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ABSTRACT
Agricultural adoption of innovation has traditionally been described as slow to diffuse. To address this, early engagement of stakeholders has been grounded in a PD approach. Results of the process were positive, as active engagement of stakeholders returned rich data. The contribution of the work is also presented as grounds for further design research in the livestock industry.

Author Keywords
Agriculture, disruptive innovations, participatory design (PD), human centred design (HCD), case study

INTRODUCTION
The Australian livestock sector is viewed as a traditional industry, very much reliant on its supply chain. Technology adoption within the industry has not been as smoothly accepted as some innovators might have once thought; with the time lag between adoption and diffusion being documented as taking between a few months to over 30 years for diffusion to occur (Frank, 1995). One reason for this diffusion lag was that development of these innovations did so without the proper acknowledgement of the user in their design. The notion of an innovation having to fit within the ‘way of life’ of a producer was also prevalent in the 1995 study.

The industries ‘way of life’ attitude has seen a dependency for graziers to rely on livestock agents to do much of their transactional work within their farming operations. These local agents act on behalf of the producer and charge a commission based fee approach for their service. Livestock are double handled and conditions placed on them are not pleasant with disease spread a common issue. For many producers this is the only sales channel that they use. The scope of this project presents a new technology which may be able to aid the producers in this way and disrupt the traditional distribution channel.

A disruptive innovation is defined as a product or service which is deliberately targeted at a lower spectrum of a market (Christensen, 1997). Therefore the innovation is targeted at a new set of customers with differing values to the mainstream. However, over time as the technology/service improves the advantages of this low cost alternative, gradually become the ‘norm’ and the market accepts the innovation. In the livestock industry, this new technology has the capacity to disrupt the value chain in its analysis of livestock, the mode of sale and subsequent distribution of sold goods.

PARTICIPATORY DESIGN APPROACH
The value of design is in its ability to create and construct novel ideas and approaches to innovative solutions. Throughout the livestock sector design thinking has not been a widely used tool to create new products and/or systems. Instead as previously noted companies have typically innovated for innovations sake; and adoption rates have been typically slow. Design thinking in this project has been therefore grounded in a PD approach through stakeholder engagement across the entire value chain. The livestock industry presents a different view on adoption, in that acceptance and final implementation is very much dependant on cultural factors of the subjective norm (Pease & Rowe, 2005). Compared to human centred design (HCD), PD allows these qualitative ideals to resonate through the research (Carroll, 1996). With the context of the agriculture’s traditional, face-to-face relationship, a PD approach facilitated better interactions to occur. Indeed the technology presented in the research was only a means to draw upon deeper cultural issues at play, within a disruptive change to the industry. Stakeholder engagement has been fundamentally positioned about the assessment of future proposals (scenario based) and done so in a multi-staged format.

PARTICIPATORY DESIGN METHOD

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Table 1: Stages of research

Before the creation of a future proposal was designed, the initial stage of the study drew upon semi-structured interviews of key stakeholders amid the value chain. With a mixed HCD and PD approach in this first stage, attitudes and other cultural understandings were found and documented. This understanding developed barriers to market and identified latent needs. Further stages of the research allowed for these insights to be explored via a PD method.

The design proposition and business model were created to provoke an engagement within the research participants (Bucolo & Matthews, 2010). Each group (2-5 participants) was presented with the scenario based design narrative and asked to comment on the system and implications to how each slide would affect them on a personal level, but also in a sector wide manner. The stakeholders in the groups represented one key point throughout the value chain.
The groups critically evaluated the proposed design and drew out cultural barriers to market, practical concerns of the technology and commented on the system in its three parts. Discussion within each group with other participants and researchers was encouraged and many issues were debated. Readiness to innovate was then explored and contrasted between each of the comparable groups within the value chain.

Co-designing changes to the proposed future system was encouraged in group discussion. Because of the fluid nature of the design scenarios (Carroll, 2000), co-designing new aspects of the system was made easier. Refining of the proposed system was thus directed by the comments and attitudes of the stakeholders, through actively engaging participants’ ideals for the system.

As part of the provocative system being testing by the PD approach, stakeholders were asked to intimately relate to the scenario and describe the context of the implications for the future. By asking this, traditionally stakeholders were able to think more broadly and innovatively.

**FINDINGS**

The majority of stakeholders in the Australian livestock sector are traditionally minded. Given this notion, talking to these stakeholders about change and disruptive innovation seems a difficult task. The results of the PD approach by this research contradict this broad assessment. The final stage of data collection involved the use of workshops, populated with stakeholders from only one given section of the value chain. As initially expected, stakeholders were intrigued by the proposal, but attached negative judgments before understanding the proposed design solution.

The proposed design solution (scenarios) played on this, traditional and negative mindset. By using characters in the design narrative that demonstrated a scepticism to all technology presented to them, the stakeholders were able to relate more easily to them. As the proposal progressed and the design solution took shape, the characters presented made positive connections to the technology. For most of the stakeholders this worked well to extract cultural issues surrounding the adoption of innovations within the sector. Major themes of education, communication, practicality and a culture of trial-ability of technology were identified.

The PD method allowed researches to engage with stakeholders in a way that allowed both positive and negative opinions to be voiced. However it was important for the facilitator of the workshops to create an appropriate ‘headspace’ for the participants to be in. This needed to be established very early on in the discussion. If this did not occur, the stakeholders were found to be quite unresponsive. Stakeholders were encouraged to think ‘twenty’ years into the future, but for some, the constraints of contemporary technology restricted the innovative thinking of the group. Until this was established the value of the proposed design could not be discussed. Some participants could not even begin to consider the end value proposition, before understanding the process of how they would get physically get to that.

For the higher percentage of the stakeholders who participated, they showed immediate ability to think about the future in terms of innovation and technology. As the group’s discussion moved forward, the scenario worked to challenge the traditional value exchange within the industry. This ‘provoking’ of the group was intended to create debate amongst the group of stakeholders. This worked best with larger groups. Unfortunately given the rural constraints of the industry, some workshops were of only 1-2 participants, and the same level of discussion was not recorded.

**CONCLUSIONS**

The PD approach allowed high-quality stakeholder engagement with agricultural industry members. This was found to be of high value, as the research team could extract cultural issues relating to the adoption of innovation, with the livestock sector. Focusing more on this issue than the technology itself will mean that, further R&D efforts can be more specifically positioned in the value chain. As the proposed technology poses disruptive attributes, establishing this understanding is vital to the development of the proposed system.

The contribution of this work highlights that innovators in the agricultural field need to understand that the industry is indeed a traditional one, but is certainly innovative. These two terms have previously been confused. The understanding that the industry is a traditional one is not completely representative, because it assumes members are purely non-adopters. More accurately livestock stakeholders need to consider more issues, before utilising a new innovation.

This early stage of research afforded a personal and participatory approach to the research. This face-to-face relation was expressed as a concern of the proposed design solution, in that it challenged physical communication. Future progression of this exploratory work therefore assumes that the technology must be compatible within this scope. The implication of the work establishes a cultural understanding, enhancing further design efforts.

**REFERENCES**


Participatory Design for Technological Disruption within the Agricultural Sector

Carl Behrendorff (B.Des)
Queensland University of Technology
2 George St Brisbane QLD 4000
0431479890 carl.behrendorff@qut.edu.au

Dr. Sam Bucolo
Queensland University of Technology
2 George St Brisbane QLD 4000
s.bucolo@qut.edu.au

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