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Examining the methodology of participatory design to create innovative sanitation technologies in rural Malawi

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Top-down sanitation programs that promote a specific sanitation technology based on the presumptions of 'outside experts' have been criticised for endorsing unsustainable, expensive and inappropriate technologies. In response to these failings, a new era of demand-led sanitation programs (including community-led total sanitation and sanitation marketing) encourage greater participation of users to create appropriate sanitation technologies. This paper examines the use of participatory design sessions with local builders and householders in three rural districts in Malawi. The paper provides an account of the participatory design methodology and critically reflects on the processes and challenges in relation to power, creativity and ownership. The designs created during the sessions are presented with recommendations for further testing and structural refinement.

Introduction

Different methodological approaches have been used to engage users in the design process in demand-led sanitation programs. Two common demand-led approaches are sanitation marketing and community-led total sanitation (Mara et al. 2010). Sanitation marketing programs in Lesotho, Vietnam, Cambodia and Kenya applied the principles of human-centred design to offer sanitation products and services that matched the needs and preferences of the consumers (Blackett 1994; Sijbesma et al. 2010; Baker et al. 2011; IFC & WSP 2012). Human-centred design has been defined as 'attempts of researchers and designers to interact with end-users constructively in their innovation projects' (Steen 2011). In Vietnam, Cambodia and Kenya sanitation marketing programs engaged international researcher and design teams to conduct qualitative market research with users and sanitation suppliers (Sijbesma et al. 2010; Baker et al. 2011; IFC & WSP 2012). The market research informed the research and design team to create iterative designs and prototypes that were subjected to extensive user testing.

The CLTS methodology presented in Kar & Chambers (2008) recognises the importance of having a strong supply of hardware to meet growing consumer demand. The methodology recommends that external facilitators should 'help in establishing linkages with local markets' (Kar & Chambers 2008). The support includes encouraging local innovation and production, identifying locally available products and materials and training locals to manufacture sanitation hardware (Kar & Chambers 2008 p.53). Recently, Kar (2012) emphasised the selection of technology is crucial to overcome second and third generation problems such as groundwater contamination and environmental pollution (Kar 2012).

Participatory design practices

This research applied participatory design methods to identify designs which could lead to the development of appropriate sanitation technologies. Participatory design offers a methodology that allows the 'research-designer' and 'user' to cooperate and engage in mutual learning (Steen 2011). Participatory design provides a space for 'users' to express traditional, tacit and often invisible knowledge and skills used in their daily lives (Spinuzzi 2005). The history of participatory design stems from Scandinavia in the early 1970s. The approach was derived from a Marxist position to democratically engage industrial workers in the integration of new technologies into manufacturing processes (Spinuzzi 2005). Participatory design is an established

methodology used across a wide breadth of social development programs in countries with developing economies (Winschiers-Theophilus et al. 2012).

Participatory design applies a methodological and philosophical position that aligns to participatory action research (PAR). Both approaches attempt to create a democratic space between researchers and participants and to link research objectives with actionable goals (David 2002; Bozalek 2011). PAR methodology has been extensively reviewed and critiqued (Campbell 2002; David 2002; Bozalek 2011). The roots of participatory research are framed by Western-democratic thought and practices and Campbell (2002) argues they require thoughtful application in non-Western cultures. The selection of participants must be methodologically sound and where appropriate be inclusive of marginalised people (Bozalek 2011; Winschiers-Theophilus et al. 2012). These criticisms have encouraged practitioners of participatory design (Steen 2011) and PAR (Bozalek 2011) to advocate that practitioners have a duty to critically reflect on their role, power and knowledge throughout the research process.

Existing sanitation technologies in rural Malawi

Evaluations of CLTS programs and formative market research conducted in rural Malawi identified the need for design improvements in existing sanitation technologies (Phiri 2010; Cole et al. 2011). Formative market research conducted in three rural districts found more than half of all sanitation facilities collapsed within 12 months after construction, resulting in families returning to open defecation or sharing a facility (Cole et al. 2011). The formative research also found sanitation suppliers were unengaged in the sector due to low-demand for existing designs.

Case study

Program context

In 2011, UNICEF Malawi initiated a rural sanitation marketing programs with three District Government partners. In partnership with local district environmental health officers the first author conducted formative market research (Cole et al. 2011). The research informed the development of an integrated marketing strategy that addressed the four P's of price, product, promotion and place. In 2012, the participatory design sessions were applied to address the 'Product' and 'Price' components of the integrated sanitation marketing strategy.

The overall program was based on a 'ground-up' philosophy. The primary source of information was from the collective knowledge and skills of local builders and villagers. The first author provided training in the process of participatory design to District-level Environmental Health Officers during a three-day training workshop and attended the first design session held in each district. The EHOs were responsible for project management, participant recruitment and logistics.

Participatory design approach

The methodology of the participatory sessions were derived from methodology presented in Spinuzzi (2005) and IDEO (2009). The sessions were conducted in the early stages of the design process. Spinuzzi (2005) refers to this stage as the 'fuzzy end of innovation' where new ideas are generated and not questioned. The three-day design sessions consisted of four steps: *1: Initial exploration of work; 2: Discovery processes; 3: Prototyping* and *4: Feedback*

Methodology

This study applied a pragmatic research paradigm and used mixed methods to collect and analyse data generated during three participatory design sessions. The integration of qualitative and quantitative data was used to create a deeper and wider picture of the outcomes of the participatory design approaches (Fielding 2012).

Study sites

Three study sites were chosen to represent areas located along the lakeshore of Malawi. These sites were chosen as lakeshore districts with sandy soils were found to have a high rate of collapsing pit latrines (Cole et al. 2011). The sites were located in Salima, Mangochi and Nkhata Bay districts. The design sessions were conducted at the group village level which normally consists of three to four villages.

Group villages were purposively selected using the following criteria: i) consisting of more than three villages or greater than 300 households, ii) not more than 90 minutes drive from a central market, iii) representative of the typical soil type within its traditional authority, iv) a suitable location to conduct building and construction of prototypes and v) a group village leader with a track record in supporting innovative social programs.

Participant selection

Researcher-designers: included the first author and district and village-level government staff. The first author is an Australian researcher that has nine years of experience in the sanitation sector. District staff members were chosen to participate by the District Environmental Health Officer (DEHO). The government staff included environmental health officers (EHO), assistant EHO and health surveillance assistants.

Users: included construction specialists and householders. Construction specialists were purposively selected from the three to four villages that made up each study site. Four construction specialists (masons, carpenters and builders) were invited to attend from each village (up to 20 representatives). The selection criteria were: i) Proven reputation as a builder, carpenter or mason, ii) had constructed a latrine in the last 12 months and iii) a permanent resident of their village.

Two representatives of households were invited from each village (up to 6 representatives). Householder representatives were individuals that had acted as natural leaders during previous CLTS events, village health workers or people with a proven interest in sanitation. Only females were chosen to represent households to counter the strong male-bias of the construction specialists.

Data collection, analysis and limitations

Qualitative data was collected using triangulated sources that included personal notes, participants' drawings and text, written reports prepared by District government staff and recorded interviews with participants. Unstructured interviews with builders and householders were conducted during the design sessions. The interviews were recorded and transcribed.

Findings

Stage 1: Initial exploration of work – Confirming knowledge between users and researchers-designers

An important goal of participatory design is the creation of a common-language between users and designers-researchers (Spinuzzi 2005; Steen 2011). The first stage of the design sessions provided a strong platform for users and researchers-designers to develop a common vocabulary. The three main types of sanitation technologies identified during the design sessions were categorised by users as unlined, nkhokwe and cement-lined pit latrines. The existing sanitation technologies and their advantages and disadvantages identified by users aligned with the findings of earlier formative market research (Cole et al. 2011). This process had twin benefits, the first was the establishment of a common language between the two parties and the second was the confirmation of earlier research findings.

Stage 2: Discovery processes – Hangover of subsidy programs

A significant challenge arose during the discovery process where some users insisted on the inclusion of cement as a construction material. Researchers-designers argued that including cement in the design would make the latrine unaffordable for the majority of households. The users stated Government must provide the cement through a subsidy program. This created discussion amongst the group on the role of Government in the provision of hardware subsidies in sanitation programs. Two main themes emerged from the users' perception of cement, the first was cement is an essential component of a strong latrine and is linked to modernity and the second was subsidy programs for cement can be successful if managed appropriately.

Cement is progress, why would we want to use wood? Wood is a primitive way for latrines. Cement is a part of progress Male, Nkhata Bay

The other (cement) subsidy programs were not well managed, we can manage them better. The fertiliser subsidy is working, why can't we do the same for cement? Male, Nkhata Bay

Stage 3.1: Prototyping – Consistent design themes identified for clay soils

The design sessions in Mangochi and Nkhata Bay identified a consistent design theme – the use of corbelled burnt bricks to form the floor of a pit latrine (Figure 1 & Photograph 1). The brick corbelling eliminated the use of wood or cement as a building material. Corbelling is an established latrine building practice that overlaps one brick over another to reduce the diameter of the pit (Government of Zimbabwe n.d.). However, unlike existing designs (such as the Blair Toilet) that apply a cement slab, this design used bricks to form the slab. Users stated the benefits of brick corbelling was that it eliminated the need for; wood which is commonly attacked by termites resulting in an unstable floor, and cement which is unavailable in local markets and is prohibitively expensive (Cole et al. 2011).

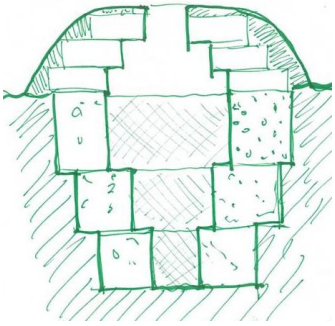

Figure 1: Sketch of corbelled design

Photograph 1: Top view of prototype of corbelled design

Stage 3.2: Prototyping – Lead user identified innovative construction approach

In Salima, the design session was conducted in a lakeshore village with sandy soil. A CLTS triggering event had occurred two years earlier. Due to the momentum developed during the CLTS program, Government staff were able to identify 'lead-users' to participate in the design sessions. 'Lead-users experience a problem or a need that they cannot fulfil with a current product or service and develop modifications or novel applications' (Steen 2011). The lead users identified the challenges of existing sanitation designs and offered immediate solutions. The solution combined the existing wooden frame (nkhokwe), wrapped with plastic and reinforce with sandbags (Photograph 2 & 3). The sand-bags were constructed by cutting and re-sewing local maize bags.

Photograph 2: Wooden frame (nkhokwe) is constructed using local reeds woven with rubber threads taken from tyres

Photograph 3: Wooden frame (nkhokwe) is wrapped in plastic and reinforced with sand-bags

Stage 4: Feedback – Responding to criticism

During the feedback sessions it was identified that design teams were not responding to criticisms presented by villagers but rather they were defending their design. The ability to 'design on the fly' was found to be a new approach for the user designers. The researchers-designers decided it was important to record the villager's comments to capture the feedback. The feedback would be used to inform future versions and upgrades of the initial designs.

Lessons learnt

Tackle the hardware subsidy issue with users before commencing the participatory design sessions

Awareness and support for hardware subsidies in sanitation programs was found to be high amongst all builders and villagers (users). In contrast, Government and donor staff (researchers-designers) opposed the use of hardware subsidies. Participatory design aims to develop consensus in the objectives between users and researchers-designers. By allowing an open discussion on the role of hardware subsidies it offers a space for dialogue between the two parties. Although all parties may not reach consensus, the process allows the group to recognise the other party's views, which over time may lead to consensus building.

Develop specific design criteria and ensure users are aware and supportive of the criteria

Clear and specific design criteria are a vital component of a success participatory design process (IDEO 2009). Clear and specific design criteria set the boundaries for exploration that can occur during a design process. The development of the design criteria should occur in a small team (ideally those involved in the formative market research process) that are aware of the preferences and needs of sanitation users and suppliers. This will improve the likelihood that the outcomes of the design sessions are suited to the local environmental and market conditions.

Identify and engage with lead users and suppliers in the local sanitation sector

Engagement with leading thinkers and innovators is an established approach in the field of human-centred design. Lead-user approach engages with users who are leaders in their field and are pushing the design process to improve their own daily lives, livelihoods and employment (Steen 2011). A few of the local builders and villagers involved in the design sessions had been exposed to previous sanitation programs. These users, particularly those who had attended CLTS triggering events, had given previous thought on ways to improve the design of existing sanitation technologies. These users often drove the innovation process within their team and the wider group.

Participatory design methodology can be integrated into CLTS and sanitation marketing programs

During the sessions it was recognised by Government staff that the participatory design methodology aligns with the philosophical and methodological approach of both CLTS and sanitation marketing programs. They stated the participatory design sessions are an ideal CLTS follow-up activity. The use of the sessions was also found to integrate into the sanitation marketing program as they identified suitable designs to address the 'Product' and 'Price' of the integrated sanitation marketing strategy.

Technical review and refinement of the design created during the sessions is essential

Participatory design, occurs at the 'fuzzy end of design', and hence creates only design directions (Spinuzzi 2005). The input from structural engineers with experience in sanitation design provided important recommendations on the safety and durability of the designs. The review offered suggestions for running locally-managed trials to test improvements and certain aspects of the designs. Failure to include the technical review and refinement stage could result in unsafe and dangerous designs being released into the market.

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