Chapter 2
The Information Architecture of Meaning Making

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Abstract We live in a world of increasingly complex, interconnected, societal problems. Design Thinking (DT), as an academic concern, and amongst other disciplines, has been grappling with such problems since the 1970s in order to solve the problems facing humanity and the environment. Initially, this paper briefly introduces the discourse of design thinking before describing in reference to selected theory from the field of design thinking a brief account of the characteristics of complexity and indeterminacy within the design phases of *researching*, *ideation* and *prototyping*. This paper then examines the ways in which the practice of information architecture (information architecture, IA) operates in some very similar ways and how this view reframes an understanding of the practice of IA. The paper will then present three 'illusions' embedded in the current view of information architecture that we believe account for its misconception. The reframing of IA presented here has implications for the field of information architecture, its theory, its practice and the teaching thereof, but perhaps more importantly also for other fields of design that stand to gain enormous value from the application of the thinking, tools and techniques of IA to grapple with the complex problems of our time.

2.1 Introduction

In the past decade many of the disciplines traditionally described as design, including graphic design, industrial design, and information design, have undergone a conceptual shift that has seen them transformed from practices primarily focused with surface, form and product to become fundamentally concerned with solving problems facing humanity and the environment. This reframing of design has led to a number of significant changes that have and continue to impact design practice and design education.

This reconsideration of design has been highly influenced by the discourse of and about design thinking. While design thinking (DT) has in recent times been ad-

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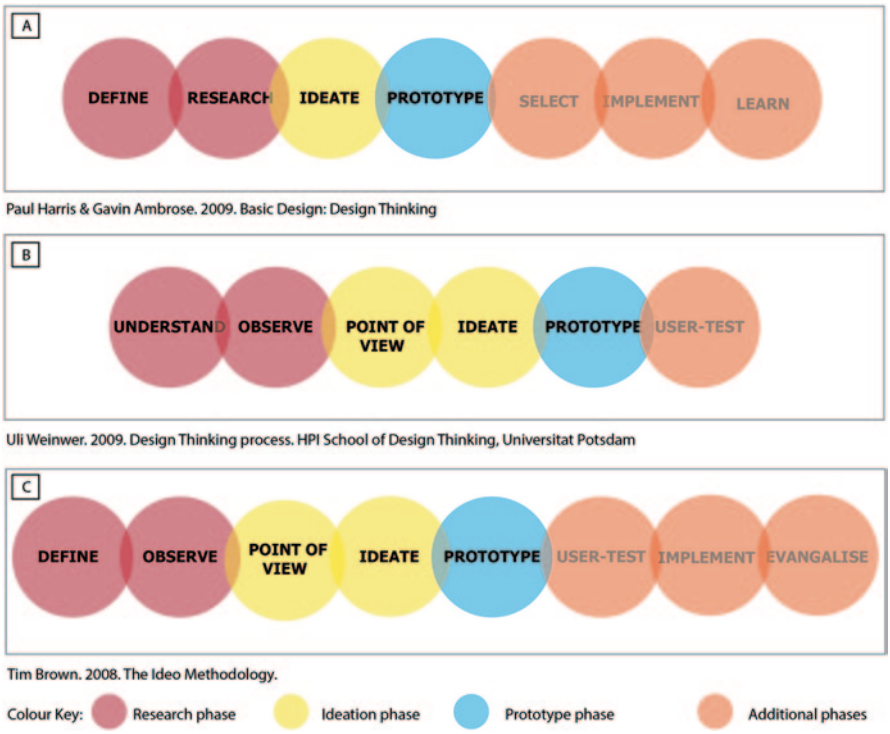

Fig. 2.1 An illustration of 3 design thinking models from Harris and Ambrose, Weiner and Brown respectively

vocated as an approach to generating innovative business practice[1], DT has a legacy in design theory that can be traced back at least as far as the early 1970s. There is a however strong cross-pollination between the business process driven approach and the more theoretical discursive approach. Between these two polarities, DT as the applied practice of design that seeks to solve the problems facing humanity and the environment is enacted.

As reflected in Fig. 2.1, DT is often represented diagrammatically as a model detailing a continuum of phases representing the design process. Each phase reflects a particular mode of conceptual activity and the continuum is understood as iteratively self-regulating. In Fig. 2.1, model A originates from Paul Harris and Gavin Ambrose's *Basic Design: Design Thinking* (2009) model B is adapted from Potsdam D-school's model (Weiner 2009), and model C is an adaption of the IDEO model (Brown 2008). Although all the models have at times differently named stages, they are at an overall level conceptually similar in that the *Prototype* phase can be considered to be preceded by *Ideation* and *Research* phases.

The concern of this paper is not to exhaustively define a model for DT but rather to use the various DT models to present the sequence of conceptual thinking in a

[1] See Thomas Lockwood's Design Thinking: Integrating Innovation, Customer Experience, and Brand Value (2010) for a business orientated description of design thinking.

generic DT design process so that the acts of synthetic conceptualisation that occur within the *Ideation* phase and are required for the transformation of *Research* into *Prototype* may be contextualised. For it is within the *Ideation* phase that the designer grapples with complexity in an attempt to resolve, through the artificial, a solution to the problem and it is here, we feel, that information architecture may be able to assist the designer to cognitively construct resolution.

2.2 Research in Design Thinking

The *Research* phase of DT is concerned with understanding the societal world within which the final design solution will exist and operate. For as Klaus Krippendorff suggests in *Design Research: an Oxymoron* (2007), design is inherently a social activity and thus in order to produce meaningful solutions, a designer must acknowledge and support peoples conceptions and desires and this requires listening, observing and collaborating with people so as to understand how they "think and justify their actions in worlds they always are in the process of constructing".

Design research[2] is at the most fundamental level, the practice of collecting information about users and their physical and conceptual environments so as to gain a holistic understanding of the design problem and the social circumstance from which the problem arose. Research methods that are used to extract this information vary in range but include examples such as user and group interviews, observation; user probes diaries and contextual mapping. Conducting design research can be in itself multifaceted. As far back as the early 1970s, Horst Rittel and Melvin Webber, in *Dilemmas in a General Theory of Planning (1973)*, describe the difficulties of identifying societal problems:

> We have been learning to see social processes as the links tying up open systems into large and interconnected network of systems, such that outputs of one become inputs of another. In that structural framework it has become less apparent where problem centers lie, and less apparent where and how we should intervene even if we know what aims we seek.

Richard Buchannan in *Wicked Problems* (1992) further propagates the value of research as he believes the act of designing should be orientated around attempting to understand the societal problem as he considers the fundamental activity of design as the conceptualization and development of solutions purely in response to the contexts of the particular problem at hand.

The outcome of a rigorous and rich research exploration into social reality results in complexity, as social reality is inexhaustibly intricate. At its most tangible, the complexity takes the form of data generated by the research activities. It is worth noting that the research data can only ever be interpretive as according to Bourdieu (Highmore 2008), social reality is itself regulated by the 'proclivities and dispositions, the abilities, practices and understandings that are often only tacitly understood' and the selection of what is valued is based on the decision making of

[2] The term 'design research' is used inclusively to describe any human-centered design research practice that informs the design processes and is not meant to represent either Plomp and Nieveen's '*Educational Design Research*' (2009) or Koskinen et al.'s (2011) '*Design Research*' methodology.

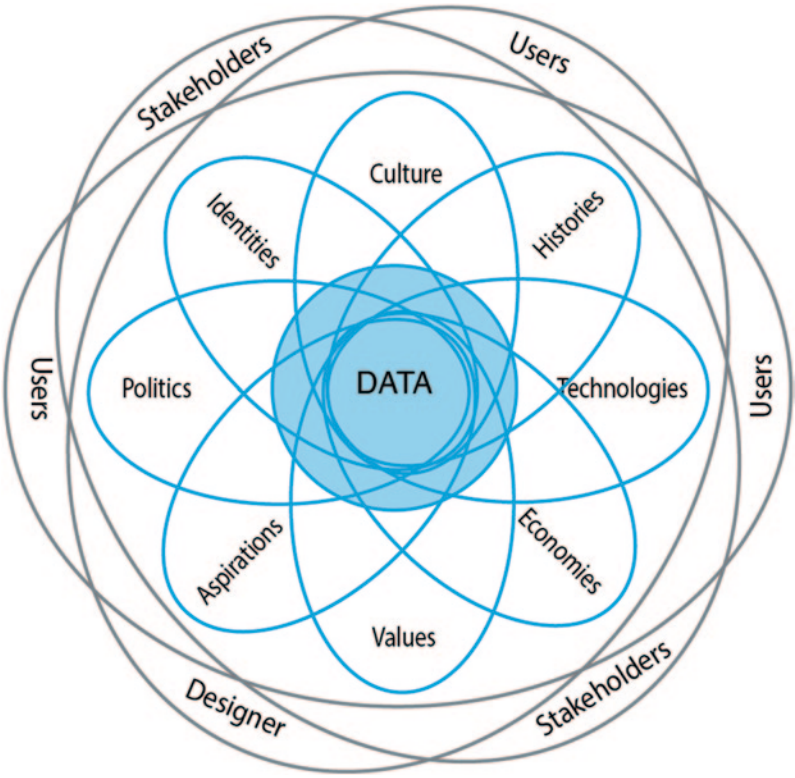

Fig. 2.2 Illustrates examples of the different societal factors that potentially could be explored, across the numerous stakeholders, in order to begin to address societal problems

the researcher and what is divulged by members of the society. Research data that reflects the complexities of people's lives can be understood to impact on the design process in two distinct but entwined ways. Firstly, the data originating from the research process can be understood as the context from which the problem emerges and secondly, also as the context that provides the relational social logic that the solution must acknowledge in order to seem 'spontaneous' (Highmore 2008) to the end user community. In this essay, we refer to the rich complexity that is reflected by research data as a *problem ecology* (Fig. 2.2).

2.3 Ideation in Design Thinking

Rittel and Webber (1973) connect the act of understanding and the act of forming design in a mutual relationship. They describe the requirements of design problem solving as follows:

> One cannot understand the problem without knowing about its context; one cannot meaningfully search for information without the orientation of a solution concept; one cannot first understand, then solve.

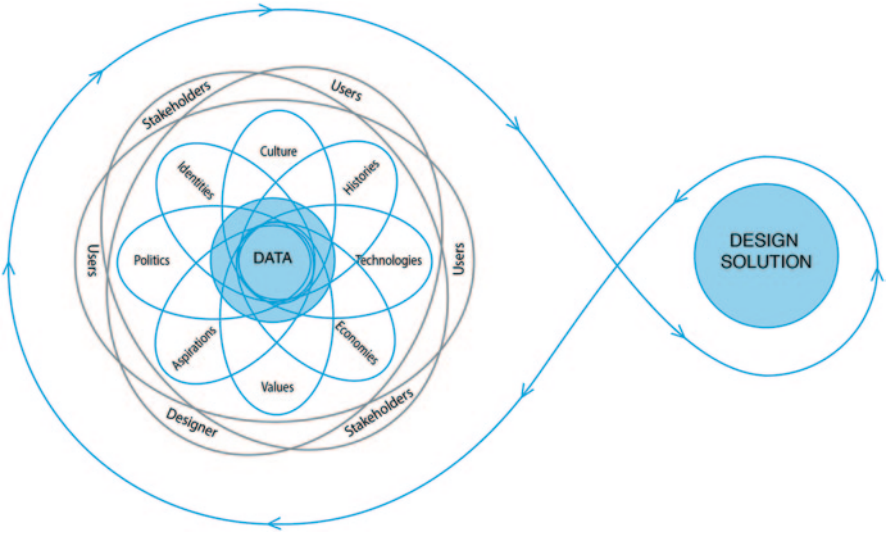

Fig. 2.3 A representation of a problem and solution conjecture

Rittel and Webber place both the context of the problem and any potential solution within an iterative loop that cyclically and reciprocally edits the understanding of both as illustrated in Fig. 2.3. This iterative loop is in essence the *Ideation* phase of the design process and attempts to reconcile the research findings with the artificial solution in a problem/solution conjecture. Therefore, if the resulting complexity from the research is manifested as data, then the process of 'understanding' the data through synthesis can be considered essential in the act of problem resolution.

Nigel Cross (2006) observes that this type of problem/solution conjecture as typical of the thinking employed by designers, as designers are 'solution-focused'. Cross and Dorst (in Cross 2006) describe the stages of defining mutual problems and solutions as follows:

> The designer starts by exploring the [problem space], and find, discover, or recognize a partial structure. That partial structure is then used to provide them also with a partial structuring of the [solution space]. They consider the implication of the partial structure within the solution space, use it to generate some initial ideas for the form of a design concept, and so extend the partial structuring… They transfer the developed partial structure back into the [problem space] and again consider implications and extending the structuring of the [problem space]. Their goal…. Is to create a matching problem-solution pair

Thus the formulation of matching problem-solutions is a conceptual process during which design solutions emerge from the designer's analysis, categorization, structuring, organization prioritization and consideration of the rich data. The emergent solution, selected by the designer, then reciprocally further reduces the range of relevant data, focusing on the data that will impact further thinking around the solution. For example, if a problem ecology was constructed around 'city transport' data describing perceptions of automobile wear and tear could be discarded once the strategic decision to build cheap bicycles and develop safer cycle routes has taken place. This iterative, conceptual repositioning of problem and solutions can be

described as the generation of design solutions by reducing the complexity though analysis while simultaneously forming meaning (the solution) through synthetic construction[3]. Additionally, we contend that the problem/solutions conjectures can be viewed in a less binary structure then Cross's 'pairs' as a problem could, after consideration, be better understood to have a number of equally acceptable solutions depending on specific contexts and users. Alternatively, problems may also require a system of solutions. For example the problem of 'crime' could be solved by finding solutions for problems as diverse as poor education, lack of employment, cultural entitlement and police corruption.

2.4 Prototyping in Design Thinking

How Cross and Dorst's (in Cross 2006) '*partial structure'* in the problem/solution conjuncture is manifested is crucial in understanding one of the primary distinguishing features of the DT approach to problem solving. In DT the design solution evolves from the partial structure, which in turn evolves from data collected in the human-centered research exploration. The design solution can thus be considered to have emerged from a 'bottom up' or generative approach within which there is a clear conceptual link between research insights gained from people, and the final solution.

This framing of design contrasts with a product-led, more traditionally view of design within which the various disciplines of design each have their own product types. These product types can be regarded as generic solutions that have been developed over time and have been successfully proven to be adept at solving particular determinate problems. For example the design product 'chair' is a proven solution for the problem 'what do I put in the living room to facilitate rest?' Subsequently, in most Industrial Design departments, at one stage or another, students are briefed to design a chair.

The power of the design product is that their value has been established and proven through their usefulness. This power is also the design products weakness as meaning is often 'hidden' in the product itself, contextual rather than universal and often tied into socio-political systems that may be culturally, economically and ecologically unsustainable. For example, in traditional African cultures where mats are used to sit on, is the answer to 'what do I put in the living room to facilitate rest?' still a chair? In reality the concept of 'chair' fits into a larger perhaps Western concept of 'sitting room', which fits into an idea of a space for rest, and everything seems to make sense. But in a village without lounges, that have different understandings of resting and different practices, spaces and rituals for rest, the concept of 'chair' may appear bizarre.

[3] See Dindler (2010) for a discussion of the historical emergence in design theory of problem setting and problem solutioning.

Buchanan (1992) counsels against the temptation of applying premeditated and assumptive[4] design solutions to complex problems. Buchannan describes the results of this dependence as "mannered imitations of an earlier invention" that may no longer be relevant to the specific possibilities of a new situation. Applying design products automatically in response to design problems, without a rigorous investigation into the nature of the problem, implies that design problems all share the same problem data set and are consistently alike. Nigel Cross (2006) similarly describes product-led approaches, which he terms 'fixation', as a phenomenon that limits particularly inexperienced designers to "reuse features of existing designs rather than explore the problem and generate new features" as problematic.

Johann van der Merwe (2010) in a *Natural Death is Announced* describes design as a discipline-neutral groundless field of knowledge that constantly sources knowledge, skills, practices and contexts from other fields of knowledge as dictated by the location of the 'specific design problem' Van der Merwe's observation implies that design solutions are in their own manner as indeterminate as design problems and contain no natural form or structure and are always acts of synthetic construction.

The framing of the design process to include complexity and indeterminacy during problem formation (*Research* phase) and during solution formation (*Prototype* phase), while acknowledging the interrelated systemic nature of design problems and design solutions, has lead us to use, in this essay, the phrase 'the problem/solution ecology' to describe the *Ideation* phase. Key characteristics of problem/solution ecologies include, amongst other things, paradox, conflict and contradiction and this is where a traditionally analytic approach to solutioning falls short as do often purely discipline-led approaches as they fail to grasp the larger complexities of the problem wherein paradox, conflict and contradiction often reside. Attempting to better understand the problem ecology through analysis, categorization, structuring, organization prioritization and reflection often provides clarity, new perspectives and creates opportunities to reconfigure solutions by restructuring the problem.

2.5 The Practice of Information Architecture

Although the term "information architecture" was first applied by Richard Saul Wurman, an architect, in his book *Information Architects* (1997) the practice of information architecture tends not to be associated with "design" but rather an adaptation and evolution of thinking, tools and techniques (for example taxonomies, common in the field) derived from fields such as Information and Library Science. This is in no small part due to the usefulness of the thinking in these fields in dealing with data storage and retrieval challenges so relevant to information rich environments such as the World Wide Web.

Remaining true to Wurman's thinking on information architecture the term remains applied in graphic design and information design practices where its applica-

[4] Buchanan terms these types of solutions as 'categorical'.

tion refers to the structuring of the visual representation of information, predominantly in print media. The term can also be found applied in the field of information technology (IT) where it refers to the flow, storage, rules and relationships of data in IT architecture.

Our interest in this paper however is oriented to the practice of information architecture as applied primarily in media spaces rather than IT and in particular the way that the practice has come to be understood as falling within the field of user experience design (UXD) (Hobbs et al. 2010). In this reading UXD has a primary focus on digital environments (like the World Wide Web) where the practice of information architecture design is one of several practices that contribute to the design and production of interactive experiences like websites. These practices include but are not limited to interaction design, usability, copywriting, art direction, coding and programming, etc.

Earlier in this paper we described the manner in which DT operates to solve complex, indeterminate problems situated in social reality. Similarly to DT, information architects either research to discover or are provided with large amounts of research data, which they organize such that it can be understood, and in so doing present a solution. This maps to the first two stages in DT (Research and Ideation) and again, like DT, information architects produce prototypes that can be tested and iterated upon by reference back to research and users.

Information architecture also shares with DT a view of problems as systemic. Information architecture, when practiced, is most often solution focused and applies models of research, organization and feedback to understand and explore the system or systems in which the problem exists. Information architecture methodologies and solutions are understood to be transient, iterative and evolving, as users and context are better understood and change over time.

2.6 Research in Information Architecture

The practice of information architecture today is predominantly product-led where solutions are required for specific channel bound problems. For example, companies often find that users cannot find the information they require promptly or effectively on websites and will turn to information architects to re-organise and/or re-label content and sections to improve the findability of content. The reasons why users struggle to find specific items of content or functionality can vary broadly however: websites, for example, exist in the context of the broader media mix and channel make up of companies where differing organizational logics may apply in different channels or contexts. This can create an expectation by a user that a consistent logic will be applied and when it does not, results in findability problems. Equally, a user's mental model may not map to a companies understanding of a product or service and when an interactive experience manifests such a breakdown in the information architecture, usability failures occur.

To remedy the issues that present themselves in product-led briefs information architects will endeavor to look beyond the immediate problem space presented in

the channel (for example the website alone). Research will be conducted into the broader organization (through stakeholder interviews, site visits, etc.), the market place will be reviewed and understood (through competitor analysis, best practice reviews, etc.) and users will be researched (through, for example, card sorting or user interviews).

By conducting research the information architect is attempting to gain a broad view and understanding of the problem in a systemic context. In practice, it is understood that although a website is the ultimate product that will be required by a client the approach remains problem-led and furthermore that dependencies and constraints exist beyond the product (from within the organization, in the market context and in the lives of users). In this sense, the information architect is tacitly acknowledging the presence of a problem/solution ecology that is complex and exists in social reality.

Buchanan notes that when indeterminate problems present themselves they do so as a struggle to determine where a problem-centre lies (1992). As previously described, in attempting to understand the larger context in which the immediate problem presents itself, in the case of indeterminate problems, the identified problem can often be a symptom rather than the cause of problem itself. For example, the failure of a website to assist users in finding something may be because of differing understandings and associated language used within an organization, in the marketplace and that commonly used or expected by users.

The research required to illuminate the problem ecology thus produces very large amounts of information in addition to the information presented as the problem (for example, the information on the website itself, the structure of which may be the immediate problem).

Analysis of the indeterminate problem-in-context falls short of providing a solution however. This is because the problem manifests and means different things to different stakeholders and participants in the ecology. At best analysis can explain these views and document their inter-relationship as it presents itself on the surface, however determining a solution that resolves them requires, as we will discuss in the next section, synthetic thinking on the part of the information architect.

2.7 Ideation in Information Architecture

The objective of ideation for the information architect is the reformulation of information such that it accounts for the multiple realities of stakeholders, users and context to solve the problem/s at hand (Fenn and Hobbs 2012).

New groupings of information and relationships between these groups are created such that new structures emerge. Many techniques are applied for this including (but not limited to): concept diagrams, content maps, models (for example relationship models), personas and scenario development, customer and user journey design and card sorting.

An example of the manner in which these techniques combine to assist the information architect in synthetically resolving the problem-ecology follows: field

Fig. 2.4 A photograph of a user organizing content and functionality in a card sorting exercise

research (both qualitative and quantitative) produces data. Key themes and requirements can be determined from an analysis of the research as well as information about users that is also analysed to create personas, which represent key groupings of types of users. Personas may be placed in scenarios that represent the contextual factors and data derived from research and both assist in formulating the information environment required by users in the scenarios while simultaneously testing the ability of the design solution/s to answer the needs of those personas. Scenarios may then be joined up across a time-based progression in a user journey that can further resolve and test solutions and their interrelation across the macro concerns of the problem ecology. The process then continues to iterate between personas and micro and macro concerns until a workable design solution is attained (Fenn and Hobbs 2012; Fig. 2.4).

It is in this way that complexity is both discovered and understood and resolved through the application of a variety of techniques embedded in information architecture practice, that explicitly assist in the cognitive processes required of a designer for synthetic thinking (Figs. 2.5 and 2.6).

In the paper *The Information Architecture of Transdisciplinary Design Practice: rethinking Nathan Shedroff's Continuum of Understanding* (Fenn and Hobbs 2012), these authors provided two examples of techniques, card sorting and user journeys, that can assist with synthetic thinking in information architecture practice:

> In the case of [user journeys] user and business/organizational needs, content and functionality are mapped into engagement or relationship models that allow problems and related data from different sources (regions within problem ecologies) to come together in models that start to provide harmonies and solutions in paradox and conflict driven ecologies … card sorting, takes elements of content and functionality from the problem ecology and presents them (as keywords on library cards or post-it notes) in no particular order to

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