Sensemaking and Framing: A Theoretical Reflection on Perspective in Design Synthesis

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Abstract

Sensemaking is a constant process of acquisition, reflection, and action. It is an action oriented cycle that people continually and fairly automatically go through in order to integrate experiences into their understanding of the world around them. A frame is an active perspective that both describes and perceptually changes a given situation. A frame is, simplistically, a point of view; often, and particularly in technical situations, this point of view is deemed "irrelevant" or "biasing" because it implicitly references a non-objective way of considering a situation or idea. But a frame – while certainly subjective and often biasing – is of critical use to the designer, as it is something that is shaped over the long-term aggregation of thoughts and experiences, through the above process of sensemaking, and is therefore a larger way of viewing the world and situations that occur in it. Like a point of view, a frame too will change, but will change over the long-term rather than the short term.

Designers make explicit the normally implicit processes of sensemaking and framing during design synthesis, as they attempt to make meaning out of data through interpretation and modeling.

This paper offers a theoretical reflection on the relationship between design synthesis, sensemaking and framing. This reflection, based on professional practice in a world-class design consultancy, attempts to tie research from various disciplines to what many designers feel is an implicit part of their process – the ability to apply their own "intuitive" ability to find meaning in complex situations and solve complex problems.

Keywords
Experiential Knowledge; Creativity; Reflective Practices; Design Synthesis; Sensemaking; Framing; Intuition; Perspective

Understanding Sensemaking and the Role of Perspective in Framing

Cognitive psychologists, social psychologists, and communication theorists all reference the word "Sensemaking" as an integral part of learning.

Robert R. Hoffman, Gary Klein, and Brian M. Moon are all cognitive psychologists who have been studying the connections between problem solving and intuition. They reference sensemaking as a way of understanding connections between people, places and events that are occurring now or have occurred in the past, in order to anticipate future trajectories and act accordingly. Their work positions sensemaking as an internal and reflective activity, where one is actively trying to solve a specific and contained problem, but also as an external and communal activity, where a group of people are trying to solve multiple problems in pursuit of larger, organizational goals (Klein, Moon, & Hoffman, 2006). Their view of the process is one shared of many organizational theorists [for example (Westrum, 1982)] where, in a large organization, various people may hold different pieces of data, and different levels of awareness of events, that are all critical to the success of a given project. Sensemaking is deeply related to a process of "socialization", whereby those with ideas and data share that with others in an effort to actively disseminate information and build consensus. Hoffman, Klein and Moon's view of sensemaking is a *process* that is both *personal and shared*, one that takes place *over a long period of time*, and one that is heavily dependent on a *perspective or point of view*.

Brenda Dervin, a communication theorist, describes sensemaking as a process that "reconceptualizes factizing (the making of facts which tap the assumed-to-be-real) as one of the useful verbings humans use to make sense of their worlds" (Dervin, 2003). As she describes, we make sense of complicated ideas by doing them, rather than studying them abstractly. The process of sensemaking is a process of learning, and it relies on and is subjectively dependant on

the entire summation of knowledge, emotions, and prior experiences in the learner. This builds heavily on John Dewey's view of experience as being fundamental for education (Dewey, 1997), and implies that learning (and the process of solving complicated problems) must be an active process, and is always a subjective process. Dervin's view of sensemaking, then, is a *process* that is *personal* and *contingent on experience*, that *substantiates learning*, that takes place *continually and forever*, and is fundamentally based on each *participant's perspective or point of view.*

Daniel Russell and his team of researchers at Xerox PARC (and now Google) define sensemaking first as "the process of searching for a representation and encoding data in that representation to answer task-specific questions" (Russell, Stefik, Pirolli, & Card, 1993) and second as "the process of creating a representation of a collection of information that allows the analyst to perceive structure, form and content within a given collection." (Russell & Pirolli, An Overview of Sensemaking: A View from the Workshop CHI 2009, 2009) Both definitions describe the formation of a model – either a mental or actual, tangible representation – which can then be used as a hypothesis upon which to examine, test, and accept or reject specific questions and ideas. The representation is specific to the problem being addressed, and exists as a discrete model separate from larger "world views" or more abstract and general theories. Russell's view of sensemaking, then, is a *process* that is *personal*, that is *highly task specific*, that is useful for a *finite period of time*, and is fundamentally based on each participant's perspective or point of view.

David Snowden is a management scientist who has dedicated the majority of his career to understanding the complexity that exists in large corporations. In his work, Snowden frequently uses the word sensemaking as a descriptor to modify a noun. He's developed a framework that he calls Cynefin, and explains that "We consider Cynefin a sense-making framework, which means that its value is not so much in logical arguments or empirical verifications as in its effect on the sense-making and decision-making capabilities of those who use it. We have found that it gives decision makers powerful new constructs that they can use to make sense of a wide range of unspecified problems. It also helps people to break out of old ways of thinking and to consider intractable problems in new ways. The framework is particularly useful in collective sense-making, in that it is designed to allow shared understandings to emerge through the multiple discourses of the decision-making group." (Snowden & Kurtz, 2003, p. 468)

This implies that Snowden's view of sensemaking is on early and formative idea generation, and that the framework referenced supports the creation of mental models that can be used to think of problems, and solutions, in new ways. Snowden draws heavily on the use of narrative, and particularly fictional narrative, as a way of positing "what if" scenarios. His research has identified that participants who work backwards from a fictional end-state to reach a factual present-state are able to then identify the "sensemaking items", which he describes as the turning points inclusive of actors, communities, and factors in play (Snowden & Kurtz, 2003, p. 472). Snowden's view of sensemaking is a *quality* that can be applied to a framework or idea, is best embraced in a *highly collaborative environment*, has the most resonance during *early stages of problem solving* and for *a formal and finite period of time*, and embraces each *participant's perspective or point of view*.

Karl Weick, an organizational behavioural theorist at the Ross School of Business at the University of Michigan, ties sensemaking directly to organizational behaviour and particularly to the generation of organizational knowledge. As Weick describes, "… sensemaking is, importantly, an issue of language, talk, and communication. Situations, organizations, and environments are talked into existence… Sensemaking is about the interplay of action and interpretation rather than the influence of evaluation on choice." (Weick, Sutcliffe, & Obstfeld, 2005) From this perspective, sensemaking is a shared and communal activity that produces knowledge appropriate for action, but biased heavily based on the individuals doing the sensemaking – that is, each group of people who have the various sensemaking conversations will "talk into existence" a very different set of situations, organizations, and environments. Weick's view of sensemaking is a *process* that is *highly collaborative*, effective for *organizational growth and planning* in *both the short and long term,* and *highly dependent on interpretation.*

	Positions sensemaking as..	Style of engagement..	Effective for..	Length of engagement..	Highly dependent on..
Hoffman, Klein, and Moon	A process of problem solving	Both personal and shared	Long-term socialization of complex problems	A long period of time	Participant's perspective and interpretation
Dervin	A process of education	Personal and contingent on experience	Learning	Continually and forever	Participant's perspective and interpretation
Russell	A process of modelling	Personal	Specific tasks	A finite period of time	Participant's perspective and interpretation
Snowden	A quality of an artifact	Highly collaborative	Early stages of problem solving	Formal and finite period of time	Participant's perspective and interpretation
Weick	A conversational process	Highly collaborative	Organizational growth and planning	Both short and long term	Participant's perspective and interpretation

Thus, we see a landscape of researchers investigating sensemaking, coming to various (and abstractly consistent but specifically different) conclusions. Some of the views are tied to individual problem solving, while others focus on the abstract "organization" and its ability to make meaningful decisions. Some of the views describe sensemaking in an acute fashion, as an activity that has a start and end, while others view it is a long-term approach that serves as an underpinning for other activities.

Design Synthesis is a Process of Sensemaking

A fundamental consistency across all researchers above is the necessity of perspective, and an embracing of subjective interpretation as a fundamental aspect to both internal, reflective sensemaking as well as external, collaborative sensemaking. These are the same qualities that describe design synthesis – a part of the process of design found in all aspects of professional design work (including industrial design, interaction design, and service design) (Kolko, Information Architecture and Design Strategy: The Importance of Synthesis during the Process of Design, 2007). Design synthesis is an abductive sensemaking process of manipulating, organizing, pruning and filtering data in an effort to produce information and knowledge (Kolko, Interaction Design Synthesis: Translating Research into Insights, 2009). This process is used by designers during various parts of the larger design process, as they create new artifacts (used here to reference products, systems and services – both physical and digital).

While used throughout the process of design, synthesis is most commonly conducted at a precarious moment between research and definition. At this point in a project, a designer will have gathered large quantities of data from people, through a variety of primary research methods (such as contextual inquiry, interviews, ethnographic studies, cultural probe exercises, etc). They will have also gathered large quantities of data through secondary research methods (such as reading reports or journal articles). The intent of conducting this primary and secondary research is to inform the design of a new artifact, but the data itself does nothing to inform design, as data is inactive and lacking context (Shedroff, 2000). The designer must do something with the data in order for it to become active, and to actively inform design. They must "use" the data by extracting meaning from it or by generating meaning associated with it.

It is at this moment that design synthesis occurs, through an implicit and explicit series of actions. These actions are modified by the word "abductive": they all rely on a hypothesis as a form of inference (Peirce, 1998). Theoretically, these actions are limitless, as they are bounded by an infinite number of possibilities in both the specific domain knowledge being manipulated and in the experience of the designer performing the manipulation. There are, however, a series of common manipulation actions performed by professional designers; these actions include organization, pruning, interpreting, and reframing. All are driven by a personal perspective.

Organization describes the means by which a designer puts like items "near" each other, either physically (often by moving an index card around) or implicitly in their cognitive models of the data.

This nearness describes affinity, or likeness, and the intent of organization is commonly in identifying or deriving a series of patterns in the data – or in identifying opportunistic outliers, as these can act as stimulation for innovation. Organization also describes the ability for a designer to identify relationships and hierarchy, as is the case when creating a concept map, process flow diagram, outline, or tree-view of data. These relationships indicate prioritization and importance.

Pruning describes a selective measure of removing (and therefore both ignoring and implicitly prioritizing) data. Designers will prune data based both on popular similarity ("this was already captured once, no need to list it twice") and also rareness ("this was only captured once, so it's not important"), and in this manner, the pruning can be highly subjective and irregular.

Interpretation is the assignment of meaning to data (Holtzblatt & Beyer, 1998), thus extending (subjectively) the data and enhancing it.

This perspective from which interpretations are formed is in many ways synonymous with what Donald Schön refers to as a normative frame or appreciative system: "The very invention of a move or hypothesis depends on a normative framing of the situation, a setting of some problems to be solved… It is only within the framework of an appreciative system – with its likings, preferences, values, norms, and meanings – that design experimentation can achieve a kind of objectivity… Designers differ with one another, and change over time, with respect to particular design judgments, ways of framing problems, and generic perspectives manifest in their choices of problem settings, means, and paths of inquiry." (Schön, 1984) This frame is a bias, but one that designers frequently make explicit – and often put aside, shift, embrace, or actively reflect upon, through a process of design synthesis. In this process, a series of often subjective business, technological, decorative, or functionality constraints are deemed to be true, and this becomes the normative frame.

Reframing is the act of purposefully shifting the normative frame, often temporarily or in multiple directions at once, in order to see things from a new perspective. Designers may be able to manage multiple frames (commonly including "their own", "the user's", and "the business's") and realize tradeoffs when various frames are given precedent.

Synthesis actions are rarely mutually exclusive; that is, an action performed during synthesis might be both organizational and interpretative at once, or it might be an act of interpretation occurring in an effort to reframe from a new perspective. Regardless of the specific synthesis action that the designer takes, synthesis is always generative – it always produces more data, information and knowledge, than was present before the actions began. In this way, it is dissimilar to an empirical study that seeks to understand things that already exist (while remaining objective), and is dissimilar to a predictive behavioral study that seeks to identify causality and what people are likely to do (by remaining objective). Synthesis (and design in totality) seeks to understand the facets of things that do not yet exist by bringing them into existence, and the process of synthesis helps to guess what people will do, feel, or think once the thing that does not yet exists, exists.

A Need for Rigorous Approaches and Methods to Synthesis

While designers have historically referenced a period of design synthesis in their process, little has been done within the community of design research and design practice to formalize methods of synthesis or to describe a cohesive theory of synthesis. Instead, designers commonly performed design synthesis in the due course of solving a design problem, and it was rarely explicitly separated from forms of ideation and the "raw creativity" commonly associated with form giving. Additionally, synthesis was rarely conducted overtly – instead, designers would synthesize research through casual conversation in the design studio or – more commonly – through personal reflection, and much of the synthesis process was conducted "in one's head". However, it has become necessary to conduct design synthesis externally – publically – due to a number of factors:

1. **Design problems are more complicated**, and therefore, require a more rigorous and explicit process. Designers are increasingly enjoying a more prominent role in both large corporations and in creative agencies, and a result of this prominence is more responsibility for larger budgets and more in-depth projects (Brown, 2008). A typical design project in the 1970s might have been to define the way a chair or cup looked, or to define the identity

system (logo, letterhead, etc) for a corporation. A typical design project in the present day is to create a new software suite for a global brand, defining the features and functions, the way a user interacts with the system, and the manner in which the system changes when used on a laptop as compared to a mobile phone – arguably, today's activity is much more complicated, with more user-touchpoints, and certainly more complexity.

2. **Design teams have grown in size**, forcing processes to be externalized and formalized. In the past, designers may have worked independently, with a design review or critique (the "pinup" of sketches) occurring periodically in a formal manner. In-between these reviews, designers had no need to share their process with anyone except other designers. Integrated design teams, including engineers, marketers, project managers, consultants, software developers, and other constituents are now the norm, and designers are increasingly required to both describe and rationalize the decisions they are making, as they make them. Additionally, more members of the design team can claim to be "doing design work", as boundaries between disciplines on an integrated team may blur tremendously.

3. **Designed artifacts are increasingly invisible**, making discussion of in-progress ideas difficult without a formal, explicit, and descriptive process artifact to drive the discussion. A designer may be tasked with creating a system, service, or piece of software – things that have no physical qualities. In order to direct conversation, support decision making, and continually refine and expand ideas, the designer is forced to make their process explicit by creating diagrams, charts, models, prototypes, and other in-process artifacts.

The complexity of modern day design problems, the size of the design team, and the increasingly ethereal nature of designed artifacts has created a need for externalized, formalized synthesis of data.

Thus, design synthesis is presented as a fundamental part of the process of design, but a part of the process that lacks deep discourse and definition yet is increasingly both communal and complicated. This complexity demands a more formal theoretical understanding of synthesis, and designers require a better understanding of the cognitive and social structures that are used to support the various activities involved in synthesis.

The Role of Sensemaking and Framing in Design Synthesis

Sensemaking and Framing are the phenomenon that describe the process of design synthesis and begin to create a behavioral theory of synthesis both in and out of practice. These two theoretical constructs point to a structural framework upon which professional methodologies can be created – explicitly helping designers accomplish their work. Sensemaking, as presented above, is a process of making meaning that is highly dependent on unique perspectives and frames. In design, and particularly in design synthesis, this personal process becomes a communal and collaborative process and is used to create one or more working design frames. These frames are active, as they constantly change and adapt based on the circumstances of the project. Ultimately, these frames are the artificial boundaries of perspective, containing the scope of design work and acting as flexible constraints around a given design problem.

As both sensemaking and framing are normally internal mechanisms for understanding reality, design teams have begun to adopt technically rudimentary – but highly effect – methods and tools of sensemaking and framing externalization to create a shared "canvas" for synthesis.

Consider, for example, the following very brief snapshot of dialogue that occurred at frog design, a global innovation consultancy. The conversation took place between interaction designers who had just completed research for a new project, and were beginning the "concepting" phase of the project. They were tasked with simultaneously understanding a very vague business problem – "create a new competitive product for baby boomers and their parents" – and defining technical requirements for a supporting technology platform decision that was going to be made quickly.

> **Will**: "Let's try to get to a core concept and a set of high level constraints before we break for lunch."
>
> **Matt**: "Yeah, why don't you take the viewpoint of the older segment…"
>
> **Will**: "OK, I'll be my grandpa.. "

Matt: "OK; so, we know we have to use full and high bandwidth video transfer…" *(draws two big circles on the whiteboard, each labeled 'mobile phone', and draws another big circle on the whiteboard, labeled 'cloud'. Draws a line from one phone, through the cloud, and back to the other phone, labeled 'video – fast and HD')* "…because it's pretty awesome, and it's basically the only known piece to the whole puzzle."

Will, in character: "I don't care about awesome, but I really want to be able to watch Junior at the soccer game…" *(grabs the whiteboard marker, and draws three stick figures. He labels one 'grandma', another 'grandpa', and the third 'junior')* "..because all I care about it being a part of his life."

Grant, pointing at the figure labeled 'grandpa': "Yeah, but on your end, you don't want to watch on a tiny screen. My grandma can't even figure out how to use her answering machine, I think there must be messages on there from two or three years ago…" *(scratches out one of the Mobile Phones, and writes "TV")*.

Matt: "Cool, so in our list of technical issues, I know we're gonna run into some TV platform issues…" *(starts a list called 'potential issues' and write 'TV platform – unknown, Microsoft? Open Source???')*.

Will, in character: "If it's going to be on my TV, I need an easy way to record Wheel Of Fortune, because it's really pushing it to think I'll miss the four o'clock game shows for little Will's stupid baseball game."

Matt: "Ok, so it has auto-DVR, and if you are watching streaming video, it automatically records…" *(writes 'auto-DVR = cloud storage; Boxee?')*

Will, as an aside: "God forbid he misses Wheel Of Fortune, and god help me if I ever get old and watch game shows…"

Grant: "A DVR seems really advanced for old people."

Will, laughing: "What if there was a giant TV on wheels at the game instead of in their living room, and junior could see grandma and grandpa on the jumbotron, just like they can see him? *(draws a tv on wheels)*"

Grant: "Yeah, I mean, we add a low-fi version [of the software] that works with a webcam on the TV.."

Matt: "So we need bidirectional video, streaming?" *(writes 'tons of bandwidth. 4G?' in the 'potential issues' list)*.

In this brief portion of creative dialogue, three main synthesis techniques and approaches are used (albeit in a casual manner):

1. **Reframing from a new perspective, to empathize**. Will elects to represent the target audience, saying "OK, I'll be my grandpa". He clearly doesn't intend to become his grandpa, but instead actively attempts to view the design space simultaneously as a designer as well as an older grandfather-like figure. He then participates in the discussion viewing the emerging design concept through at least three unique lenses, switching between them quickly and without much prompting:

    a. He contributes to the discussion as an older man, with particular wants, needs and desires related to television watching and inter-generational communication
    b. He offers colorful commentary of his specific grandfather, describing the idiosyncrasies that make his grandfather unique (the need to watch Wheel Of Fortune each night, the prioritization of a game show over a loved one)
    c. He offers contributions as a member of the design team, realizing that he can feel free to be provocative at this stage in the process by describing off the wall ideas (the TV on wheels) without fear of disruption or being called "inappropriate"

2. **Creative leaps, based on personal sensemaking**. Each team member offers ideas that change the nature of the design concept.

a. Matt has begun to add constraints related to technology capabilities, creating a list of more pragmatic issues, concerns, and features. His role, at least in this particular conversation, is one that is focused on technical realism. He translates the design and feature ideas into technological barriers, opportunities, and issues to warrant further discussion. This knowledge comes from his own personal interest and experience in technology; the knowledge is separate from the design problem that has been provided from the client, and it is up to Matt to bring this information to the problem.

b. Will has begun to add constraints and opportunities, related to his personal and intimate knowledge of his own grandfather. This is biased and highly subjective, yet Will clearly has a vivid mental image of his grandfather's peculiarities and uses these to spark new design ideas.

c. Grant offers statements that are practical, building on but simultaneously tempering the "blue sky" and biased qualities of Will's ideas. Grant clearly speaks from his own experiences with the elderly, as he describes his grandmother's inability to cope with technological complexity. He too offers new constraints and opportunities.

3. **Externalization, to create shared sensemaking**. Through the use of a whiteboard, and through the shared pooling and visualization of the ideas in a single democratic (and "unowned") dialogue and diagram, the team goes through a process of shared sensemaking. Grant and Matt have never met Will's grandfather, and neither Grant nor Will would have described the technological requirements that Matt saw from his unique perspective. But all three now have a shared view of the design space, the technological implications of design decisions, and the beginning of a central, high level, very conceptual design system idea.

Thus, the normally personal phenomena of sensemaking and framing are recast in a public light in the design studio, with the following outcomes:

1. The design team builds a shared understanding of the data that has been gathered, and acts on that data through organization, externalization, pruning, and interpretation. This is the beginning of design synthesis.
2. The design team collectively develops a series of artificial constraints, informed by but separate from the design space being studied and their own respective experiences. This is collaborative sensemaking.
3. These artificial constraints are applied in the context of the design problem as a flexible container, within which the designer can begin to solve a problem; this becomes the normative frame.

Perhaps the most exciting thing the design team could do next would be to "reframe" the situation, actively shifting the normative frame (the grandfather) and simultaneously shifting the design problem into the confines of the new container. The team might ask Will to play the role of the baseball-playing grandson, or the baseball coach, or a salesman at a consumer electronics store. Each of these new perspectives would generate a new frame of reference, and would result in new, innovative, and often ridiculous design outcomes.

Summary

Brenda Dervin describes Sensemaking with a rich and robust description:

… the human, a body-mind-heart-spirit living in a time-space, moving from a past, in a present, to a future, anchored in material conditions; yet at the same time with an assumed capacity to sense make abstractions, dreams, memories, plans, ambitions, fantasies, stories, pretenses that can both transcend time-space and last beyond specific moments in time-space. This portrait of the human subject… mandates positing as possible fodder for sense-making not only thoughts and ideas, observations and understandings, but emotions, and feelings, dreams and visions, pretenses and illusions, connections and disconnections. (Dervin 2003)

Dervin's point is apt: even a designer working on the most insignificant problem approaches that problem from a thoroughly complicated, unique, and both intellectual and emotional point of view, and this point of view is in a constant state of flux. This point of view forces a subjectivity on the design process and solution, and this definition of the "human subject" begins to illustrate how design solutions are deeply embedded in the culture of the designer themselves.

During synthesis, a designer simultaneously attempts to embrace *their own* unique experiences, emotions, and history – and to embrace *someone else's* unique experiences, emotions, and history. These are the elements that are crucial to making sense of the complicated design problem. Two designers may approach the same design problem in the same way and follow the same methods and steps, yet end up with a very different solution.

This difference points to the unique aspects of the designers themselves – their "style", or "design sensibility" – which is the collective and additive whole of their lives. It also points to the unique aspects of the designers in their ability to reframe and empathize – to consider what life is life from another perspective, and make logical inferences from this new point of view. In many ways, this is the unique skill of design: the ability to temporarily exchange or at least supplement one's own perspective with that of another.

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Jon Kolko is an Associate Creative Director at frog design, and the Director of the Austin Center for Design. He has worked extensively in the professional world of interaction design, working around complicated technological constraints in order to best solve the problems of Fortune 500 clients. His work has extended into the worlds of consumer electronics, supply chain management, demand planning, and customer-relationship management, and he has worked with clients such as AT&T, HP, Bristol-Myers Squibb, Ford, IBM, Palm and other leaders of the Global 2000. The underlying theme of these problems and projects was the creation of a solution that was useful, usable, and desirable. His present research investigates the process of Design, with a focus on Design Synthesis and the creation of meaning.

Kolko's present work is heavily influenced by his prior role as a Professor of Interaction and Industrial Design at the Savannah College of Art and Design, where he was instrumental in shaping the Interaction and Industrial Design programs. He presently sits on the Board of Directors for the Interaction Design Association (IxDA), and is the Editor-in-Chief of interactions magazine, published by the ACM.

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