A ROLE FOR INFORMATION ARCHITECTURE IN DESIGN EDUCATION: DEVELOPING INNOVATION THROUGH STRUCTURED THINKING

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Abstract

In this paper, we position information architecture design and the thinking skills required for its practice as a practical application of the theory of cyberdesign. We further suggest that these thinking skills, while commonly applied to digital domains, transcend the digital because, at the cognitive level, the information architect is dealing, first and foremost with indeterminate problems. We describe how information architecture design involves the process of deconstructing dysfunctional formations (problems) and the characteristics of the design applied in the reformulation of parts into a functional reformulation. The innovation produced through the reformulation of the problem (solutioning) is positioned as an act of composition, where new meanings are created, and the implications of innovation for users (and the design) are then discussed. In conclusion, we hope to have demonstrated that these thinking skills are a meaningful area of further study for their application as teaching techniques to develop in students the necessary abilities required for solving indeterminate problems that they will be required to engage with in their careers as designers.

Key Words: *information architecture design, indeterminacy, innovation*

Information architecture and cyberdesign

The term information architecture (and information architecture design) is being used in this paper in the sense first outlined by Richard Saul Wurman in his book 'Information Architects' where he described an information architect as *"…someone who enables data to be transformed into understandable information.*" (1997) In his book, Wurman uses the term to cover the design of information across a variety of media (predominantly print) where the practices of information architecture and information design overlap greatly.

The term, and the practice of information architecture (IA), has developed substantially with later texts such as 'Information Architecture for the World Wide Web' which emerged from the growing need for a set of skills that relate directly to design in information spaces of a digital nature including but not limited to websites, software and mobile applications. In these environments, information architecture design is specifically positioned to address challenges user's face in their experience of the interfaces that mediate their consumption of and interaction with large bodies of information in databases, on servers and embedded in mark-up (like webpages) most often in hypertextual ('linked') environments like the World Wide Web or the Internet itself.

It is probably fair to say that today the term has come to be most closely related to design in and for digital environments, within the larger umbrella practice of user experience design[1], because of the proliferation of the Web and the devices, technology and infrastructure that have become accessible to so many. As a practice, information architecture design has also grown so substantially because of the need for those skills in solving indeterminate design problems[2] that proliferate in the digital domain.

[1] The term 'information architecture' is still associated with print media in information design communities of practice and is also applied in the fields of IT and Application Architecture however for a different role, practise and set of skills. Our use of the term does not span these disciplines.

[2] Indeterminate, complex or wicked problems are understood in this paper to refer to problems that have multiple stakeholders and multiple users (people who experience the problem as part of their attempt at goal achievement), large amounts of data related to the system where the same system lacks predictability.

IA shares with cyberdesign[3] a view of problems as systemic and being rooted in social realities. And again, as with cyberdesign, IA is goal driven and applies models of organisation, feedback and conversation to understand and explore the system in which the problem exists.

Van der Merwe (2009:3) describes the flexibility of cybernetics as appreciative of "*the necessity of selecting from a wide range of approaches, plus a range of tools and corresponding methods, that best fit—the type of system, the purpose and nature of the inquiry, and the specific problem situation*". In the case of IA, the approaches, techniques and tools that have developed, have largely emerged for the purposes of solving problems in the digital realm. The wide range of specific techniques utilized by IA practitioners to address indeterminate problems include (but are not limited to): complex system design; user needs analysis and representation; organisational systems and schemes design; ambiguity studies; content analysis and labelling; building of context; designing for flexibility; strategic thinking; design of relationships; conceptual and journey models and scenarios. The various techniques assist at various stages of the design process: some assist with information or data gathering, questioning the boundaries of the problem; some assist with understanding the problem from the perspective of multiple audiences and owners; some assist in the early stages of conceptualizing a solution and some with testing these solutions in one or more environments with one or more type of user; some assist with unifying the disparate needs of the multiple stakeholders of the problem.

These techniques form part of a design process and surround the core act of information architecture design itself. To date, the experience of the authors has been in the teaching of these techniques, however our experience has shown that it is the ability to think and create in the specific manner of the design of information architecture that has been lacking in our students and teaching.

The characteristics of structured thinking

In the novel *A Tale of Love and Darkness* by Amos Oz (2005) a young boy (the narrator) has recently been granted a small space for the placement of his books alongside his father's in their personal library. The boy has chosen to arrange his books by height, much to the dismay of his academically inclined father:

> "At the end of the silence Father began talking, and in the space of twenty minutes he revealed to me the facts of life. He held nothing back. He initiated me into the deepest secrets of the Librarians lore: he laid bare the main highway as well as the forest tracks, dizzying prospects of variations, nuances, fantasies, exotic avenues, daring schemes, and even eccentric whims. Books can be arranged by subject, by alphabetic order of author's names, by series or publishers, in chronological order, by languages, by topics, by areas and fields or even by place of publication. There are so many different ways" (Oz 2005: 24)

To library scientists and information architects reading this passage, Oz's description is a merely romantic and unspectacular look at what can be achieved when one categorises books using their meta-data.

What is more interesting are the lines which follow immediately on from this:

> "And so I learnt the secret of diversity. Life is made up of different avenues. Everything can happen in one of several ways, according to different musical scores and parallel logics. Each of these parallel logics is consistent and coherent in its own terms, perfect in itself, indifferent to all the others… So I learnt from books the art of composition" (Oz 2005: 24)

It is here that Oz uses the organizing of books on a shelf as a metaphor for both the many views, understandings and choices we have and make that become our lives ("*the facts of life*"), and design or art making ("*composition*").

A minor edit of Oz's latter paragraph starts to read a little like a description of the way people can navigate websites and the effort that information architects take to relationally structure navigation, to

[3] Cyberdesign, is a term coined by Professor Johan van Der Merwe, describes a theoretical field of design thinking that applies aspects of systems theory and cybernetics with in a constructivist design paradigm.

hyperlink data, in ways that provide multiple options for journeying through a single structured logic of associations:

> "made up of different avenues…[e]verything can happen in one of several ways…parallel logics...[e]ach … consistent and coherent in its own terms, perfect in itself, indifferent to all the others…"

Alternatively we can think of this as a description of people's path to the creation and discovery of their own personal meanings, views of the world and interpretations of reality. Viewed as an act of composition, much of what we take for granted (and often as fact) that has been through a process of structuring, categorization or association, informs our understanding of the world. This should not be confused with knowledge. One simple example would be the Genus of Species. Our understanding of the animal kingdom would be very different today had an alternative categorisation been applied.

The process of structuring, categorising and association (the fundamental characteristics of information architecture design) is a creative one: where once a dysfunctional formation existed (multiple disparate data sources without any over-arching, coherent sense of logic, structure or harmony), the designer will have manifested structure, categorisations and associations that create new form and meaning for its audiences. The designer will create a new functional formation. Multiple, disparate and large quantities of data and multiple audiences of the solution (including various stakeholders, various types of end users and all those responsible for engineering the final solution in which the information architecture will be manifested: graphic designers, programmers, etc) are common characteristics of the kinds of wicked problems encountered by information architects in day-to-day work.

By way of analogy, Venn diagrams are useful for describing the construction of form and meaning (and meaning through form) through structure, categories and associations:

> "…[the] principle of these diagrams is that classes [or sets] be represented by regions in such relation to one another that all the possible logical relations of these classes can be indicated in the same diagram. That is, the diagram initially leaves room for any possible relation of the classes, and the actual or given relation, can then be specified by indicating that some particular region is null or is not-null". (Lewis & Leibniz 2010:157).

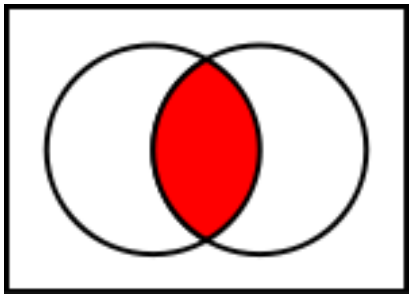

Figure 1: A basic Venn Diagram of two sets

Notwithstanding the key point that '*any possible relation'* may be applied, Venn Diagrams do however contain rules for their use. There is a particular form that is required as more sets are added and because of this there are logically inherent 'rules' or relationships governing the associations made between data sets.

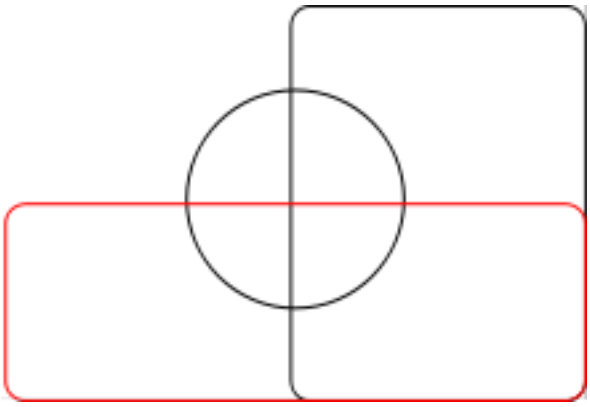

Figure 2: Edwards-Venn diagram for 3 sets **(Tanhuanpää 2006)**

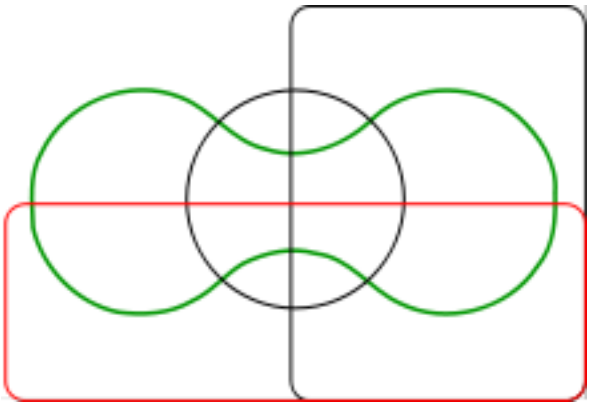

Figure 3: Edwards-Venn diagram for 4 sets **(Tanhuanpää 2006)**

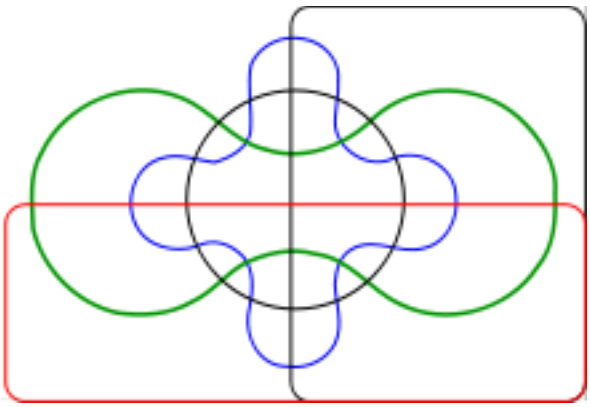

Figure 4: Edwards-Venn diagram for 5 sets **(Tanhuanpää 2006)**

The relationship between form and meaning is important here: form is both a structural concept and a visual design concept. In the former sense, meaning is created through structure (where structure is created by what is included and excluded from data sets to create relationships) and association (the choice of which data sets will be associated). In the latter sense, by applying a graphical treatment to the presentation of the data sets and levels of relationships, the meaning is communicated in the manner in which the form is represent and communicated.

In an entirely unscientific sense, staying with the general logic but not the formal use of Venn Diagrams, when data sources are added and sets related, multiple levels of meaning emerge from new relationships and although these meanings are governed by rules (dependencies) through associations, there need not be any pre-existing 'form' (for example, hierarchy) at the data level (we

just have data and the conceptual relationships that are created). Form in this sense is something imposed and can be designed as the author (or observer) chooses. Indeed, and again in wholly unscientific terms, there need not even be any particularly logical association between the data sets that are related, for example the ‘banana frog’.

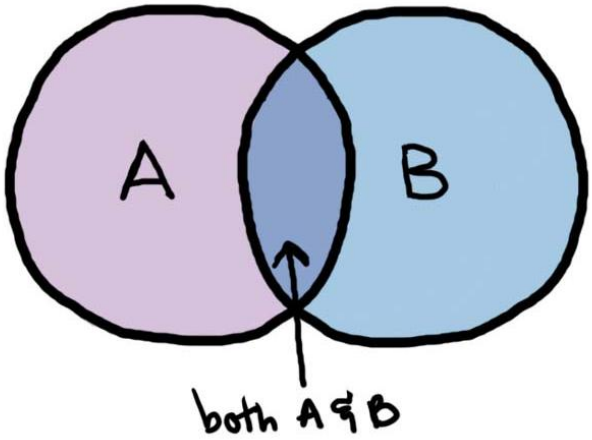

Figure 5: The intersection of both A & B (bananas and frogs)

Where the set of A represents bananas and B frogs, at the intersection we find the set of things that contain both the characteristics of frogs and bananas: the banana frog.

The point here is that in performing IA design we are performing an act of creativity and in this way we are allowed to bend the rules of science and logic because one, we are merely using Venn Diagrams as an analogy for a way of thinking and constructing form and meaning and two, because science is unlikely to ever create the banana frog which we just did in a few words.

The ability to observe a body of data (possibly made up of different types of data) and find patterns that can become categories; to merge, relate or overlap categories into a structure (or multiple structures that are then related and overlapped); to create meaning through the construction of associations and relationships between these forms (in the structure); and ultimately to communicate these meanings for the use of others, is the essence of information architecture design. And, much like imagining the internal world of a child creating something in Lego, the rules governing the design are totally up-for-grabs, flexible and subjective.

Structured thinking and problem solving

But what is the connection between the creation of meaning and problem solving?

When presented with a complex problem, analysis of the problem alone, will not provide a solution; an additional step is required, one where the designer formulates the solution. Underlying the burden of solving indeterminate problems there is creativity which in and of itself has its roots in play and fun; a child-like freedom to connect dots that otherwise would not be connected to create new forms and meanings that solve problems which thinking in a linear, or purely analytical manner, struggles to resolve.

When presented with a (complex) problem that cannot be solved simply it often helps to unpack the problem into parts. This provides clarity, new perspectives and creates opportunities to reconfigure the parts to discover a solution by reconstituting the problem. In the case of extremely complex problems there can be very large numbers of parts and, as previously noted, what we think or perceive the problem to be is often part of the problem. So the process of exploring the context of the problem introduces new parts that form the ‘big picture’ or total context of the problem. The designer is now working with the known or inherent parts of the problem in addition to the discovered, contextual parts of the problem. This creates a very rich environment of data and information to work from.

The process of deconstruction is then followed by reconstruction: a reformulation of the parts both in terms of how they are perceived and understood, their meaning in isolation and their meaning in

relation to one another. It is in the reconstruction that complex problems, often with complex solutions, are re-formulated (where a key aspect of the artistry of the designer is in the presentation of a complex solution as a simple one to the end user). This reconstruction is an act of composition and it is in this act, where a previously dysfunctional arrangement existed, that a new formation is created which provides a new meaning through a new form, a new arrangement of parts.

Design considerations in innovation

When innovating, a new formulation of parts is presented as something new to the user (and all stakeholders) and this often breaks with a user's 'conceptual model' or 'mental model' of the object they are interacting with (Norman 1998: 12). The dysfunctional formation and the associated conceptual model (how it is understood and the meaning it holds for the user) is what the user is familiar with.

The context is the present reality and stakeholders often struggle to imagine anything different to that (as do users) and thus the need for a designer to intervene. In this dysfunctional state, especially when stakeholders and users have no alternative, workarounds will be created usually resulting in inefficient and ineffective interactions and outcomes. Such workarounds can become so entrenched that the meaning of the formation can appear as knowledge of a truth, a single state with no alternative, something that is not questioned. When the meaning of the formation (and the context in which it exists) is accepted as knowledge both stakeholders and users in the problem lose the capacity to reconsider the formation.

When the formation changes to the extent that the entrenched conceptual model no longer applies, the innovation fails because the user doesn't understand it; the use and or the purpose of the innovation holds no clear meaning in the mind of the user. It is for this reason that designers try to make their innovations intuitive, removing the requirement for a full knowledge of the formation and context, proceeding directly to use (Krug 2000: 10)

Harmony is created when a new formation still holds the same meaning, or a new meaning that is equally capable of being easily understood, while still being intuitive. Although a user's knowledge of the context and formation is not a requirement for a successful design solution (consider a car or a microwave), a new formation with an understandable meaning will provide longevity for the design solution, because inevitable iterations required by the solution (naturally so because solutions operate in dynamic and changing contexts) will be more easily received by users.

Although making things easy to use (designing in intuitiveness and making complex or new solutions appear simple) is an essential part of good design, the skills required to deconstruct, observe and reconstruct meaning lie at the heart of the benefit of the application of information architecture design.

Conclusion

Our hypothesis is that structured thinking (which is both analytical and creative; structured and flexible) and the reformulation of meaning that it produces, lies at the heart of design thinking with the aim of solving indeterminate design problems. Divorced from the practice of information architecture design for digital environments, the thinking that characterises IA and its practitioners, could be considered to be a critical tool for solving indeterminate design problems within any or across multiple environments, and it is this skill, which we hope to develop in our students.

Ideally, the cognitive abilities and processes that facilitate structured thinking, as employed by information architecture designers, should be understood to form the basis for concepting, executing and measuring learning methods for design students. This will form the basis of future research in this topic by the authors where the 'thinking skills' of information architecture will be unpacked in psychological terms to inform teaching modules that will be tested and measured with students to determine their effectiveness as aids to developing learners' ability to solve indeterminate problems.

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Short Biography

Terence Fenn has worked in the Department of Multimedia since January 2003. He is responsible for the interactive design and research orientated components of the multimedia programme. Originally trained as a fine artist, in 2001 Terence was awarded an Aus-Aid Nelson Mandela Scholarship to study a Master of Art and Design Education at the University of New South Wales in Sydney. Terence is currently the coordinator of the Multimedia Department's BTech programme. His primary area of interest is the role that design can play as an agent of support and positive change in the lives of people.

Jason Hobbs has been practising information architecture and user experience design since 1997. He pioneered the user journey design method and is internationally recognised in his field. For the past six years jh-01 / Human Experience Design has been one of the few truly beautique and independent user experience (UX) design companies in South Africa. The services offered include user-centered research and testing, strategy and design. Jason is an Affiliated Researcher at the University of Johannesburg's Research Centre Visual Identities in Art and Design. He is presently a part-time lecturer at the same university. He regularly presents at International conferences and actively works to grow the local community of practice through the SA UX Forum which he founded five years ago.