (Weaver, 1948). This same juxtaposition comes later from the more familiar language of Simon and Rittel in their conception of the ill-defined, wicked problems faced in planning activities. Different from the “tame” problems involving measurement, this type of problem is marked by unmanageable variables, conflicting stakeholder perspectives, interdependencies with other problems, and ultimate unsolvability.

The Interplay Between Problem and Solution

A second aspect of complexity comes from our inability to identify root causes and definite solutions to problems and the exchange between problem and solution. Many designers and policy makers might find that “the information needed to understand the problem depends on one’s idea for solving it” (Rittel & Webber, 1969, p. 225). That is, the process of identifying a problem yields a solution. Additionally, every wicked problem is an indicator of another wicked problem and solutions are coupled with other solutions (Rittel, 1970; Keeney, 1982). Given the difficulty of 'taming' these wicked problems and the plurality of problems and solutions, a problem has many unknown sources and a solution reveals other issues. This problem-solution quagmire and the aforementioned multiplicity of variables brings us to the limits of our cognition or our 'bounded rationality' leaving us only tools and strategies to cope (Farnham, 1990; Simon, 1969; Weiss, 1982).

Irreconcilable Stakeholders

While the multivariate, wicked nature of complexity indeed plagues much of decision making, additional difficulty arises out of the diversity of stakeholders that these decisions intend to represent. In this vein, complexity can quickly be traced to the social interactions between stakeholder groups surrounding an issue. Value trade-offs, multiple objectives and the absence of an overall expert among stakeholders are all characteristics of complex contexts (Keeney, 1982). When weighing the benefits of one decision over another and identifying what might be the most desirable outcome, the diverse, heterogeneous groups around issues can entrench our decision making contexts with competing values. Designers and policy makers diligently seek a "transcendent solution because…it is the only strategy which serves all of the values involved in a decision no matter whether they are assessed in terms of their intrinsic worth or in terms of the importance of interests behind them" (Farnham, 1990, p. 100). Therefore, complexity is inherently a social phenomenon and a result of the different perspectives and goals of actors in the decision landscape.

Policy makers are aware of these unclear solutions and understand them through the interconnectivity of the many symptoms of wicked problems (Connors, 1996; Easton, 1965; Lloyd, 1978; Stone, 1988; Susser, 1992; Verduijn, & Brugge, 2001). The uncertainty that is described in policy development is also manifest in the design process through the designer’s inability to determine one definite, successful solution to a problem (Buchanan, 1992; Margolin, 1996; Owen, 2007; RED, 2006). Policy makers and designers share the same wickedness and deep uncertainty of their problems yet different approaches to cope with them have risen out of each area of practice. Similarly, both fields address these problems with a continuum of temporary solutions that only tame issues without resolving root problems. The insolvability of these root problems emerges as a point of departure for comparing complexity in design and policy development via the tools in each discipline.

Design and Policy Tools as Complexity Management Strategies

Design and Policy Tools

The problems and work context in design and policy do indeed share similar complexities; yet, we take different *approaches* to managing variables and use different *tools* to navigate our complex environments. These approaches and tools are agents of impending decisions that help us better understand the landscape of our problems. A tool has multiple uses and takes on different meanings depending on its operator, the intended task, and the work environment.

However, tools also represent the thinking and intent behind actions in each discipline and are actively used in an instrumental fashion. This research draws from the tool sets of designers and policy makers and compares how complexity is framed and managed in each.

The nine identified tools described earlier can be expanded to cover many other methods and approaches and represent the core values of design tools such as user-centeredness, the development of alternatives, a strong capacity for visual thinking, and an orientation towards collaboration. The primary operating paradigm for designers has its roots in the much discussed dichotomy of the designer as an "analyzer" and as a "creator," to use Heiko Sacher's (2002) terms; this contextualizes the types of tools that are used in design and can describe how designers engage in practice (Frascara, 2002; Owen, 2007; Sacher, 2002) using tools for analysis and tools for creation. Thus, design tools are used in a flexible, interpretive fashion, strikingly dissimilar from traditional representations of the design process characterized by step-by-step, discrete occurrences that arrive at an outcome (Dubberly, 2005). This mode of structuring design tools refrains from implying any temporality and allows decisions, and therefore the tools implemented, to be made in an intuitive and non-linear way. This research broadly discusses design tools and acknowledges that variations of each tool exist across the design silos and other related disciplines. The toolset was a vehicle to express the approaches of designers, the values and intents of the design process, and the apparent methods that are strategically used by designers.

Based on observation of the legislature and initial interviews with stakeholders in the policy cycle, nine tools were identified to represent the larger policy tool set used by state legislators in understanding issues:

- **Expert consultation** brings in a specialist perspective on a particular issue whose advice is considered reliable.
- **Evaluation of current law** in respect to a proposed bill can be vital. The elected official upholds and interprets current statutes and regulations.
- **Analysis of other policies** and case studies from other states offer insight into the potential success of newly introduced legislation.
- **Stakeholder meetings** provide a forum to voice concern or support on an issue. These focused meetings are intended to address the specific concerns of affected stakeholders and bring clarity to conflicts.
- **Town hall meetings** are public gatherings where community members voice group concerns, gather grassroots support, or receive feedback from public figures.
- **Debate** and deliberation amongst individuals representing multiple perspectives is useful to understanding the facets of an issue.
- **Committee meetings** gather advisory committees to consider bills of similar subject matter prior to being passed. Testimony from experts and the lay are invited to these public meetings.
- **Constituency outreach** can shed light on the varying viewpoints surrounding an issue. It can involve communication with the media, being a part of the local fabric, or attending community meetings.
- **Staff research** is useful to gain a complete understanding of a proposed bill, its history, and any related bills.

The underlying political philosophy supports these findings and characterizes the policy context and the approaches therein as adversarial, competitive, agenda-driven, participatory, and discursive. Not to be confused with 'policy tools' or 'policy instruments' which are "method[s] through which government seeks a policy objective" (Salamon & Lund, 1989, p. 29) such as a public education program or a new water use program, each of these tools embodied steps

taken by a legislator during policy development that shape the way issues take form. Some of the tools are procedural requirements that are a part of the policy cycle such as committee meetings, others take place on an as-needed basis such as town hall meetings, and still others are a part of a legislator's daily activities such as expert consultation. While, these tools are employed at varying points through issue development at the legislature, the implementation of the tools is closely tied into the formal ebb and flow dictated by the policy process from issue recognition to the formalization of a policy in the state's revised statutes.

Using Tools to Frame Complexity

> Actors in the policy drama design policy much as architects or engineers design material artifacts. They compete and cooperate to set policy problems, and they invent policy solutions that evolve as a result of the actors' transactions with the policy situation. When policy objects are put out into the larger environment, they tend to take on meanings unanticipated by their designers, as other actors see and respond to them in the light of their own frames and, often, in a changing policy context (Schön, 1994, p. xix).

The way in which tools frame complexities, namely the variables, problems, solutions, and stakeholders of each professional context is revealing of manifestations of complexity. This paper suggests that the tools are used to manage and organize the aforementioned aspects of complexity and that they effectively become complexity management strategies that have emerged from the differing cultures in the two fields. An analysis of these tools reveal four key areas that are of central importance to design and policy practice yet differ in how complexity was framed in each field: context, problem definition, value orientation, and participation. The following accounts describe these areas with specific examples from the aforementioned primary research as well as secondary sources.

Context

Perhaps at the heart of the differing approaches to complexity are the underlying structures and contexts in which designers and policy makers work. Private and public sectors impose different constraints on actors and lead to different motivations and actions in practice. A key observation of the legislature was that it cultivates a short-term mindset even when policies have long lasting implications. While legislators recognize the value of longitudinal thinking, they want a quick return on their investment in terms of pushing bills successfully in as little amount of time as possible. This incremental pattern of policy creation might be prompted by motivations of being re-elected the following election cycle, the need to see the results of their work for continued support from their constituency, and the imbedded disposition of a part-time legislature (they are not salaried enough to live without a secondary income). Issues with long-term consequences are more difficult to understand and support. It is possible to conclude that this disposition for the short-term is transferred to stakeholders, thus propagating a cycle of incremental policy development.

The most generative design tools such as brainstorming might be perceived as counter productive to developing policies and misconstrued as creating unnecessary risk. The generation of ideas complicates the approaches taken to gather support from opposition and other stakeholders and works against the grain of policy development. The context presented in design is that of selfless dialogue for the sake of generating better ideas, while the context presented in policy development is that of incremental adjustments that accommodate stakeholders, yet, both result in collaboratively created outcomes.

An example of these differing contexts can be seen in the way prototyping takes place in design and policy contexts. When presented with this tool, legislators closely associated it with the use of pilot studies that are initiated by legislators as a means to test a policy idea. Prototyping or piloting a policy is valued as a way to bring unforeseen issues to light prior to full adoption of a bill and as a way test the efficacy of a potential bill. In design, the value of prototyping comes from quick feedback loops, iteration, and refinement. There are a number of impediments in the policy process that cause the use of this tool to take a different course: When pilot studies are introduced to the legislature they need bill approval. In this situation, one legislator would need to successfully introduce a bill for a pilot study and then reintroduce the bill as a full-scale policy the following legislative session or after the study period is complete. This process is too slow when legislators' concerns lie within one singular session. A pilot can lose support if: another issue takes prominence; if the sponsor leaves; if money dwindles; or if an idea does not fit well with the current legislatures concerns. Moreover, long-term projects are difficult to sponsor when legislators are motivated by quick results that contribute to their reelection. This example shows that the differing operating paradigms of design and policy are tied to the same need for testing out an idea and incorporating feedback into a future iteration, yet two distinct ways have emerged from different manifestations of complexity.

Problem Definition

Just as our professional contexts shape the landscape of complexity, so do they dispose the problems that we face to the constraints, opportunities, and affectations of each field. That is, problems are identified and defined uniquely to the contexts in which they arise. Problems in the client-based, business-driven professional model of the design world are shaped somewhere in between the client, customer and designer. In contrast, the body of individuals who actively appeal to policy makers characterizes the public context of the policy world: they compete for a voice in the policy process and for representation in the policy outcome. Problems are effectively shaped by the voices represented and heard in this process. The significance of how problems are defined is evident in the manifestations of complexity, the management strategies of our tools and the outcomes that result.

Problem definition is widely recognized as a contributor to the successes and failures in policy formulation and carries a long-standing tradition in policy discourse. In part, this discussion revolved around the notion that issues and problems are shaped by the way people individually or socially define them and result in policies that are inherently linked to the original problem construction. For example, homelessness can be considered the result of a shortage of housing, the result of economic strife, or the product of the deinstitutionalization of mental hospitals (Rochefort & Cobb, 1992). However, more salient in terms of how complexity manifests itself is the concept of problem ownership. Rochefort and Cobb (1994) conclude that some problem definitions may be under complete control of one body of authority. For example, the judiciary defines the severity of a certain crime through its enactment of retribution and therefore owns a problem. Another example can be seen when a community organization represents the many voices of the gay, lesbian, bisexual, transgendered community to the legislature, effectively owning and taking responsibility over an issue, and as a result omits outlying needs and leaves them unrepresented. Schattschneider (1960), well-cited for his work in political analysis, concludes that those who own a problem at the point of definition and through deliberation will successfully define the solution to it.

Equally important are the means in which issues come to the attention of legislators. Observation in the research revealed four types of transactions that provide starting points for problems in the policy context:

- **Special interest lobbying** includes the presence of any type of lobbying effort; it can be ongoing or issue specific.
- **Personal experience** refers to any event, either casual or organized that a legislator personally experiences. These experiences tend to build empathy and can be catalysts for bill sponsorship or the recognition of an issue by the legislature.
- **Proactive citizens** can band together or act individually to voice their needs and opinions on a particular issue. This may be referred to as citizen lobbying.
- **Policy analysis** is undergone by research staff, policy organizations, think tanks, public interest groups, and other private organizations and serves as a measurement of efficacy of previously created legislation; policy analysis directly sways which issues will be heard and which will not.

While paying clients usually represent the origin of problems for designers, the design team must champion the needs of a user group to encourage a client to take a certain course of action. However, in the policy context there are numerous ‘clients’ with differing agendas and there is proactive representation that results in uneven depiction of a population's needs. The divergence of actors and roles of stakeholders delineates how problems are defined and how our tools shape and are shaped by complexity.

Value Orientation

Different value systems have also emerged out of the contexts of design and policy. The competitive, adversarial nature of the policy world bears a two-value dynamic that permeates the underlying political structure and the policies produced by these regimes. The design context puts great weight on people's stories and interactions around a given circumstance and is implicitly open to the subtleties of people's experiences with design products. Designers create a multifaceted depiction of potential outcomes through the use of drawings, stories, and words. This is evidenced by the systems bent of many design tools such storyboards, mind maps and brainstorming and emphasis towards understanding the interdependence of variables and inclusiveness within a user group.

The two valued orientation in politics can be traced to the literature in a variety of ways, however, it is well-articulated by the preeminent linguist Hayakawa; he writes, "This penchant to divide the world into two-opposing forces-- "right" versus "wrong," "good" versus "evil" -- and to ignore or deny the existence of any middle ground, may be termed the *two-valued orientation*." (Hayakawa, 1990, p.113). Originally coined by philosopher Alfred Kozybski, this value orientation is endemic to our two-party political system and can be seen in the political positions that each party maintains and in debate, a cornerstone of politics. Take for example the emergence of 'pro-life' and 'pro-choice' as the two predominant positions on abortion. The two-valued system is also tied to policy makers expectation of rational decision-making, attempting to remove emotion from decisions, and the legacy structures of the political system that attempt to whittle problems down to a single interest, chosen from two. However life is not this simple, nor are we rational actors; we have aspirations, emotions, and needs and react to our world with scales of judgment, not with "right" and "wrong." It is in this convergent policy process that a reactive political culture is bred and the tools of debate and discourse manage and temper complexity.

This fundamental difference is exemplified by exploring the use of mind mapping, a design tool, in the policy context. Mind mapping or webbing, as several legislators knew it, was a familiar concept to interviewees at the legislature and was interpreted as a method of structured brainstorming. However, mind mapping would ultimately not be able to be utilized as a tool to generate policy ideas for two reasons. First, legislators simply do not feel they spend their time creating new, original legislation; they manage bills. Second, in the context of argumentation and adversarial relationships, the generation of ideas, a key aspect of the design process, complicates the approach of garnering support on an issue from opposition. The generation of alternatives as it is construed in design happens in a more dispersed, ambiguous fashion in policy making, somewhere between legislators' agenda and the interests of those represented in the policy process.

Participation

In exploring how complexity is framed in design and policy, it is important to understand how we engage people, the end-users (and sources of inspiration) of the products that we work towards. Design tools typically come from a grounded perspective, treat problem areas as unique, and are inclusive by involving stakeholders at the stage of their own experiences. Quite different, the organization of legislatures include salient issues, stakeholders, and variables that are represented proactively while quieter voices fall by the way-side. For example, interest groups and lobbying efforts often represent specific issues or larger ideologies in place of direct citizen involvement (Kingdon, 1989). Complexity in policy manifests itself through the proactive voices of lobbyists, interest groups and citizens incited by the structure of representative democracy. In the design context, complexity is proactively sought by designers through inclusive tools in an attempt to preserve ambiguity of variables until constraints require convergence on an outcome.

The paradigm in policy development is that of representative democracy where a legislator represents a group of people, their needs, and their expectations for the legislative outcome. Legislators are primarily reactive in their actions and handle issues as they present themselves. In the same vein, legislators have limited opportunity to engage in proactive policy making. While design practitioners must be reactive when responding to client expectations, they remain proactive in the process of understanding the needs of end users and stakeholders. As the designer is situated between the expectations of consumers and the expectations of a client, they act as an intermediary and communicator between both sets of actors. Therefore, the operating paradigm in managing complexity in design is the designer as expert interlocutor who proactively reaches out to stakeholders and incorporates their needs and expectations into the design outcome.

Design practice heavily relies on the experiences of individual people during the design process to achieve desirable outcomes (Arnold, 2005). In contrast, the research made it clear that citizen viewpoints and opinions were often solicited late in the policy development process, after issues had been formed and agendas were set. Evidence of this is also seen by legislators interpreting personas as a tool to understand other legislators (as opposed to members of the public) given that representatives and senators represent a defined segment of the state’s population. This coincides closely with the verbiage consistently used by legislators that embodies a tone of appeasing and even placating stakeholders. For example, one representative endorsed town hall meetings because they make “people feel like you’re listening.” Another representative suggested that stakeholder meetings are “more of a PR move,” that they “make sure people don’t complain.” The everyday citizen holds a unique place at the legislature where “they are typically reached after the damage has already been done.”

Conclusion

This paper tracks issues of complexity in design and public policy contexts and proposes that differences in context, problem definition, value orientation, and participation are at the root of the differing constructions of the same types of complexity. The research found that the aforementioned variance in values is brought on by different management approaches of stakeholders, styles of defining problems, and methods of accounting for variables. This leads to different representations of complexity and ultimately different types of outcomes. It is clear that the different cultures have produced different systems to handle complexity and vary in the way they approach problems. Strategies such as collaboration, the development of alternatives, iteration and participation assume different forms depending on the context in which they are present. Tools also result in different outcomes, whether they are used in a competitive, representative and reactive environment or an inclusive, participatory, and proactive environment. Now more than ever, designers and policy makers are becoming familiar with the complexities brought by our ill-structured, wicked problems. This research serves as a foundational discussion by shaping a common language between design and policy practice and is a starting point to begin sharing best practices and exploring interdisciplinary collaboration.

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