IN-CONTEXT AND ECOLOGY IMMERSION FOR RESILIENCE: AN EXPLORATION OF THE DESIGN OF A HOUSEHOLD FARMING KIT

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Abstract

Human-Centred Design proposes the method of In-context Immersion or meeting people where they live, work and socialise as a method to gain new insights and opportunities for the designer (IDEO, 2013). This method as per the majority of empirical research tends to simplify complex situations in order to provide a set of criteria that can then guide a design intervention to such problems. This paper explores how it is important to not only understand the contextual situation of a problem, but also a much broader range of contexts and influences which constitute the ecology of the problem. Ecology Immersion can be defined over and above the designers' immersion into a specific context by the further discovery and exploration of other connected contexts. The designer is able to map a broader system by immersing her/himself in these interconnected contexts and hence foreseeing how a proposed intervention could interact in the greater ecology of the problem. An example could be the effect the seemingly independent biological system and economic system could have on a small-scale agricultural project. This improved understanding then allows for the design intervention to have a better foundation in terms of the systems it relies on, which potentially aids the final intervention's resilience. This paper explores and criticises the design process of a household farming kit as an example of such a method. This critique will offer potential insight into future applications of this method in the field of Industrial Design and its potential application in other design disciplines to encourage greater resilience.

Keywords: In-context immersion, ecology immersion, industrial design, small-scale agriculture, food security, design for social development, social impact design, Johannesburg.

INTRODUCTION

Social impact design, or design for public good that is socially, environmentally, and economically sustainable, is clearly gaining traction in design education, research and practice (Smithsonian Institution 2013). As this mode of design expands, design methods focused on such endeavours need to be tested and refined. This paper firstly explores the method of *In-context Immersion* as utilised by various design practitioners under a variety of guises as an attempt by designer/s to better understand the people they are designing for or with, especially when designing for marginalised communities (IDEO 2011, pp. 46-47; Polak 2009, pp. 15-17 and Martin & Hanington 2012, p.60). This method, as adopted by many practitioners, is criticised by the authors as taking too narrow and reductionist a view in relation to the complex economic, social, cultural and political realities experienced by the majority of people from communities where such design is taking place. The paper then explores the systemic nature of problems in terms of their broader ecology and the proposed method of *In-context and Ecology Immersion* is then explained. The combination of In-context and Ecology Immersion is explored in relation to a research project, the *Design and Development of a Household Farming kit* (Brand 2014) (Figure 1). The paper then concludes that such a method provides the opportunity for greater resilience for both the design intervention and those who will rely on it.

Figure 1: *Anna holding the hoe-tool at her home (Photo: Kyle Brand).*

IN-CONTEXT IMMERSION

In the Human-Centred Design Toolkit developed by the design and innovation consulting firm IDEO, the method of In-context Immersion is advocated as a method which design practitioners can adopt in order to "...understand the people they are designing for not just on an intellectual level, but also on an experiential level" (2011, p. 46). This understanding at a level of personal experience is intended to allow unexpected opportunities or new insights to be revealed. This is in contrast to the preconceptions brought into any context where a designer is designing for someone else. In-context Immersion can be defined as immersing oneself in the context in which the design intervention should operate. This often means that the designer would seek to experience the typical conditions that the final user of the intended design intervention would experience. In Figure 2 one of the authors is seen conducting a focus group with Jeffery Hughes and Willem van Zyl at their farms in Noordgesig, Soweto. Conducting this interview on their farm allowed for a two-way immersion, that of the author in the farms environment and the farmers' immersion into the conceptual world of the designer. During such a focus group, the farmers could physically identify issues in their environment and demonstrate their points of view without feeling alienated by an unfamiliar context. These focus groups drew attention to aspects the author did not notice during previous immersive experiences.

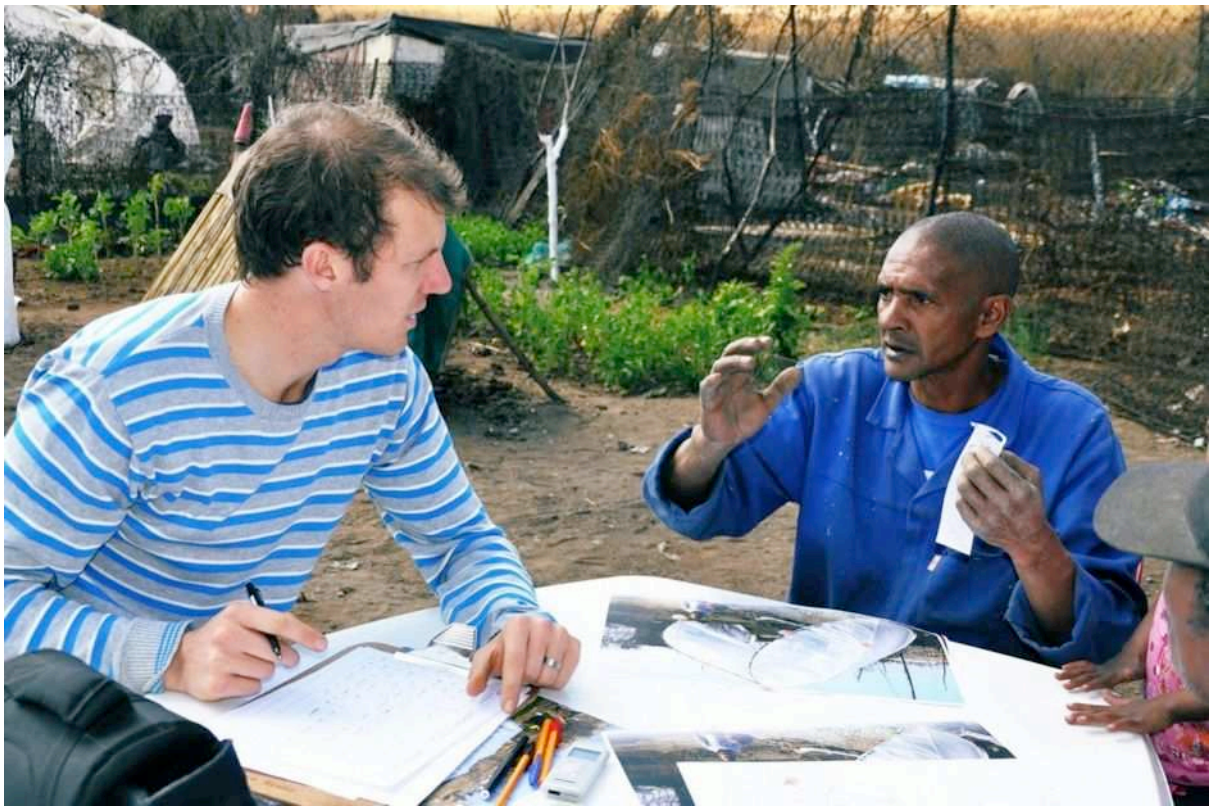

Figure 2: *Jeffery Hughes explaining a concern he had with the farming tunnel design, photograph by Myles Day (used with permission).*

The process of In-context Immersion has become a fundamental building block in most participatory design practice. The design practitioner often assumes a visit to the location of the participants as non-negotiable, especially in socially orientated design projects where the designer and participant come from vastly different socioeconomic contexts. Relating to the authors' project, since the design intervention was for farmers, the designer needed to visit their farms. This is in line with what Paul Polak suggests when he describes two of the steps in his guide to practical problem solving: "2. Talk to the people who have the problem, and listen to what they say" (2009, p. 15-17) and "3. Learn everything you can about the problem's specific context" (2009, p.17).

In-context Immersion is similarly termed Design Ethnography by Bella Martin and Bruce Hanington in their book, *Universal Methods of Design* (2012, p. 60). They describe this method as an approximation of the immersive methods of traditional ethnography, which encourages the designer "...to, deeply experience and understand the user's world for design empathy and insight" (ibid.). Design Ethnography differs from 'true' Anthropological Ethnography in that the designer is seeking time-sampled observations and behaviours. These experiences can be sought through "the experience sampling method, diary and photo studies, cultural probes, contextual inquiry, and various forms of observation, including modified versions of participant observation" (ibid.).

This pervasive adoption of In-context Immersion might be attributed to the development and wider acceptance of user-centred design methods amongst design practitioners (Smithsonian Institution, 2013). The extent to which designers actually immerse themselves and their intentions behind such projects have led to some criticism by the targeted population of what could be considered a new imperialism through design (Nussbaum 2010) or ulterior economic motives hidden under the banner of charity (Arad 2012). This debate will likely continue as 'Social Innovation' continues to become more mainstream. Indian industrial designer and academic Singanapalli Balaram highlights how it is not only the people one is designing for that the designer needs to take cognisance of, but also the economic, social, cultural and political realities of a country (Balaram 1998, p. 3). He states that, "the design activity of any country cannot be well understood without knowledge of the context in which it operates." This extends the notion of a possibly too narrow in-context immersion to a broader immersion into the ecology of the context.

THE ECOLOGY OF PROBLEMS

A greater capacity to access and acquire knowledge as a result of rapid increases in communication technologies in recent years has led to a far more nuanced understanding of problems. Seldom, if not ever, can a problem be considered finite and isolated. "I have yet to see any problem, however complicated, which, when looked at in the right way, did not become still more complicated" (Anderson cited in Meadows 2008, p. 11). Problems, like the people they affect, are always interconnected and highly complex. Richard Buchanan in his discussion on Rittle's description of wicked problems explains that, "Design problems are "indeterminate" and "wicked" because design has no special subject matter of its own apart from what a designer conceives it to be. The subject matter of design is potentially universal in scope, because design thinking may be applied to any area of human experience. But in the process of application, the designer must discover or invent a particular subject out of the problems and issues of specific circumstances" (1992, p. 16). This highlights the need of the designer to define a problem's boundaries, but in too narrowly defining a problem a designer can easily miss important considerations for the long term resilience of a design intervention.

Problems are systemic in nature, leading to not only a difficulty in understanding them, but also in solving them. Donella Meadows, in her book *Thinking in Systems* (2008) explains, "A system isn't just any collection of things. A system is an interconnected set of elements that is coherently organized in a way that achieves something" (p. 11). This systemic nature of problems refers to their interconnection with additional sets of elements, these elements could include other problems or other contexts that are connected and therefore also affected by the problem at hand. Often if carefully investigated, any problem presents a very deep and complex array of not only elements that are interconnected, but also additional interconnected systems. This array of systems with interconnected elements is seldom static, but rather dynamic and continually changing, hence the indeterminacy of wicked problems (Buchanan 1992, pp. 15-16).

The word ecology has been chosen by the authors to capture the dynamism of the systemic nature of problems. This word, ecology, is typically associated with the description of natural systems, especially highly complex systems. As an example of a highly complex system, Meadows describes human beings, "We are complex systems - our own bodies are magnificent examples of integrated, interconnected, self-maintaining complexity. Every person we encounter, every organization, every animal, garden, tree, and forest is a complex system. We have built up intuitively, without analysis, often without words, a practical understanding of how these systems work, and how to work with them" (Meadows 2008, p. 3). Although Meadows describes the human body as a complex system, systems of a similar nature are termed as ecologies in this paper in an attempt to encapsulate their dynamic nature.

Understanding the ecology of any problem in order to bring about considered change, as in any good design intervention, is crucial. This is important in order that the design intervention is well considered and the resulting change is a beneficial disruption to the current system. When addressing problems with designed solutions one needs to be cognisant of the systems on which the designed solution would rely. This has implications in terms of resilience (unpacked in the following heading) on both the design intervention and those relying on it (Campbell & Brand 2012, p. 281). Without cognisance of the ecology that accompanies a presented problem, the problem itself is not defined, making it impossible to solve effectively without pure luck, which should not be encouraged.

The ecology of a problem is very vast and complex, this makes it difficult to understand and take account of. However a designer attempts to explore the current ecology of a system, the greater their understanding and the more poignant and effective any designed disruption can be. Even doctors specialising in a specific field of medicine are required to study and understand human anatomy as a whole. So even though one could not legitimately claim to comprehend the full ecology of a problem, one could have a relative comprehension, and the broader the better. To develop this, one needs to understand the elements connected within the ecology, since the ecology itself is intangible without its parts. This would require an in-context immersion into the different elements within the ecology. Typically user-centred design practitioners would inherently visit the immediate, obvious, context to which the design intervention is linked. However, there are many other elements which also play an important role in the design intervention's existence and these interconnections require consideration. In other words, the exploration of additional in-context immersion experiences in order to understand "not only at an intellectual level, but

also at an experiential level" (IDEO 2011, p. 46) each of these different elements. This is what is defined in this paper as Ecology Immersion.

The danger in only immersing oneself in the immediate, obvious context is that this results in a potentially finite understanding of a problem from the viewpoint of the end-users. Often to solve a problem in the longer term, one needs to have a broader understanding of the ecology in order to change the broader system/s that the designed intervention relies on. It may be these system/s that need to be changed since this is what could have led to the original problem in the first place. Solving only the problem and not altering the system/s could result in the problem being solved for a finite period, but then the same or a similar problem being replicated by the system/s that incurred the original problem. Robert Pirsig explains that "...if a factory is torn down but the rationality which produced it is left standing, then that rationality will simply produce another factory. If a revolution destroys a systematic government, but the systematic patterns of thought that produced that government are left intact, then those patterns will repeat themselves in the succeeding government. There's so much talk about the system. And so little understanding" (Pirsig 1974, p. 94). It is this broader understanding that the method of Ecology Immersion aims to seek out. This enables broader systems to be altered, to solve problems not only in the finite manner but also in the long term and hence become more resilient.

RESILIENCE

"Resilience is the capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks, and therefore identity" (Walker et al. 2006, p. 2). Resilience can refer to a number of different entities, from people and communities to biological systems, economies and governments. Resilience in this paper refers to both a design intervention as a physical product, as well as the resilience of the people relying on the product. The resilience of a product can have a major influence on the resilience of people or communities because of their reliance on it (Campbell & Brand 2013, p. 281). The ecology of problems as explored above is related to what can be termed the ecology of a design intervention. When a design is 'inserted' into the ecology of the problem in order to bring about change, it becomes an element in the newly readjusted ecology. If this design intervention is not resilient itself, it becomes a point of vulnerability for not only the entire ecology but also creates a point of vulnerability for the people using it, thereby possibly compromising the resilience of both the people and the ecology/system (Campbell & Brand 2013, p. 281).

"A diverse system with multiple pathways and redundancies is more stable and less vulnerable to external shock than a uniform system with little diversity" (Meadows 2008, pp. 3-4). In the same way, this can be applied to products. For example, a product's ecology includes its manufacture, distribution network, functions, market and so on. If these are diverse and multifaceted the products ecology is more resilient, resulting in a more resilient product, and hence a more resilient broader ecology, ultimately resulting in a more resilient end-user. Resilience is critical for marginalised people and communities, since any disruption that is not recovered from quickly can lead to more disruptions, which could put the community in a position that compromises not only their current, but future wellbeing as well (Pasteur 2011, p. 15).

In order to understand the practical application of In-Context and Ecology Immersion to enhance resilience in design interventions, the rest of the paper unpacks the design process of a household farming kit undertaken by the authors over three years (2011-2014).

IN-CONTEXT AND ECOLOGY IMMERSION IN PRACTICE - A HOUSEHOLD FARMING KIT

Small-scale farming falls under the broader context of food security. Food insecurity is a global, national and community problem, which is highly complex and multifaceted (FAO 2008). When approached from the level of practical impact, Ian Smillie outlines various systemic issues that unfolded during the development and commercial sale of product to impact on food security in Tanzania: "When the project was conceived, most oil was imported; prices where high and availability was a problem. By 1986, however, after the equipment had been developed and the cost of the technology was more or less fixed, import restrictions were lifted, and the prices of oil fell. Fortunately this did not seriously affect the profitability of the press, but

it signalled a problem frequently ignored in the development of appropriate technology" (Smillie 2008, p. 133).

In the example above, the systemic nature of the problem, the design of an oil press, is clearly more than just the oil press itself, but extends to the Tanzanian government's import policy and how that impacts on the oil press's commercial viability. Meadows provides insight into problem solving on a range of scales, she explains that many serious problems, such as food insecurity, have attempted to be solved by "focusing on external agents" (2008, p. 4) and have led to the creating of further problems. "Hunger, poverty…, for example, persist in spite of the analytical ability and technical brilliance that have been directed toward eradicating them. No one deliberately creates those problems, no one wants them to persist, but they persist nonetheless" (ibid.). The issue is that these sorts of problems are "intrinsically systems problems" and can only be solved by acknowledging "the system as the source of its own problems, and find[ing] the courage and wisdom to *restructure* it" (ibid.).

In order to understand the systemic problem of food insecurity in Johannesburg, the methods of In-context and Ecology Immersion were utilised in a Masters project undertaken at the Department of Industrial Design in University of Johannesburg titled *Design and Development of a Household Farming kit (HFK)* (Brand 2014). The project built upon a previous mini-dissertation project which also explored the development of small-scale agricultural equipment. The Masters project aimed to develop a farming kit consisting of a set of basic equipment for a small-scale farming. The problem identified with existing kits was that they were not designed as a considered whole but were rather a collection of tools purchased from suppliers. On occasion these tools overlapped in function and/or were not considered in accordance with the desires and needs of the farmers who they were given to. The farmers often simply accepted the tools without question since they received them for free and as the common English saying goes, "no one looks a gift horse in the mouth". The HFK aimed to not only provide the farmers with better, more appropriate equipment but also provide lower-cost better targeted equipment that functioned as a holistic kit. This more considered kit could then be provided by NGOs and governmental organisations to more farmers (i.e more kits) for the same price that the existing kits were being purchased for. The initial concept of the kit consisted of: a greenhouse which provided farmers with the advantage of crop protection from hail and insects, and an extended growing season; a multifunctional hoe-tool, which would assimilate a hoe and spade into a single hand tool; seeds for planting; and an instruction booklet to provide the farmers with sufficient knowledge to use the kit. This paper focuses specifically on the method of In-context and Ecology Immersion as it proceeded during the design development of the HFK.

When the project began the study wasn't well defined, so potential partnerships were sought to better identify and establish its direction. This led to networking opportunities and contact with many organisations and groups who were also undertaking work in small-scale agriculture. This developed into the first context in which the researcher was immersed, that of similar stakeholders. This networking enabled the researcher to become better known within the local community of those working within the realm of small-scale farming and food security. A number of workshops were attended which helped develop further opportunities for immersion. Local food markets as well as a range of small-scale farmers were visited as the project began to take shape. For example, a visit was made to Mr dos Santos (Figure 3) a home food gardener who grew vegetables since he was not able to purchase the varieties he preferred from retailers. He had developed an extensive garden growing a wide variety of vegetables in a small area and much knowledge was garnered from his expertise.

Figure 3: *Mr dos Santos in his home food garden (Photo: Kyle Brand).*

As the project began to take shape, an additional multi-stakeholder partnership was established between the authors, the local Food and Agricultural Organisation of the United Nations (FAO) and the Balimi Food Security Company (BFSC). This relationship was instigated by the authors after visits to the FAO seeking a potential partnership and it was the FAO that connected the BFSC and the authors. The BFSC then invited the authors' to a site tour as part of a stakeholder meeting they were hosting. The BFSC asked for assistance with presenting and communicating their own project and this together with the authors' project was presented to a number of interested parties including officials from the local government office. This became the first of many partnered presentations to high level government officials such as the Department of Rural Development and Agriculture, as well as commercial entities such as the Senwes agricultural company (http://www.senwes.co.za/). These repeated presentations allowed for the researchers' greater understanding of the context of NGOs and governmental organisations.

It soon also became evident that it would be helpful to also start personal experiments with vegetable growing in order to be able to speak from experience with the farmers working on the project. Using limited space, a series of box gardens allowing for a range of vegetables to be grown were started at the researcher's home (Figure 4). This not only gave the researcher an empathetic connection to participants, who were engaged during in-context immersion when visiting the participants in their own contexts, but also allowed for the immersion into the context of home vegetable growing. This in turn led to other opportunities linked to home gardening projects.

Figure 4: *Carrot grown during personal gardening experiments (Photo: Kyle Brand).*

The next context for immersion was with the farmers themselves who would be the users of the farming kit. A series of prototypes were developed and tested by the farmers themselves. The greenhouse for example, needed to be set up on the farms by the farmers and was not simply delivered pre-assembled. This resulted in the researchers working with the farmers in its setup; on occasion this meant first assisting the farmers with current tasks they were busy with before beginning. During this time, informal conversations with the farmers encouraged an extended empathetic understanding of their context.

In addition to the immersion with the farmers and the immersions into other interrelated contexts explored above, the researchers were also following current literature on small-scale agriculture in both Johannesburg and abroad. This once again expanded the broader understanding of the ecology of the problem of food insecurity.

All these different contexts into which the authors were able to immerse themselves to different degrees, with differing stakeholders and in different environments led to a greater understanding of the broader context and system of food insecurity and small-scale farming in Johannesburg. Initially this method began merely as partnership seeking, but after a number of immersive experiences the value of such a method became apparent. This led to a more focused and applied application of what has been described in this paper as In-context and Ecology Immersion. In a sense, this method developed organically as the project progressed, but its value became evident from the greater understanding of the ecology of the greater problem and it was therefore pursued with a greater sense of focus and intention.

The opportunities for immersion were initially sparse, but as the project progressed they became ever more available. Initially any opportunity to be immersed in a context which was interconnected within the ecology of food security was seized. However, as many more became available the researchers had to be more selective and also focus more directly on the context where the final design intervention of the household farming kit would operate. In Figure 5, the green squares represent different contexts into which the authors were immersed. In the initial stages, a number of contexts are examined through immersion, but as the project progressed, exploration could only be sought in selected contexts in order to arrive at a conclusion. There is also a bulge later (moving from left to right) in the diagram which aims to describe a period when further contexts were sought and examined in relation to a more defined design intervention. In this case, this was the examining of different manufacturing methods and the testing of various options for the

prototypes manufacturing. The largest extended green block (running the length of the diagram) represents the end-users, in this case the farmers, and their context for the design intervention. This is shown as a continuous line, although it is made up of a large number of shorter immersions, since the in-context immersion is an experience that extends into the psychological and intellectual realm of the designer and end-users even though physical contact may not be maintained during the entire period. After a number of in-context immersions, the ecology of the problem was better understood, which led to more considered design decisions in terms of the greater system relating to the implementation of the household farming kit. These decisions included the choice of materials and manufacturing methods used to develop the tools in the kit; the decision to promote natural farming methods; the adoption of a subsurface irrigation system in order that the farmers did not till the soil repeatedly, thus encouraging low-tillage farming.

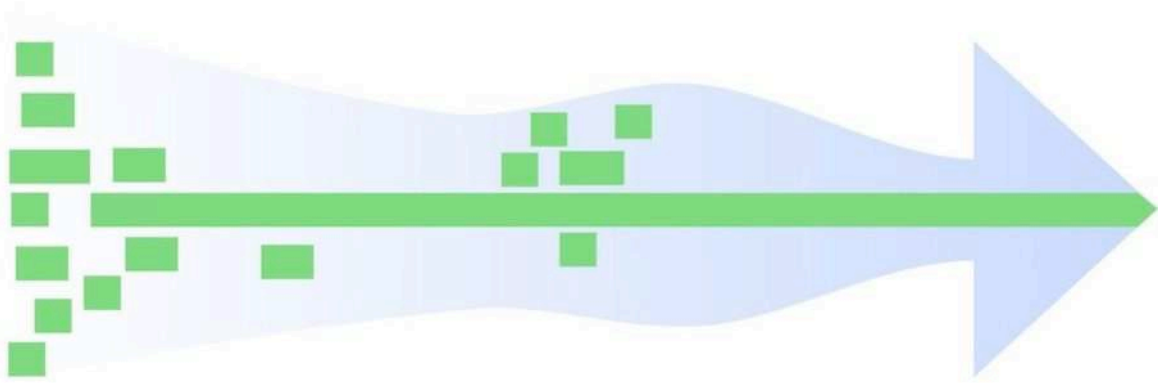

Figure 5: *Multi-context outline in terms of time.*

"Conway and Barber define [agricultural sustainability] as 'the ability to maintain productivity, whether of a field or farm or nation, in the face of stress or shock'. The stress might be small or large, temporary or permanent. It could be the result of local factors, such as drought, flood or grasshoppers or it could come from external forces such as an increase in the price of fertilizer or the withdrawal of technical support. "Sustainability thus determines the persistence or durability of a system's productivity under known or possible circumstances" (Smillie 2008, p. 118). In order that the household farming kit promote agricultural sustainability it was considered in terms of its local ecology and the greater ecology of food security. This was undertaken by reducing the price when compared to existing offerings (the kit cost approximately half that of existing kits); designing the elements so that they can easily be replicated and repaired using local artisanal skills (observed and investigated during various in-context immersions); and designing the equipment to fit the specific needs of the farmers together with them, thereby reducing its potential for redundancy.

Figure 6: *The greenhouse design being set up in Kanana (Photo: Kyle Brand).*

Phillip Oosthuizen, an industrial design academic, proposes the following factors that all good designs should consider (Interview 20 March 2014):

- Use - How the design functions. Is it usable, does it consider the person who would operate it?
- Manufacture - How the design is made. What materials to choose, are they repairable, what skills or machinery are required for the making of the product?
- Business - How does the design make business sense? Is it cost effective and efficient?
- Environment - What impact does the design have on the environment? Is it environmentally sustainable?
- Society - What impact does the design have on society? Is it a socially considered solution?

Different design projects and design interventions would inherently have a different balance of consideration for each. These factors of design can act as a good guide for the types of contexts that needs to be considered in order to develop an understanding of the greater ecology of a design problem. In the example of the *Design and Development of a Household Farming Kit* each of these were explored in-context through immersive experiences: the use of the kit in relation to the farm, the farmers, their households and small-scale farming; the manufacture by developing a series of prototypes and by experimenting with different manufacturing techniques for different elements of the kit; the business by interaction with NGOs and governmental organisations; the environment through various workshops, as well as seeing and studying a variety of different farming practices; and lastly society through a multi-stakeholder approach to the entire project.

Adopting a method of In-context and Ecology Immersion helped develop a richer understanding of the different interconnected contexts related to small-scale farming. This gave the designer a great advantage in terms of both opportunities for the design, but also in considering potential vulnerabilities in terms of the greater ecology in which the design would function.

CONCLUSION

This paper has discussed In-context Immersion as a method of gaining empathy for a problem context, but also unpacks the benefit of understanding the systemic nature of problems and hence the further methodological development of Ecology Immersion. "To have to grapple with divergent problems tends to be exhausting, worrying, and wearisome" (Schumacher 2011, p. 78) but by immersing oneself into many interconnected contexts one develops a tacit understanding of the ecology thereby putting oneself in a better position to design a well-considered, resilient product.

Systems thinking and multi-context approaches to design are not original. However, the increased popularity of social impact design has led to many practitioners diving into an immersive experience with the end-users of a product/system potentially at the expense of considering the other interconnected contexts, and thereby the ecology of the greater system. In this lies the potential that the design only effectively addresses the problem in terms of the current context of the end-users at the expense of a changing broader ecology, hence limiting the solutions resilience. By defining and proposing In-context and Ecology Immersion the authors aim to remind designers to consider the greater ecology associated with problems they are trying to solve. This in turn should result in more resilient and sustainable products that limit the points of vulnerability for their users.

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