

The Firma Model: A Tool for Resolving Complex Societal Problems

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Abstract

As the focus of design broadens to include problem solving located in complex societal systems the emphasis in design education must shift accordingly. Knowledge of and competence in conducting research within the scope of design practice, and using insights gained from research to conceptualise appropriate solutions is a necessity that design students urgently require. In support of this need, this paper will introduce and describe the Firma Model, a meta-framework that spans the human-centered design process, which aims to assist the design student and educator in grappling with complex problems.

The first section of this paper presents a description of the Firma Model, which is supported by a theoretical rationale. This description explains how the model can be applied to frame design research, orientate design strategy and evaluate solutions. The second section provides an account of how the Firma Model evolved as a teaching tool and how the model has been applied in two different educational contexts. This second section concludes with a critical reflection of the application of the Model in our teaching practice over the last eighteen months. This reflection details concerns that arose, considerations for use, as well as a brief discussion of how lessons learned will be incorporated into future teaching activities using the Firma Model.

Keywords: design, models, research, strategy, critique, ethics

Introduction

Societal problems are often complex, illusive and subject to societal agreement (Rittel & Webber 1973, p 165). Societal agreement itself has many nuances related to the beliefs and practices of the various actors who comprise a society, as the term wicked problems (Rittel & Webber 1973, Buchanan 1992), used to describe them, implies. Furthermore, it is possible that multiple and conflicting ethical positions may co-exist in society (Gowans 2012, Westcott n.d.).

The emergence of problem-ecologies is intrinsically linked to the notion of complexity and indeterminacy in design (Fenn & Hobbs 2012, pp. 7-9). Using a simple analogy, a problem-ecology can be viewed as the natural habitat of the wicked problem. Therefore in order to solve a wicked problem, the designer first needs to ensure that they are interpreting the wicked problem accurately and this involves understanding the environment from which the problem emerges.

As problem-ecologies are invariably societal, most often the focus is on the human experience of the problem. However one can argue that understanding the problem-ecology - in order to find resolution in a manner that provides most benefit for the widest range of actors and environments - demands more than subjective interpretations of societal reality. Thus, in conjunction with understanding the human experience, the research exploration should include more macro forces such as economy, politics, the sustainable environment, technology, market forces and so on.

Further to the challenge of comprehending this complexity is the burden on the student designer (and designers in general) to resolve the pluralism of perspectives, needs and ethical frameworks held by multiple stakeholders within problem-ecologies.

As Kallman and Grillo state: 'The intention behind an ethical analysis should...allow an individual to appreciate all the possible course(s) of action that can be taken according to the differing, and often conflicting, sets of ethical values and then make a judgement as to which is applicable for them in the real world.' (1996, p. 5)

Of course, this places a heavy burden on the designer and even more so the student designer. Design, as Donald Norman (2015) states, is called upon to examine the complexities of our times yet does not adequately prepare people for this need as design in tertiary education is still very much stuck in disciplinary silos 'that no longer suffices to deal with large, complex problems that involve multiple disciplines, technology, art, the social sciences, politics, and business' (Norman 2014).

We argue, that while there is immense value in engaging with complexity in order to design solutions that are appropriately ethical to the widest range of stakeholders and most appropriate to those that need it most, there is an additional burden on design educators to prepare students for contemporary practice. This preparation, we believe, involves adding knowledge, skills and abilities related to problem-resolution to complement design students' disciplinary knowledge. Thus, we concur with Norman (2014) who states:

'Problems are more volatile than ever before, and information often changes faster than it can be validated. This is why we need a new research tradition to explore the issues involved in models of education as well as models of practice.'

In order to support the transfer of knowledge pertaining to design research and assist design students in engaging with complex societal problems, this paper introduces the Firma Model, explains its conceptualization and briefly exemplifies the application of the model in two educational contexts.

Section 1: The theoretical context of the Firma Model

The conceptualization of the Firma Model draws on a variety of sources and has been influenced by a tendency in models for HCD (Human Centered Design) to tend either towards overly broad and generic or overly narrow in the extent to which they consider the problem-ecology and further, assist the designer and stakeholders in understanding and solutioning for it. Examples of the former include IDEO's desirability, feasibility and viability model (2009, pp. 8-9) and Steen's model of HCD methods (2011, p 48); and of the latter, McCarthy & Wright's (2004, p. 79) *Threads of Experience*, Marc Hassenzahl's *Three Level Hierarchy of Goals* (2010, p 44) and Yanki Lee's *Three modes of Participation* (2008, p 33).

Additionally, the authors have drawn on the *PEST* model (Yingfa & Hong 2010, p. 563) for macro-environmental analysis (perhaps better known in the fields of strategic management and marketing than design) and earlier work of their own describing the social complexity of data gathered in researching problem-ecologies (Fenn & Hobbs 2012, p. 4).

In the context of this research the Firma Model has emerged with three primary aims:

1. To provide a generic research framework that can be applied to broadly and deeply explore and define problem-ecologies.
2. To identify key areas of concern within the problem-ecology and thus assist in articulating the design strategy (i.e. how should the areas of concern be changed).
3. And lastly to, provide the basis for critiquing the resultant design solution based on a knowledge of what the problem was and the desired change.

In achieving these aims we believe that the Model can play a role in assisting designers and students of design in recognizing the multiple viewpoints (of an ethical or other nature) that may be held by the many stakeholders within the problem ecology and thus provide a basis for their resolution.

The areas of concern

The Model is based on a conceptualization of a variety of generic factors that may be at play in any given problem-ecology. These we refer to as the 'areas of concern' and are categorized into immediate, contextual and paradigmatic concerns:

IMMEDIATE CONCERNS	CONTEXTUAL CONCERNS	PARADIGMATIC CONCERNS
<p>The organisation: usually the commissioning agent for a design project which could include businesses, government bodies, not-for-profit organisations, etc</p>	<p>Environment: the context of use, spaces and places where the problem manifests that span both physical and digital environments. In this Model, technology is understood and explored as a facet of environment</p>	<p>Economy: the macro- and micro-economic conditions at play that affect or are affected by the marketplace and organisation / s engaged with the product or service (this can include governmental policies, approaches, plans and the bodies responsible for managing and or implementing strategies, such as regulators)</p>
<p>Users: the end-users of products and services</p>	<p>Society: the societal context in which the product or service, organisation and marketplace operate (including norms, values, types, etc)</p>	<p>Politics: both the broad framework of governance (and its associated values and goals) and the particular strategies, policies and bodies that exist in relation to the product or service, the organisations, market place and society that they serve</p>
<p>The marketplace: providers of the same or similar products or services, generic alternative products and services, the supply chain for the delivery of products and services and other immediately affected organisations and places for the operational delivery and experience of the product or service</p>		<p>Culture: the beliefs, norms, values and behaviours of a society at large, the interplay of cultures within a society and sub-cultures as they relate to the product or service, the organisations and marketplace in question</p>
<p>Legacy: The apparent framing of the problem from a historical perspective in the context of the organization, users and marketplace (why is this a problem now?)</p>		<p>History: the broad historical context (and possibly contended views thereof) that inform an interpretation of the economic, political, cultural and societal status quo, as well as an understanding of the immediate environments, marketplace and organisations related to the product or service being explored</p>

Table 1: The areas of concern employed by the Firma Model

Important notes regarding the logic of the areas of concern:

- No one concern is more important than another and as such there is no intended or implied hierarchy in the categorisation or ordering of the areas of concern.
- The lack of hierarchy is critical to developing sustainable solutions: if the multiple needs of the ecology cannot be resolved in relation to their inter-dependencies then the forces at play are likely to work against the design solution over time.
- The areas of concern aim to guard against assumption: first, in assuming a particular understanding in a particular context and second, in acknowledging when insufficient data exists for a particular area of concern.

Applying the areas of concern

The aims of the Model (to assist in making sense of the problem-ecology, determining the solution-ecology and providing a basis for critique of the resultant solution) are made possible by re-applying the same set of concerns at different stages of the HCD process. Initially and prior to starting the research process the Model is applied to identify the types of research and data required. For the purposes of guiding and validating ideation key areas of concern, identified in the research and synthesis processes, are identified as requiring change. This, in essence, is the design strategy. Lastly, with a framework in place, the Model can then extend to assessing the impact of the design based on a set of criteria that both continue to exist at the generic and specific levels¹. It is in this sense that the Model acts as a meta-framework to the HCD process and may be represented in diagrammatic form as follows:

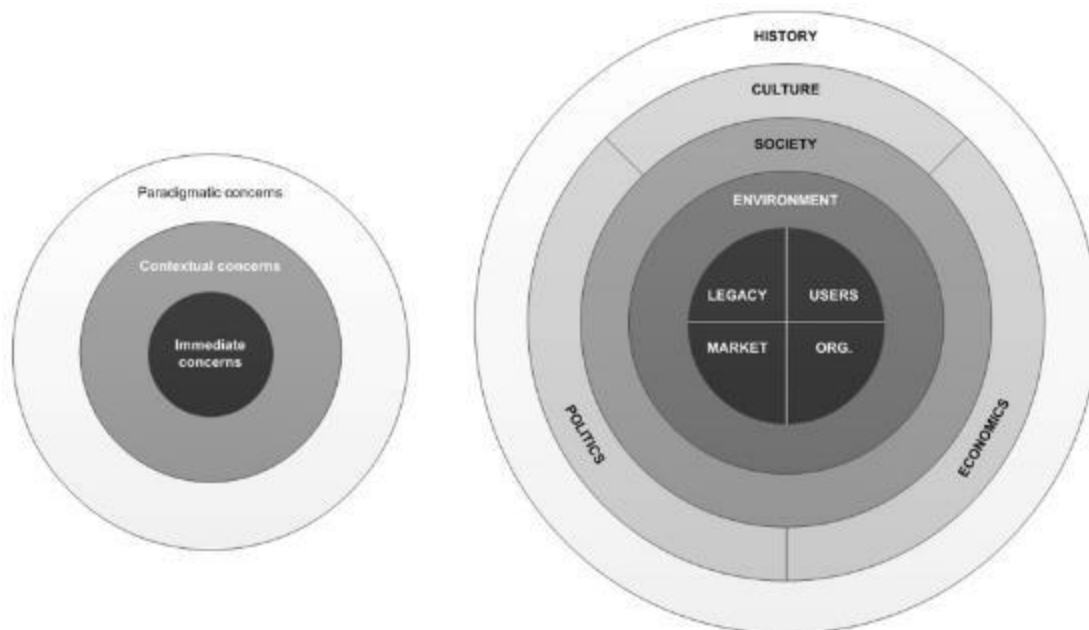


Figure 1: At left we visualise the categories of the areas of concern as radiating outwards from Immediate to Contextual to Paradigmatic (where the Contextual areas are in the middle as the environment and society are understood to be where the influence of immediate and paradigmatic concerns play out). At right, the complete Model is visualized with the detailed content of the areas of concern within.

¹ By 'specific level' we mean with reference to those areas of concern identified in the design strategy. By 'generic level' we mean the generic set of areas of concern that should be revisited (much as in the first phase when embarking on researching the problem-ecology) for the purposes of critique (1) because the nature of such interlocking systems means it is difficult to always predict outcomes, (2) because over time conditions in the ecosystem are likely to change, and (3), because unintended consequences of design interventions can lead to new knowledge.

We will now briefly explain the application of the Model as it relates to its aims to assist in research, strategy and critique.

Applying the Model for research

In research, the areas of concern act as a guide to assist the designer in considering multiple perspectives from which to understand the potential breadth and depth of a problem across an ecology. The areas of concern include multiple stakeholders, environments and perspectives intentionally, so as to be true to the potential complexity that resides in ecosystems.

In research, the Model should be applied in assisting to build a relational logic between the areas of concern. This is how one forms the hypothesis of the problem-ecology. The word ecology is used precisely for this reason because we are attempting to understand the multiple factors at play in the existence of a problem and how they affect each other. For this reason, the cross analysis of data and insights from multiple areas of concern is crucial.

Furthermore, the problem-ecology is a hypothesis and is arrived at through a synthetic process in design where understanding the problem is to formulate a solution (Rittel and Webber 1973, p. 161, Nigel Cross 2006, pp. 78, 80) arrived at through multiple rounds of exploring hypotheses. The aim of the Firma Model here is to ensure that all possible areas of concern have been addressed as inputs into the synthetic process such that the designer can have confidence in the breadth and depth of data and insights being explored for understanding the problem.

Two points are worth noting:

- The Model presents no requirement for the application of any particular research types or techniques. In application the designer would look to choose appropriate methods per area of concern; multiple research techniques may be applied for the purposes of exploring a particular area of concern; and a certain research technique may be applied to more than one area of concern.
- If an assumption is required to be made regarding the content of a particular area of concern it needs to be acknowledged as such. Acknowledging assumption is crucial a. because if a hypothesis has a strong reliance on the assumption it should signal concern and b. should the solution not produce the desired impact it is easier to trace the process back and determine if an assumption was the cause of a misreading of a problem.

Applying the Model for strategy

An effective design strategy requires that it articulate the purpose of the design effort and the desired outcomes of the intervention. To this end, the design strategy should emerge from an understanding of the problem-ecology as this defines the purpose of the design effort at large.

The Firma Model applied for research provides a definition of the problem, the areas of concern at play and the affected stakeholders in the problem-ecology. It follows then that articulation of the manner in which these areas of concern (their stakeholders and relationships) should change and move from a problem-ecology to a solution-ecology, is made available.

Furthermore, ideation is guided and enriched by the explicit relationship that is provided by the use of the Model between the design strategy and research. For example, it would provide context for facilitated co-design workshops and assist in providing the appropriate context for prototype testing.

Applying the Model for critique

Knowing which areas are of concern, and how they (and others) should change, makes knowing where to look to understand impact, a logical progression.

Many measures already exist to understand change within the fields and disciplines interested within individual areas of concern and all may be applied in conjunction with the Firma Model. Where we believe additional value is offered through the use of the Model is:

- In understanding the impact across multiple areas of concern (the systemic dimensions of the problem / solution-ecology),
- In providing a framework and research that spans areas of concern such that a broad view can be taken to observe and identify unintended consequences of change, and
- Having provided a solution hypothesis, if the change required does not occur (or occurs with new problems) it is possible to trace the thinking back to the initial understanding of the problem-ecology to revisit either its interpretation and / or the solution upon which it evolved.

Understanding is required for critique and critique is required for understanding. In this sense the application of the Model at the start and end of the design process provides for a continuous logic through the process that offers an important level of accountability in what is otherwise a difficult space to determine impact (both because of the levels of complexity present and because of the potentially radical forms of transformation that occur in HCD and synthetic processes).

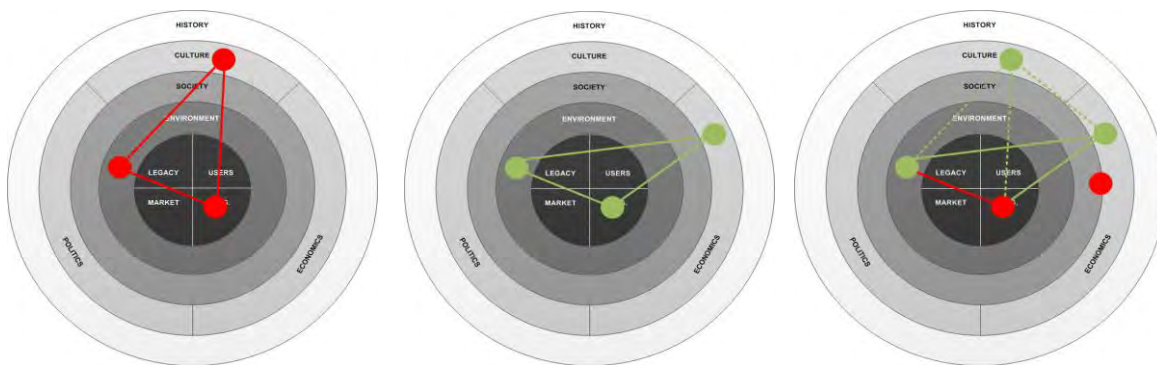


Figure 2: At left, a hypothetical example of how three factors across the areas of concern could be displayed to define a problem-ecology. Centre: an example of how, based on the example at left, we may demonstrate the solution-ecology. At right, an example of how, based on the example in the centre, we may demonstrate the manner in which certain interventions were or were not impactful during critique.

Section 2: Applying the Firma Model in Design Education.

The following section discusses the application of the Firma Model in our teaching practice over the last 18 months. The discussion provides an account of the evolution of the Model, describes two examples of the Model applied in teaching activities and lastly provides a critical reflection outlining concerns, considerations and future intentions drawn from our experience of using the Model.

Case study: Department of Multimedia, University of Johannesburg (IXD students)

We first introduced the Firma Model into our teaching practice in the 2014 academic year. Our initial version of the Model was as a series of thematic categories that we provided to 3rd year interactive design (IXD) students to help them frame secondary research related to a design problem. After the initial success of this exercise (which increased the students' awareness of the broader contexts and interdependencies of singular problems) we decided in 2015 to use the categorical framework in a visual form.

Our initial application of the Firma Model in February 2015 was with 4th year IXD B-tech and Honours students in the Department of Multimedia at the University of Johannesburg. In the 4th year of study

students are expected to conceive of, design and develop a self- motivated project. Students with an IxD focus are expected to identify a problem, ranging from the mundane to the hedonistic, that effects people and resolve the problem in a human-centered design manner. As the problems students solve are societal, they tend to be complex and indeterminate.

It is worth noting that the majority of the students (10/12) had been exposed to the model in its previous form the year before and nearly all the students (11/12) had been taught or had work experience in design projects that were complex in nature although this experience was predominantly in group projects with a high degree of lecturer facilitation. This point is worth noting as we have learned in other HCD student projects that student who have had no experience of ‘finding’ design problems in the world and have only experience of applying design briefs with determinate problems can become very anxious and disconcerted when faced with complex indeterminate problems.

Figures 3-4, are two examples of the 4th year students’ Firma Models which were used here as initial framings of the problem that were attempting to understand so as to resolve. Figure 3 addresses the everyday concerns of dog owners. Figure 4 describes the problem of navigating the notoriously disorganized Bree St, Taxi rank in central Johannesburg.

Problem Statement: Looking after dogs

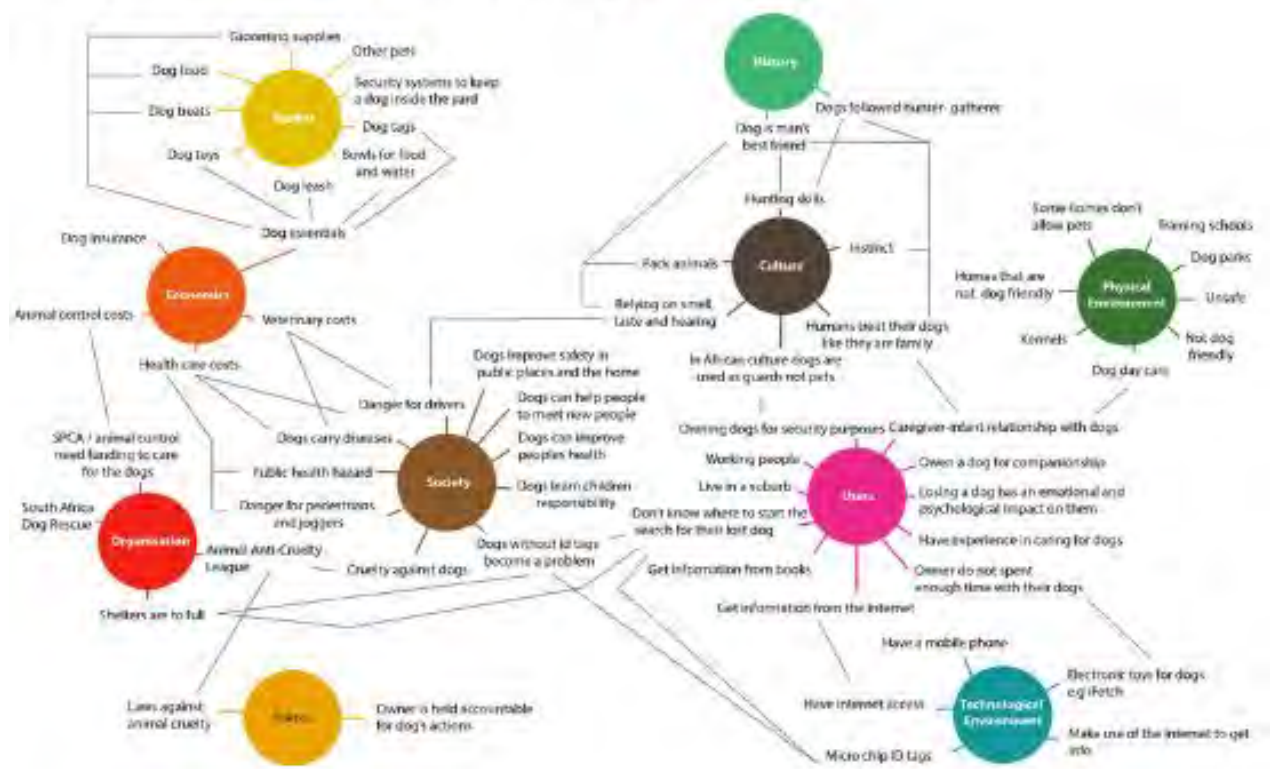


Figure 3: Firma Diagram describing the problem-ecology associated with suburban dog ownership (Image courtesy of A. Pienaar)

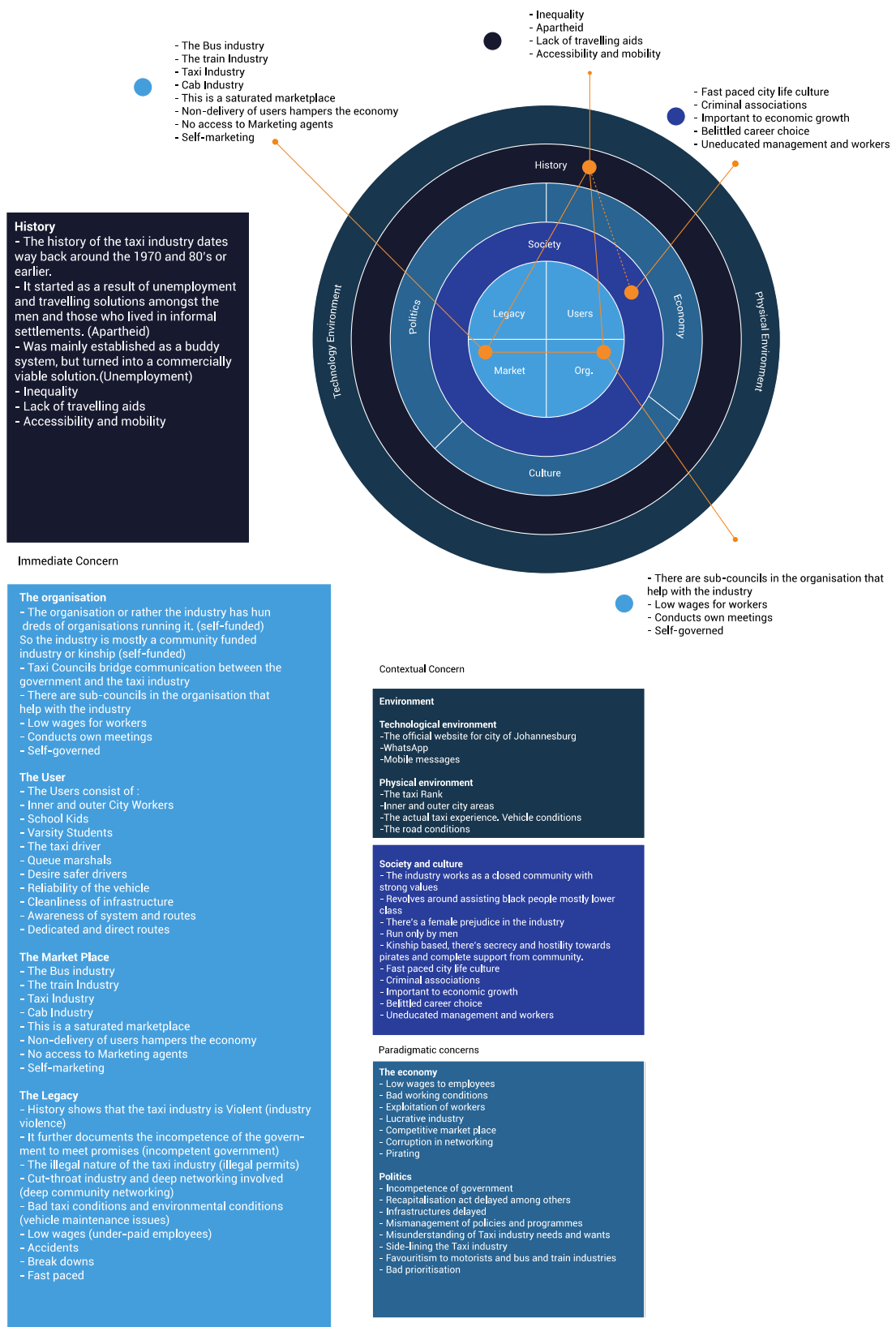


Figure 4: Firma Diagram describing the problem-ecology associated with Bree Street Taxi Rank, Johannesburg (Image courtesy of K. Mokhari)

The first goal that the Firma Model achieves is in allowing students to visually represent their collected data. A visual representation of the data in the model performs three immediate functions:

1. Through addressing the topic requirements of the particular categorical lenses, students are guided towards viewing problems from positions they may not have considered.
2. Students are forced to assess what they consider the most pertinent insights for each lens to be. This act of criticality helps to not only select the most relevant data but also helps to reduce the cognitive load of accounting for all the data found relating to the problem when attempting to consider solutions.
3. By visualizing the research insights, the act of research can become dialogical in the sense that other contributors (such as lecturers and classmates) can engage with students over their interpretation of the problem.

The ability to assess the students thinking concerning their problem-ecologies in the early phases of problem framing was valuable to the lecturing staff as it enabled (in a very dynamic and accessible manner) the demonstration of reframing in the context of the student's own problem-ecology. This reframing occurred by shifting the consideration of the problem to another lens in the same level. For example, how taxi users and taxi drivers could view Bree Taxi Rank differently. Alternatively, the reframing could occur by shifting the problem to a lens at a higher level. For example, understanding the chaos of Bree Taxi Rank (environment) as directly impacted by poor municipal service delivery (society).

The impact of the Firma Model on strategic thinking was evident in the formation of the student's design concepts. Developing the strategy by engaging with complexity deeply effected most of the students thinking.

One example of this mature consideration of a complex problem is the design project illustrated in Figure 6 that originally intended to resolve the chaotic environmental graphic design of Bree Taxi Rank. By reframing the problem as a service delivery issue the student conceptualized a digital application that allowed citizens of the city to voice which services / infrastructure they felt the city should provide. Each submitted suggestion could then be seconded and voted for, with the intention of presenting city management with a clear democratic voicing of concerns. A second example of the use of the model to reframe initial consideration was a design project that explored drug abuse in Kagiso, in the West Rand of Johannesburg. The design student identified that drug use was often a result of boredom and a lack of opportunities. As a result, the solution strategy shifted from drug education (where there were already many existing players) to helping the Kagiso youth connect with positive activities such as sports, cultural groups and skill workshops.

Case study: Metaphase staff workshop (Japan)

On the 14th of July 2015 Jason Hobbs conducted a workshop with 21 design staff members from the company Metaphase in Tokyo, Japan as part of the Summer 2015 UX Strategy Forum, hosted by Sociomedia (also a design company based in Tokyo).

The workshop began with a presentation by Hobbs describing the theory and application of the Firma Model. This was followed by the explanation of a problem that the workshop attendees would use the Firma Model to address.

The theme of the problem was 'Aging in Japan' and had been researched in advance of the workshop by Hobbs using sources available on the Web. Twenty individual data points had been prepared. A few examples follow:

- Japan has the highest proportion of elderly citizens: 33.0% are above age 60, 25.9% are aged 65 or above, 12.5% aged 75 or above, as of September 2014
- Herbivore men (草食(系)男子 Sōshoku(-kei) danshi): Japanese men who do not desire

- marriage or having a girlfriend. This is viewed as a leading cause of the declining birth rate.
- Encouraging the elderly to leave Tokyo could stimulate rural economies

Three tasks were set for four groups: First, map the data points into the Firma Model and the areas of concern; second, synthesise the data and develop solutions to the problem of 'aging in japan'; and lastly, to provide examples of how they might use the model to form the basis of a critique of their solutions².



Figure 5: Participants of the workshop mapping data points into the Firma Model

With regard to the first task (and although there is no rule to the correct allocation of data points into areas of concern) a positive outcome was the debate generated between participants regarding where data points should be allocated. This prompted a deeper interrogation of what the data points meant, both on their own (does this insight belong in one category or another) and in relation to one another, as more were added. This was viewed as successful as it indicated that participants were engaging with both the complexity of data and building a relational logic that would begin to form the hypothesis of the problem-ecology.

² The workshop provided three hours for the completion of these tasks and only the first two tasks were able to be completed in the time provided



Figure 6: Participants developing a relational logic between data points across the Firma Model

For the second task participants began ideating potential solutions. Two immediate and significant outcomes were that (1) multiple solutions were being explored and that (2) the participants were intuitively evaluating their solutions against their problem-ecologies. Again this was viewed as a positive outcome as it indicated that, in the first instance, the participants remained engaged in the complexity of the problem by considering a solution-ecology that built upon the relational logic of the problem-ecology, and in the second instance, their progression from problem analysis to synthetic solutioning contained within it the process a reference backwards that would facilitate traceability and therefore accountability.

All the groups were successful in being able to develop solutions and then articulate both their problem- and solution-ecologies to the other groups ending the second task and due to time constraints the workshop as a whole.



Figure 7: Participants presenting their problem- and solution-ecologies to other groups

Conclusion

This paper has presented the Firma Model as a tool to assist design students with the framing of complex problems, developing strategy that is orientated by problem framing and lastly, to evaluate solutions in a holistic and meaningful manner. A theoretical account of the Model has been presented as well as the manner in which the Model provides traceability, accountability and sustainability.

Lastly, we have attempted to contextualize its application through an account of its evolution and by providing two case studies. In both instances it was observed that the level of engagement between facilitators and learners, as well as learners and their peers, resulted in rich and meaningful considerations around research, insights and possible strategy. In conclusion we would like to offer the following critical reflections:

1. Using the model to track the development of a research study is perhaps the strength of the model rather seeking to present only a summary of research findings.
2. Not all lenses are equally relevant in every design study. Some lenses will, depending on the context, attract more data than others.
3. A first draft of the model should be constructed purely from the researcher's assumptions of the problem. This act makes the assumptions apparent as well as, when compared with later drafts, can be used to track what has been learned.
4. Initial research drafts should capture easily accessible information most often available from secondary research. This framing would generally describe the paradigmatic and contextual levels of the Model and would help define the focus of subsequent field research.
5. It is often the case that certain data points could potentially exist in more than one area of concern although this is discouraged as critical debate regarding the meaning of the data is stimulated when one is encouraged to pick one or other area of concern.
6. We have been unable to report on the use of the Model for critique as in the first case study students had not completed their full projects by the time of writing this text, and in the case of the second the workshop ran out of time.
7. While other existing models were used to inform the Firma Model additional areas of concern are expected to arise and may require inclusion into future iterations of the Model.

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