Framing Complexity: an experience-led approach to designing user research

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Abstract

Human-Centered Design (HCD) methods have been identified as valuable and effective approaches to designing with and for people, but is also due to complexity and indeterminacy, often difficult to practice. With the popularisation of HCD in contemporary design education, and the subsequent emphasis of human-centered research an ethical question arises as to whether design students are adequately prepared to engage with the type of research that more and more they are expected to conduct.

This paper engages with this concern by presenting an approach, which utilises Marc Hassenzahl's Three-level Hierarchy of Needs model to conceive and design a human-centered research plan. The approach described in the paper is first introduced from a theoretical perspective, and then illustrated as applied in a design project.

Keywords: *participatory design; user research; activity theory; focusing research exploration*

Introduction

Human-Centered Design (HCD), and in particularly participatory design methods have been identified as valuable and effective approaches to designing with and for people. Participatory design, philosophically and in practice, includes users and other stakeholders directly in the design process in order to facilitate understanding between the individual stakeholders and between the stakeholders and the designers (Grønbæck 1993, p. 79, Steen 2011, p. 49). Participatory design approaches are advocated by a number of authors (Sanders 2008, Wright & McCarthy 2010, Molapo & Marsden 2013, Byrne & Sahay 2007, Frawley 2012) as viable methodologies for engaging with users in order to design solutions that are empathetic, useful and usable particularly when the community for whom the solution is intended is unfamiliar to the designer or design team.

However, understanding societal problems is itself an arduous process as the problems themselves can be ill-defined and elusive, hidden in the complexity of social reality and offering no clear direction for resolution (Rittel & Webber 1973, p. 156; Krippendorff 2007, p. 71-72). Furthermore, underpinning most HCD methods is the rejection of any assumption of what the solution should entail (Keinonen 2010, p. 18, Buchanan 1992, p.10). The designer, when practicing HCD is therefore often faced with complexity on both ends of the design process as both the framing of the problem as well as models for solving the problem are unknown.

Due to the complexities embedded within societal formations and the absence of clear design outcomes it can, particularly for novice designers, be difficult to ensure that outcomes generated from participatory exploration are in fact relevant and capable of positively impacting on design decision-making. Additionally, the use of qualitative primary methods of research associated with participatory design often result in complex and fragmented data (Visser et al 2005, *p.* 14) which may or may not be relevant to the resolution of problem. Lastly, and perhaps most relevant, it is our experience obtained through running HCD design courses with undergraduate students, that they often do not have a considered approach to constructing research questions. The result of this lack of

technique is that undergraduate students struggle to obtain rich and insightful data from their research activities.

From a general ethical stance this paper acknowledges HCD with its focus on designing with and for people in order to identify and respond to people's actual needs as opposed to *creating* need to feed unsustainable economic growth[1], as just. However, the specific ethical concern this paper seeks to address is perhaps more mundane in nature and relates to the expectation placed on design students to engage through qualitative, primary research with people's experience of the world. The concern here is that these expectations are often uncritically placed on design students with very little support in terms of the transfer of technique.

The aim of this paper is to address these particular concerns by introducing and illustrating an approach to framing participatory exploration. However, it is worth noting that this approach is not exclusive to participatory design and can be used in other HCD methods. Additionally, the term 'research question' as used here should not be confused with interview questions as while the 'research questions' may end up as interview questions, they could be used in any number of methods to guide data collection.

This paper proposes an experience-led approach to framing participatory design research explorations, substantially informed by Activity Theory[2]. As such, the framing of research is perhaps most relevant to fields of design concerned with the goal-orientated interactions of people with products, systems or services. These fields include, but are not limited to: interaction design, industrial design, information design, wayfinding, user-experience design, and service design.

Methodology

Initially this paper provides a brief theoretical framing related to the resolution of complex problems through the application of participatory design. This framing acknowledges the benefits of a participatory approach as well as its challenges. The framing is followed by an introduction and explanation of Marc Hassenzahl's *Three Level Hierarchy of Needs* model (2010, p. 12, 44). The model presents a hierarchical approach to the conceiving of users' actions in which their instrumental goals are orientated by their current and desired motivational needs.

Understanding people's psychological needs is an essential aspect of understanding their motives, Hassenzahl argues, and to this point presents the *Top-10 Psychological Needs* (Hassenzahl, p. 46) as a model for assessing whether design products do indeed meet the motivational needs of users, and as an extension of this provide appropriate user-experiences.

This paper extends Hassenzahl's use of the models by suggesting that the *Top-10 Psychological Needs and Three Level Hierarchy of Needs* model can be used to directly structure participatory design research interventions.

The application of these models to this end is described in a short case-study example of a *contextmapping* (Visser et al. 1995) design project undertaken with small-scale urban farmers in Soweto, South Africa. Lastly, the paper concludes by outlining the benefit of the applied model in the facilitation and focusing of participatory exploration.

The value of participatory processes.

HCD, as illustrated in Figure 1 is a broad umbrella term that includes design approaches that focus on users and their contexts of use throughout the planning, design, implementation, and reflections on a design solution (Steen 2011, p. 45). How users and their contexts are engaged can vary depending on the selected methodology. The methodologies on the left of Figure 1 include: Empathetic Design,

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1 See Fry (2007) for a critique of unsustainable design practice
2 See Kuuti (1995) and Nardi (1995) for seminal descriptions of Activity Theory

Contextual Design, and Ethnography which tends to place the users as the passive object of the researchers study, and as such seeks to understand the current practices and perceptions of the user (Steen 2011, p. 50-53). These methodologies are often applied in commercial design practice when users' contexts are familiar to the designer. However, particularly when designing solutions for communities outside of the designers' familiarity, these approaches to HCD can be limiting (ibid, p. 148).
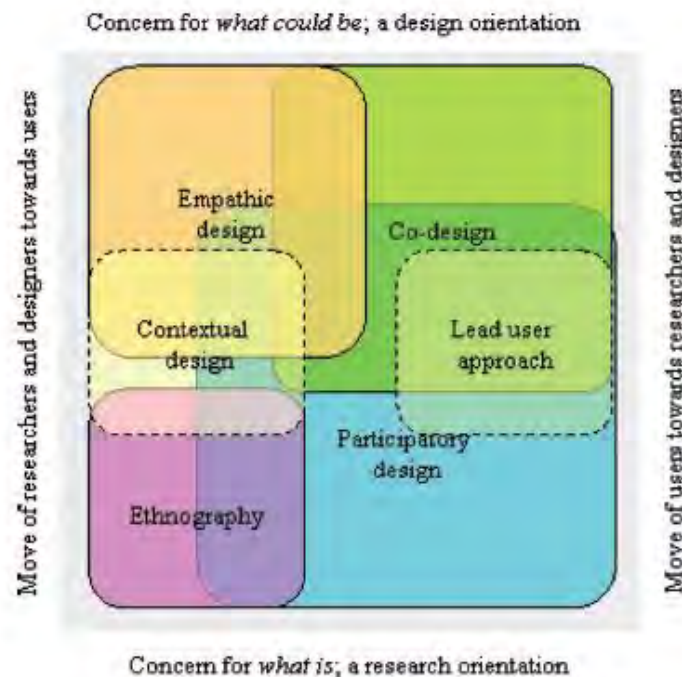

Figure 1: The various different approaches to Human-centered Design, Elizabeth Sanders (Steen 2011, p. 48).

Participatory methods of which Co-design and Lead-user Approach are, in the context of this paper considered as sub-categories, advocated by a number of authors (Sanders 2008, Wright and McCarthy 2011, Molapo and Marsden 2013, Byrne and Sahay: 2007, Frawley, p. 2012) as viable methodologies for engaging with users in order to design solutions that are empathetic, useful, and usable.

Participatory design, philosophically, and in practice, includes users and other stakeholders in the design process in order to facilitate understanding between the individual stakeholders and between the stakeholders and the designers (Grønbæck et al. 1993, p. 79, Steen 2011, p. 49). Peter Wright and John McCarthy (2010, p. 4) describe participatory design as capable of uncovering "people's desires, values and feelings" in a realization of a "humanist vision" for design through a "commitment to understanding and working through the relationships between users and designers as different placed centers of value in the design process" Participatory design research methodologies due to their qualitative intentions and generative methods focused on obtaining rich data tend to be unstructured. For example, Wright and McCarthy (p. 27) position narrative enquiry as valuable methods for participatory explorations as they contend, storytelling relies on the generation of a shared understanding emerging via the teller's account but framed to consider the listener's point of view and the subsequent reciprocal response of the listener. In this example, it is evident that the participatory process method can promote common understanding between the designer and the participants. What is perhaps not clear, is what the 'story' should be about and how the storytelling should be planned in order to generate relevant narratives. This predicament could be applied to many other generative participatory research activities including *Design Charette* (Martin

& Hanington 2012*, p*. 58), *Collage* (Martin & Hanington 2012 *p*. 34) and *Role-Playing* (Martin & Hanington 2012*, p*. 148).

While it is true that any shared understanding will to an extent help the designer better understand the user, when designing (particularly with vulnerable or resource- scarce communities) there is a an increased ethical need that design solutions are relevant and applicable in order to "maximize the purchasers' investment" (Marsden, in Rogers et al 2012*, p*. 452). In order to ensure that design solutions are as appropriate as possible, an emphasis on constructing effective research practice needs to be in place.

To help focus participatory research inquiry, this paper puts forward Marc Hassenzahl's *Three Level Hierarchy of Needs* model (2010*,* p. 12, 44) and his *Top-10 Psychological Needs* (*p*. 46) framework as a viable approach for guiding practice. The *Three Level Hierarchy of Needs* model (see Figure 2) is based on Activity Theory (Hassenzahl 2010*, p*. 44- 45) and articulates how user-goals can be divided into three levels, which he terms *be-goals*, *do-goals* and *motor-goals*. A user- goal is an expectation of an end-condition that is personal to the user (Cooper *et al* 2007*, p*. 15). From a design perspective, the envisioned product, service or system is designed to facilitate the users' achievement of their intended goals. User-goals are a fundamental concern for any design field that seeks to understand and design for human interaction.
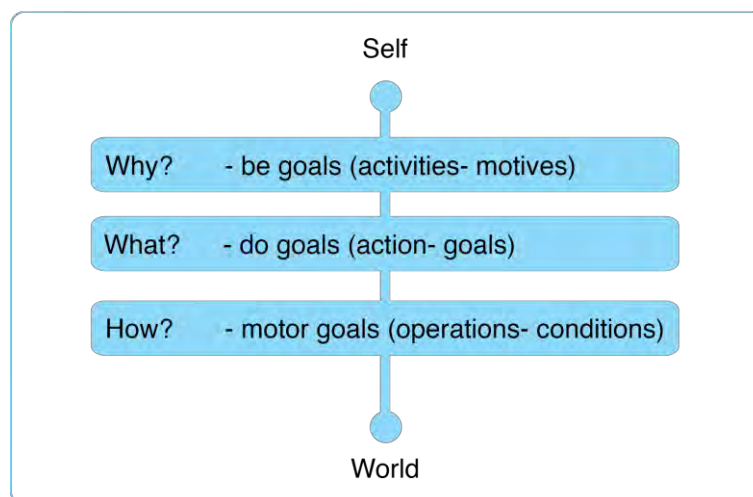
Figure 2: Adapted from Hassenzahl's *Three Level Hierarchy of Needs* (2010*, p. 45)

The *Three Level Hierarchy of Needs* describes how the individual user relates to the world through action (Hassenzahl 2010*, p*. 44). A *do-goal,* which sits at the middle level of the hierarchy, is a concrete outcome the person performing the action wants to achieve. For example, a *do-goal* would be 'monitor their bank account'. *Do-goals* generally do not change much over time. For example, today one can simply use a mobile phone go on line to see banking details while ten years ago you would need to go to an ATM, and twenty years ago it would entail visiting a bank branch.

Motor-goals at the lowest level of the hierarchy are the sub-units of actions that collectively contribute to how a *do- goal* is achieved. While *do-goals* are consistent, *motor-goals* tend to be constructed around the particular *do-goal* they support (ibid). Thus the operational actions involved in visiting a bank teller and using a banking app both fulfill the same *do-goal* but are completely different in execution.

Hassenzahl identifies human emotions as the drivers of behavior at the *be-goal* level. *Be-goals* occupy the top level of the hierarchy. According to Hassenzahl (2010, p. 43-44) *be-goals* are the user-goals that motivate action and provide meaning to the action. He describes *be-goals* as focusing on

the larger life-orientated needs of the users rather then on technological needs such as those described by *motor-goals* and *do-goals*. So for example, while *operational* goals would define how a user would navigate through the individual processes of the *do-goal* of monitoring a bank account, the *be-goal* would focus on 'why' the account needs to be monitored. Is the user neurotic, fearful of cyber-theft or is she merely trying to see whether she can make it to month end?

The Three Level Hierarchy of Needs model provides a holistic account of experience design that "comprises perception, action, motivation, and cognition." (Hassenzahl 2010, p. 4). These conditions occur when do-goals are orientated by motivational be-goals and made actionable through the contextual application of *motor-goals*. Without carefully considered *motor-goals* and do-goals an interactive system would probably provide poor service. Likewise *motor-goals* and do-goals without the teleological aspects of be-goals could provide poor user experience and subsequent uptake.

In reference to identifying be-goals, Hassenzahl (2010*, p.* 46). provides a framework, the *Top-10 Psychological Needs* (Table 1), which he adapted from Sheldon, *et al's* research into humanity's most enduring and commonly recurring needs. The purpose of the *Top-10 Psychological Needs* framework is not to be definitive in terms of identifying individually occurring needs but rather aims to capture the fundamental qualities of "*a class of experiences*" (Hassenzahl 2010*,* p .47) associated with positive need fulfillment. To this purpose the needs framework is helpful in understanding related feelings, typical behaviour, conditions, rules, and problems (Hassenzahl 2010*, p.* 48) of users' current lived experiences.

Autonomy/ Independence	Feeling like you are the cause of your own actions rather than feeling that external forces or pressure are the cause of your action
Competence/ Effectance[3]	Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective
Relatedness/ Belongingness	Feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared for
Self-actualizing/ Meaning	Feeling that you are developing your best potentials and making life meaningful rather than feeling stagnant and that life does not have much meaning
Security/ Control	Feeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances
Money/ Luxury	Feeling that you have plenty of money to buy most of what you want rather than feeling like a poor person who has no nice possessions
Influence/ Popularity	Feeling that you are liked, respected, and have influence over others rather than feeling like a person whose advice or opinion nobody is interested in
Physical thriving/ Bodily	Feeling that your body is healthy and well-taken care of rather than feeling out of shape and unhealthy
Self-esteem/ Self-respect	Feeling that you are a worthy person who is as good as anyone else rather than feeling like a "loser"
Pleasure/ Stimulation	Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and under stimulated by life

Table 1: Hazenzahl's Top-10 Psychological Needs Framework (2010*, p.* 46)

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[3] Effectance is a psychological term that describes the influence an individual may have on their environment (Dewey 2007).

Hassenzahl's attempt to classify experiences has been viewed by other commentators as problematic as it potentially runs the risk of reducing people to objects of research rather than as participants in the design process (Wright and McCarthy 2010, p. xii). However Hassenzahl's Psychological Needs Framework does present a practical, focused approach for ensuring that the core attributes required too understand users' motivations and actions becomes the focus of the participatory process.

This paper proposes that combining Hassenzahl's hierarchy model and its associated needs framework within a participatory process can negate the weakness of each individual approach. The needs model brings a focus to the research process with a structured approach highly relevant to understanding users' motivations and behaviours while in return the participatory approach negates the objectification of the research participants.

It is in respect to these two positions, each with their own unique value that I propose to unify the two viewpoints into one framework in a participatory design methodology that applies the *Three Level Hierarchy of Needs* model.

The case study, which will be used to describe how the unified framework can be applied in order to establish research goals, structure research findings and develop design strategy, was a participatory design project undertaken in collaboration with small-scale farmers in Soweto, South Africa. The final objective of the research project was to co-design a mobile web application that would promote better access for the farmers to information, in order to improve their livelihood. The participatory method used was contextmapping (Visser et al. 2005, Sanders 2000, Kistemaker *et al.* 2010) of which the primary co-design activity was a series of workshops.

Applying the unified framework: A case study of the Soweto Farmers Project

Applying the unified framework to establish research goals requires setting goals that will engage with each level of the *Three Level Hierarchy of Needs* model. Depending on the broader aims of the design project, specific questions could be formulated to enquire about any of the three levels. For example an interaction design project with a primary focus on usability may wish to unpack explore the *motor-goals* level in more detail while a new banking site may be concerned with what type of transactions clients may like to perform and thus explore the *do-goals*. Alternatively, as in this case study, focus could be applied to exploring the lived-experience of the users, in order to conceive of a new solution. *Be-goals* would then be the most relevant area of study. However no matter what the intention and focus of the study is, it is that all three levels should be explored as human action invokes all the levels simultaneously.

1. Identifying the be-goals

The initial participatory activity of the *contextmapping[4]* co-design methodology is known as the *Sensitization Phase*. In this phase, research participants independently of the facilitator perform activities designed to help them recall and focus on specific aspects of their lives. Ensuring that participants have undergone a reflective phase prepares the participants to readily engage with themes presented in the later co-design workshops phases of *contextmapping*.

In the *Sensitization Phase* of this case study, the various categories of the *Top- 10 Psychological Needs* were used to construct a series of worksheet activities. Four examples of the worksheet exercises are as illustrated in Figures 3 and 4. Table 2, indexes all the questions that were asked in the *Sensitization* worksheet with the ten psychological needs of the framework. The worksheet questions were explicitly constructed to explore the farmer's motivational *be-goals*.

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[4] Contextmapping consists of six phases: 1. Preparation (of research), 2. Sensitization, 3. Sessions (co-design workshops), 4. Analysis of data, 5. Communication (with co-designers) and 6. New Design Concepts
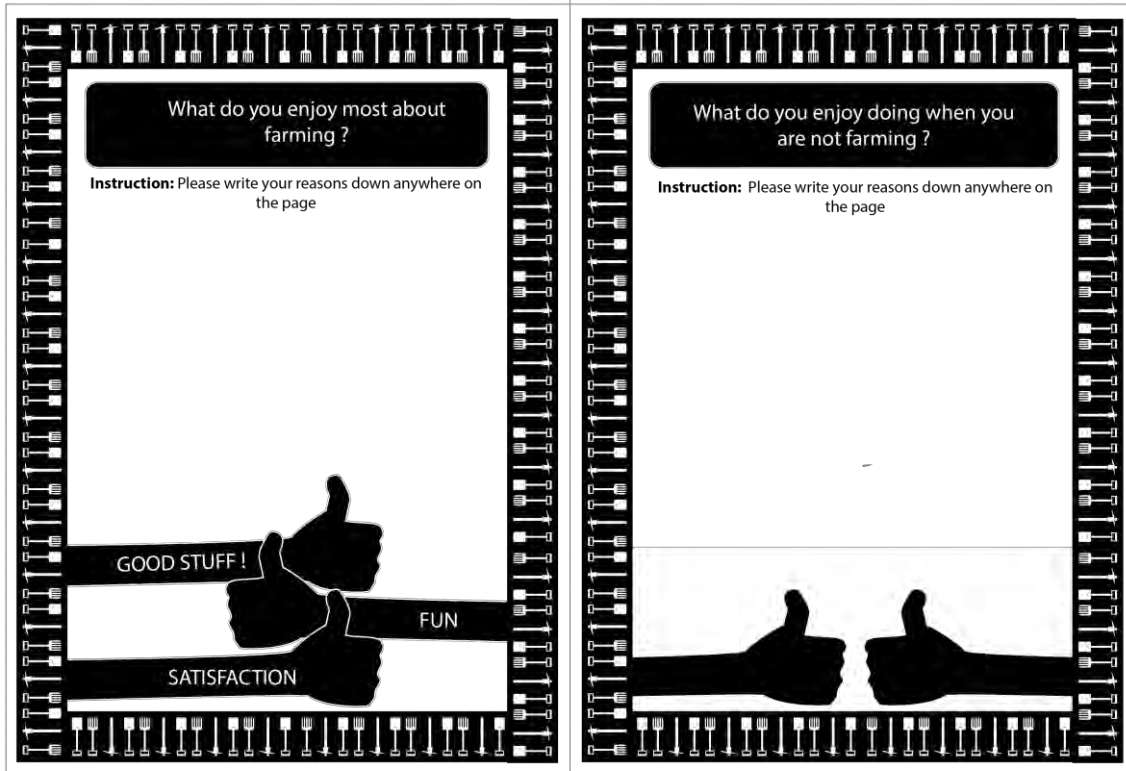
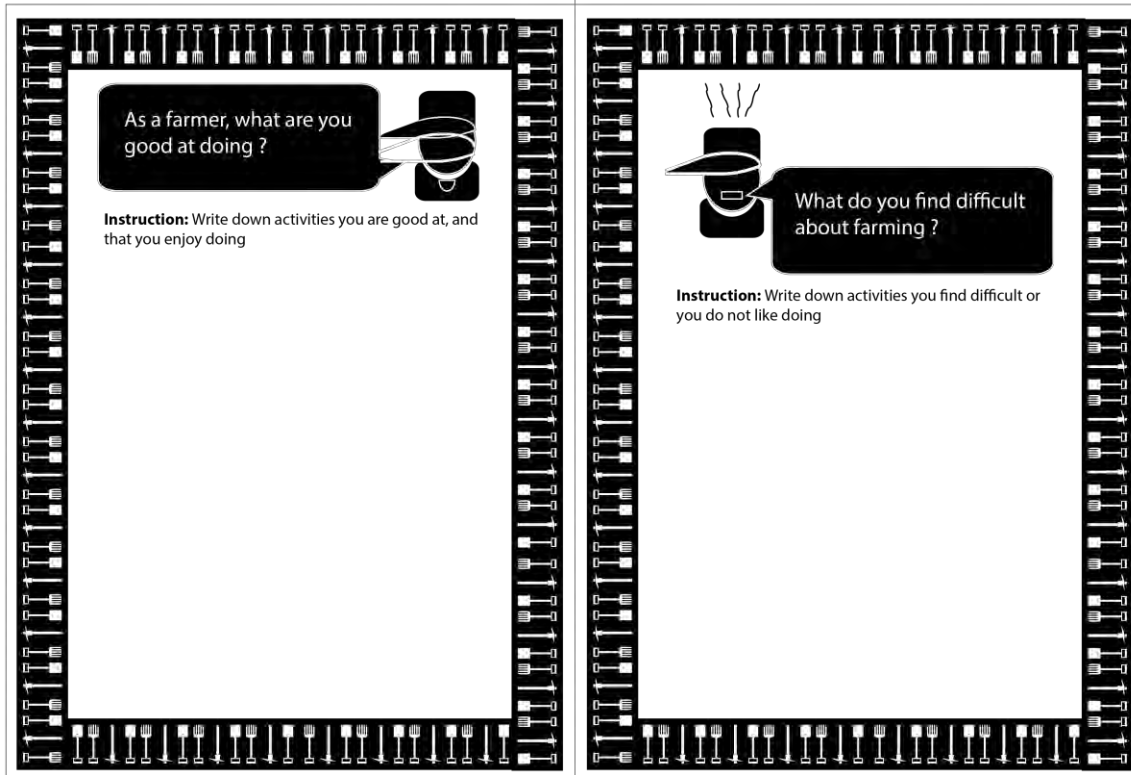**Figure 3: Worksheet examples of the applied psychological needs related to pleasure/stimulation**

Figure 4: Worksheet examples of the applied psychological needs related to competence/ Effectance

Psychological Need	Worksheet question
Autonomy/Independence	1. Do you feel you are independent? *Write down some of the things that help a farmer to be independent.* 2. Are you an independent farmer? *Write down some of the things that stop you from being independent?*
Competence/Effectance	1. As a farmer what are you good at and enjoy doing? 2. What do you find difficult or do not enjoy doing?
Relatedness/ Belongingness	1. Write down the names of people or organisations that help or support you? 2. Do you feel there is somebody that should be helping you more? 3. Who do you help, and how do you help? 4. Do you feel you could help others more, if yes how?
Self-actualizing/Meaning	1. Do you think farming is a good career? 2. Why did you become a farmer? 3. Why are farmers important in South Africa?
Security/Control	1. What are the things you can control in terms of your farming? 2. What are the things you cannot control? *Describe how these things make you feel.*
Money/ Luxury	1. How do you spend your income from farming?
Influence/Popularity	1. Do you feel that other farmers respect you?
Physical thriving/Bodily	1. Does your work make you feel healthy?
Self-esteem/ Self-respect	1. Are farmers respected in the community?
Pleasure/Stimulation	1. What do you enjoy most about farming? 2. What do you enjoy doing when you are not farming?

Table 2: The following table depicts how the worksheet questions were indexed to Hassenzahl's Top-10 psychological needs.

2. Identifying do-goals

The initial goal of the Soweto Farmers Project, which emerged during preliminary research, was to enable the farmers to have better access to agricultural-related information. While having an initial design strategy for solving the problem before focused research begins may seem counterintuitive as the purpose of design research is primarily the understanding problems in order to resolve them appropriately. Without a general hypothesis of what the problem and corresponding solutions may be, focusing research can be difficult. Thus having an initial starting point is unproblematic as long as there is a commitment to allowing the evidence, emerging from the research to alter or negate the initial hypothesis. For example, the high-level *do-goal* of this case study was specific enough to focus the study on the farmers' information needs but did not presume to prescribe *what* the 'information' was. Therefore, the *do-goal* of this study was concerned with establishing the nature and characteristics of the information content that farmers considered valuable.

3. Identifying *motor-goals*

The *motor-goals* in the context of the case study was concerned with *how* farmers currently accessed information in terms of their strategies, behaviours and practices.

Generating do-goals and motor-goals

Both the *do-goals* and the *motor-goals* were explored in two activities during co-design workshops. In the first activity, see Figure 5, farmers were asked to map their own experiences of their individual journeys of learning about farming and how they continue to learn about farming. The farmers created the learning-journey maps by collaging images and text found in magazines. Participants then used their collages to orally explain the 'story' of their journeys. The narrations of the journeys often involved discussions between the narrator, other participants and the facilitator, in order to substantiate, unpack or clarify points.

Figure 5: An example of one of the participant's collage depicting her learning journey.

The second co-design activity, see Figure 6, applied a design fiction method within which participants were tasked with using clay to model a fantasy machine or tool to help them to be better farmers. Again once participants had completed their models, they explained what they had created and why and how their creation would benefit them.

Figure 6: An example of one of the clay models. This example depicts a robot helper with a computational core and robotic tool arms

Analyses of the data

The raw data from all three of the activities was collected. This included the textual answers in the worksheets as well as audio recordings of the farmers' oral explanations of the co-design activities. All relevant data points were transcribed in a spreadsheet and finally onto individual post-it notes. The post-it notes, which numbered about 250, were then patterned, synthesized and categorised

into new formations of meaning, or relationships using the Affinity Diagram method (Martin & Hanington 2012, p. 12][5].

This case study applied the Affinity Diagram method in three rounds of categorisations, with each round using all the collected data to reflect a level of the *Three Level Hierarchy of Needs* model.

The first affinity categorisation was the *do-goals of* the model, which was determined as the 'things farmers needed or wanted to know'. Figure 7 describes major categories and sub-categories of information identified through the analyses as important to the farmers.

The second affinity categorization, as depicted in Figure 8 was concerned with the operational *how* goals which were determined as 'the current behaviours or practices that farmers undertook when trying to find out information pertaining to farming and associated activities'.

Within these two affinity diagrams a bottom-up categorisation system was applied which allowed for categories to emerge organically through prevalence and association.

Figure 7: Illustrates the categories of information identified as important to farming and associated activities
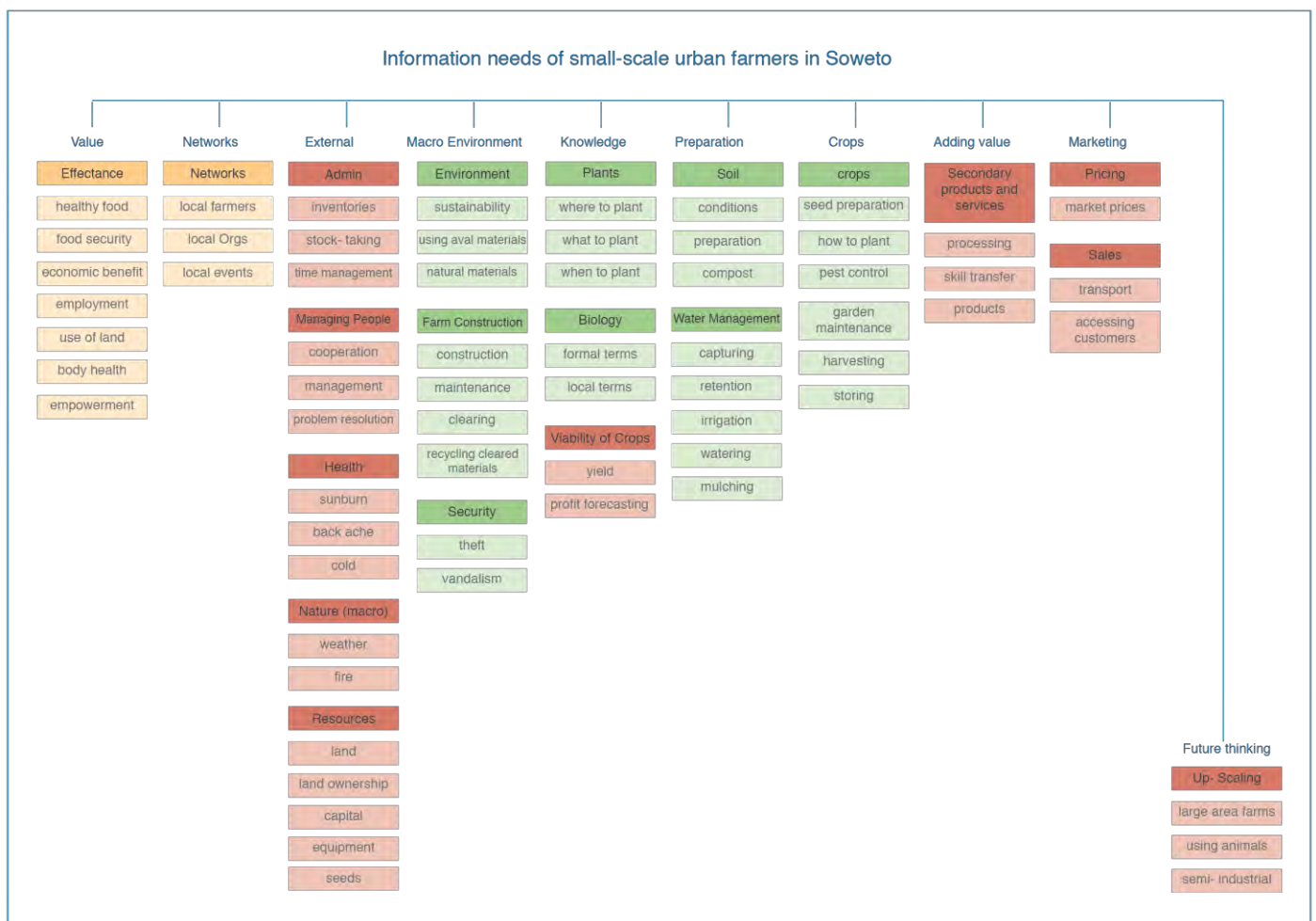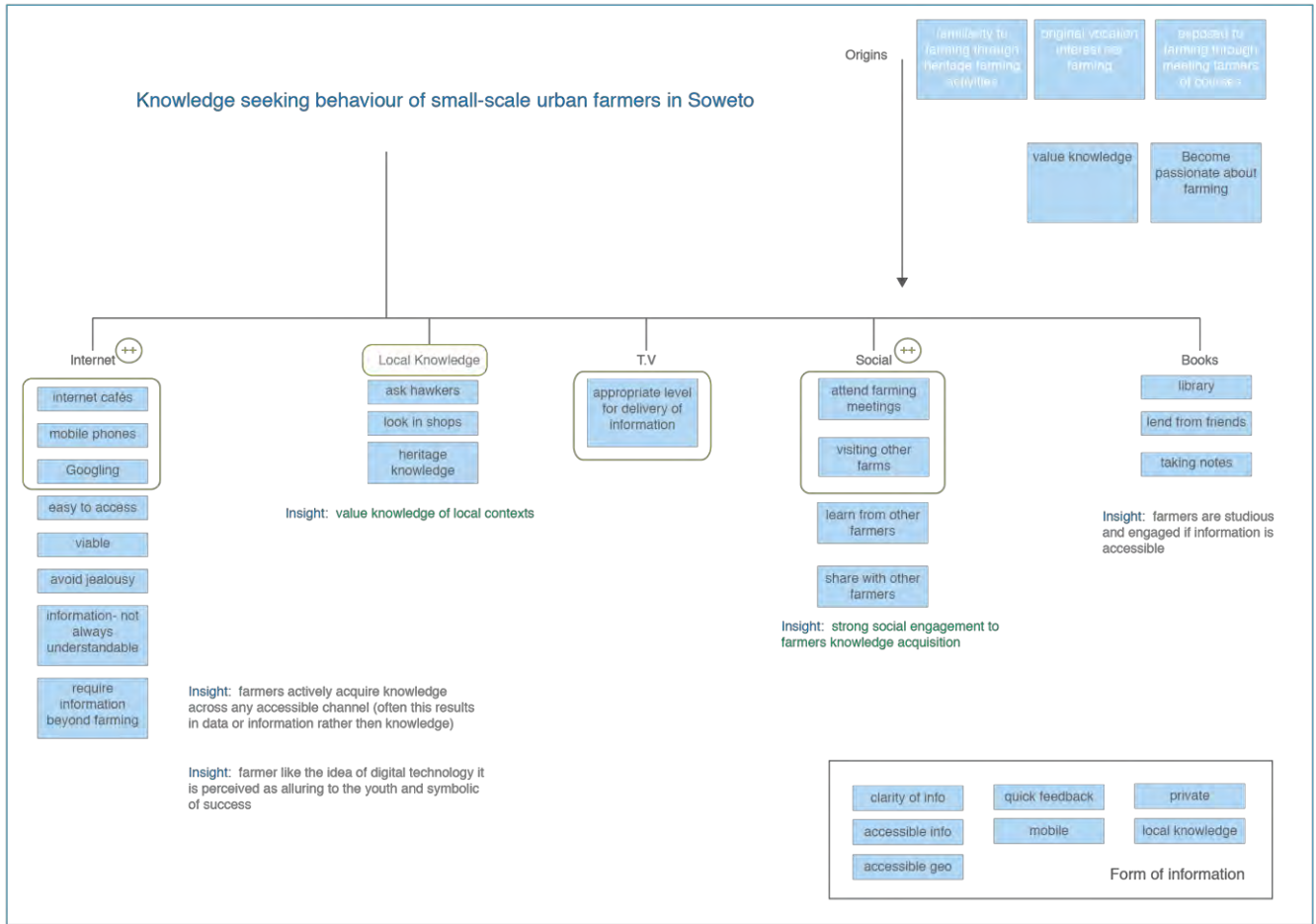
Figure 8: Illustrates and describes the most common methods farmer in Soweto use to access information about farming.

The third affinity diagram was a tighter, top-down ordering in which all the data points were arranged into ten categories indexed to Hassenzahl's Top-10 *Psychological Needs*. This categorisation related to the *be-goals* of the hierarchy model.
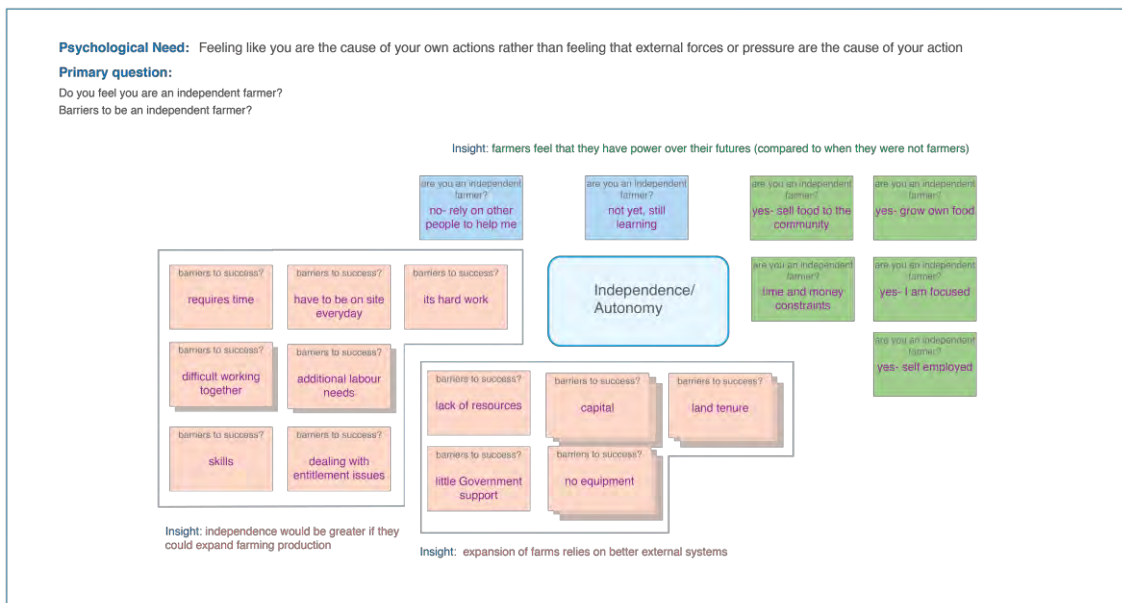

Figure 9: Diagrammatic representation of the Autonomy/ Independence category
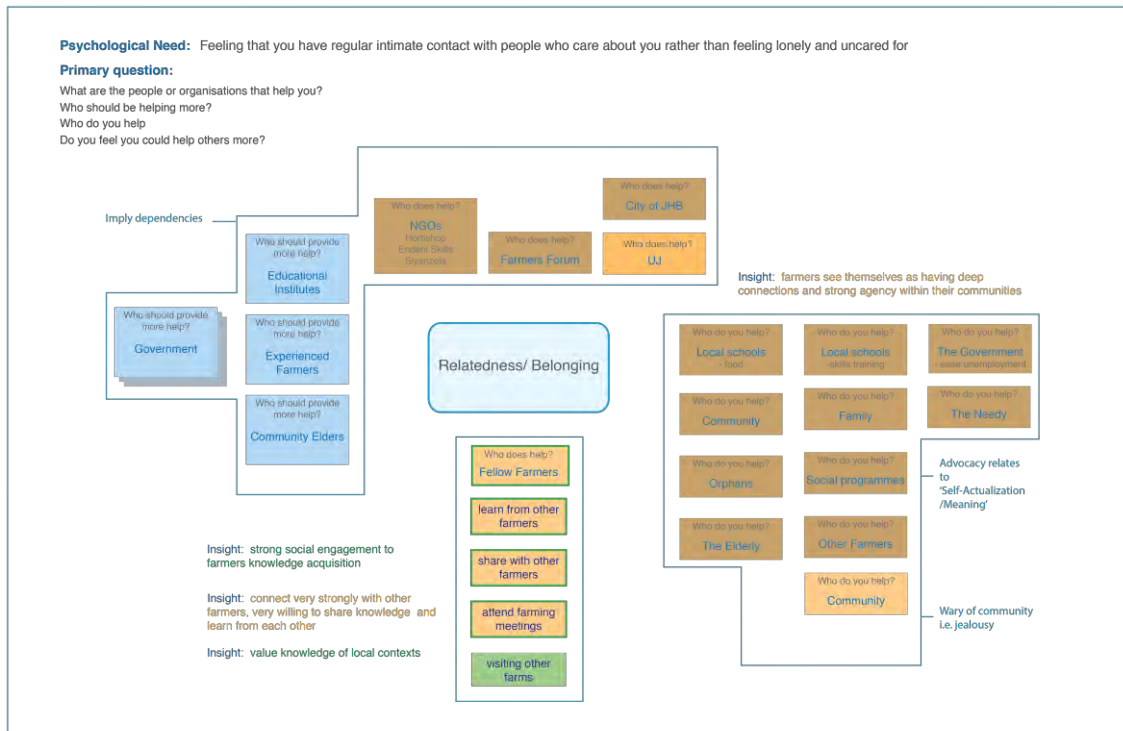
Figure 10: Diagrammatic representation of the Relatedness / Belonging category

Figures 9 and 10 represent the categorisation of two of the ten psychological needs and their associated data points. Once all ten needs categories were completed, the included data was further organised into thematic concerns represented by one or more insights. The insights gained from the psychological needs were then further analysed to determine any thematic relationships. Three major themes emerged, as depicted in Figures 11.

Key insights

Insight: connect very strongly with other farmers, very willing to share knowledge and learn from each other.

Insight: most farmers feel competent and in control of farming activities

Insight: overwhelmingly, farmers see the health value of farming

Insight: farmers feel respected within the farming community

Insight: farmers feel that farming has given them power over their futures

Insight: find farming a fulfilling activity in its own right

Insight: feel they can offer other farmers skills to learn.

Insight: value knowledge of local contexts

Insight: strong social engagement to farmers knowledge acquisition

Key insights

Insight: farmers engage with agriculture easy but often their 'real' problems sit outside of farming (business skills, industrial farming, HR skills)

Insight: their financial aspiration is for their farms to be successful sustainable businesses rather then just subsidiary income

Insight: expansion of farms relies on better external systems

Insight: independence would be greater if they could expand farming production

Insight: feel threatened by an unsecured future

Insight: Derive meaning through status, economic power and ability to provide for family

Key insights

Insight: connect very strongly with other farmers, very willing to share knowledge and learn from each other.

Insight: farmers see themselves as having deep connections and strong agency within their communities.

Insight: the perceived lack of respect farmers get from the broader community is disheartening to them.

Insight: feel threatened by the community.

Insight: farmers see themselves as useful and needed in the community and with in the broader South African community as well.

Insight: farmers see themselves as belonging to the vocation of farming (just as much as a commercial farmer)

Insight: Derive meaning through learning and sharing knowledge

Insight: Derive meaning through contributing to the health of the community

Insight: most farmers see the money they make from farming as valuable income

Insight: value community activities

Figure 11: The insights arranged into the final three themes

Modeling the solution strategy

The three themes that emerged, as modeled in Figure 11, were:

1. Improve Abilities: The need to access information in order to improve agricultural production.
2. Increase Effectiveness: The need to improve the business side of the farming business.

3. Co-value Creation: The need to enhance the value of farming as a vocation in the Soweto community and improve the esteem and confidence of farmers through utilising the existing, healthy social and community networks.
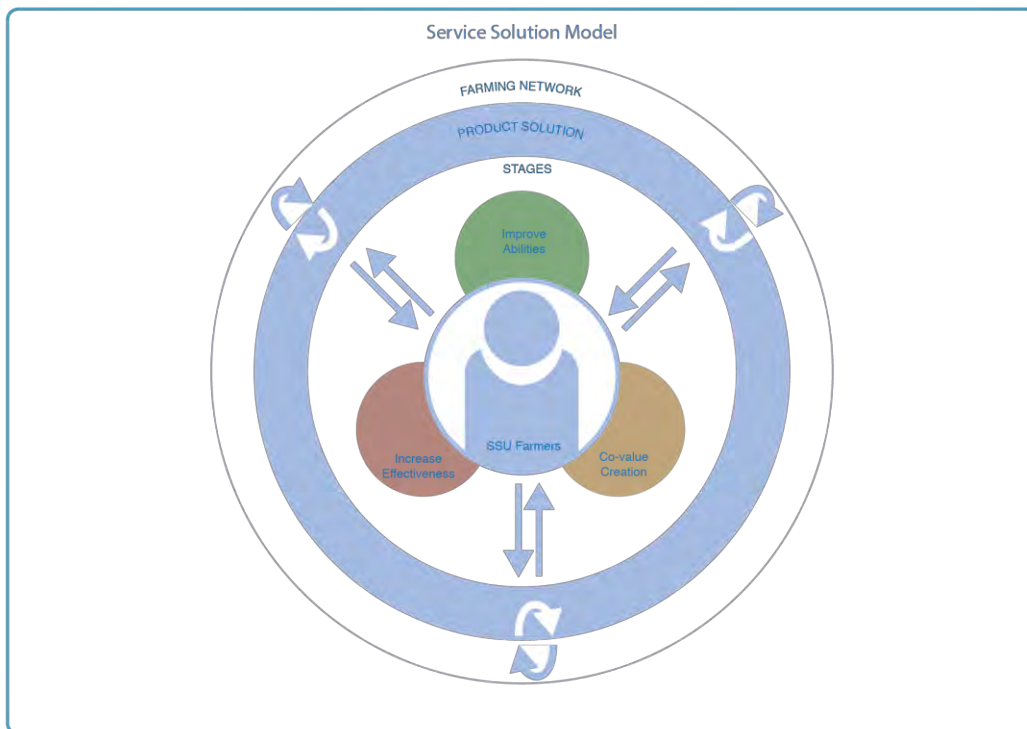

Figure 12: The solution model for the Soweto Farmers (Small-scale Urban farmers [SSU]) Project

The process of analysis and synthesis is always subjective, and in this case study, the role played by the farmer participants in confirming that insights were reflective and the strategy appropriate has been underreported[6]. However, what is important, and evident in this theoretical positioning and case study, is that the application of the *Three-Level Hierarchy of Needs Model* is a viable approach for framing human-centered research activities that address complex societal problems. The structured approach to recognizing needs presented in the hierarchy increases the likelihood of obtaining actionable insights from research activities that are directly useful for forming impactful design strategies, subsequent product solutions, as well as providing an approach to critically reflect on design product solutions.

Conclusion

While HCD has been identified as a valuable and effective approach for design, HCD can, due to the complexities embedded within societal formations, and the indeterminacy of design outcomes, be difficult to practice effectively— particularly for novice designers.

Experience obtained through running HCD design courses with undergraduate students shows that they often do not have a considered approach to constructing research questions. The result of this lack of technique in constructing design research activities is often a barrier to obtaining rich and insightful data from research activities, which can affect the impact of subsequent understanding and solutioning.

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6 See Fenn (2014) for a description of this aspect of the design project

This paper presents a brief theoretical positioning followed by a case study that describes how applying the *Three Level Hierarchy of Needs* model to frame HCD research can be beneficial in terms of enabling:

1. That the data generated is relevant to goal-orientated design such as user-experience design, interaction design, and service design etc.
2. That the research data generated reflects user needs at a motivational, behavioural and operational level.
3. That subsequently, the model can be used to interpret the generated data in a meaningful manner.
4. That insights gained through the application of the model are actionable in terms of contributing to strategising solutions.

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