CO-CREATING AN ICT ARTEFACT WITH WOMEN IN SOUTH AFRICA

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ABSTRACT

The active involvement of rural women in ICT4D initiatives is essential to ensure that they benefit from the initiative in general, and the technology artefact in particular. Usually ICT4D projects are male centered and the relevance of ICTs to the women within their contextual realities are not always considered. The purpose of this paper is indicate how an ICT artefact was co-created with rural women in South Africa in a resource constrained context. Participatory approaches like co-creation are important when implementing ICT4D initiatives aimed at rural women. Through the application of Design Science Research as the methodology an ICT artefact was co-created in a specific context in South Africa with rural women only. It is a longitudinal study that is still evolving. The lessons learnt and process that was followed will be shared. The main finding was that the active participation and feedback of the users of a system are essential when aiming to address their immediate and long term needs. If this is not the case the ICT artefact will not be used and it will yet again become part of the statistics of why Information Communication Technology for Development (ICT4D) projects fail.

KEYWORDS

Co-Creation, Rural Women, ICT4D, Design Science Research Methodology

1. INTRODUCTION

When conducting technology-based projects in rural communities in developing countries it is important to remember that ICTs are socio-technical systems (Moens, Broerse, Gast & Bunders, 2010; Stillman, 2010). Western culture, typically unsuited to local requirements, is embedded in the design of technology, and when projects are ICT vendor or donor driven, this culture must be adapted to fit the community (Moens *et al.*, 2010; Morales-Gomez & Melesse, 1998). For ICT4D projects to be successful, context specific requirements and interpretations must be taken into account during the design process, with local community members afforded the opportunity to articulate their requirements, needs and demands (InfoDev, 2003). To maximise the value of co-creation, and avoid a top-down technology push, a bottom-up approach embedded in community participation is vital (David, Sabiescu & Cantoni, 2013). Co-creation or a participatory approach allows for the incorporation of the social values, perspectives and knowledge of the communities thereby producing a product or solution, which bridges Heeks' design-reality gap (Khumalo & Pather, 2018; Heeks, 2008; Puri, 2007). All this being said, community participation in an ICT4D context is always more complex than what has been reported in the literature ((Bailur in de la Harpe, 2014)), and even experienced ICT4D researchers and practitioners can find themselves with 'burnt fingers'. If ICT is exploited (like cultural capital), it can influence the way people will use technology as well as the value they give to the use of the ICT. This is even more the case in rural areas (Singh, Díaz Andrade & Techatassanasoontorn, 2018).

The label of co-creation has been associated with various topics like developing new services, collaborating with users and innovators, adapting a product to the needs of users, participation of stakeholders in a community, creating new knowledge, networks and exchanging services (Ramaswamy & Ozcan, 2018). Despite this diversity, however, there is surprisingly little consensus on what "co-creation" is. The research question that will be addressed in this study is: How can rural women benefit from a co-creation process that addresses their requirements and needs with relation to an ICT artefact?

2. CONCEPTUALISING CO-CREATION

The term ‘co-creation’, which has its origin in the innovation domain, is increasingly being used in the development context along with terms such as ‘user-driven innovation’, ‘co-production’ and ‘collaborative innovation’ to describe the intended beneficiaries’ involvement in the design of solutions that are relevant to their needs (Smith, 2015). Co-creation refers to a situation in which research participants collaborate with the research team in order to add value to the research process and to create something of value (Humphreys & Grayson, 2008).

Co-creation can take place when the researcher and research participants are in contact with one another for a specific reason and/or to achieve a specific result. This contact creates the opportunity for the parties to influence each other’s thinking and processes. Interaction must be mutual and reciprocal and should generally be beneficial for both parties, resulting in shared value creation (Grönroos, 2011; Windisch, 2011). Co-creation enables and empowers research participants to interact and collaborate with the researcher in order to create an artefact that has value for both parties (Edvardsson, Tronvoll & Gruber, 2011). The production of the co-created artefact can be viewed as the generation of potential value, whereas use of the artefact is viewed as generation of real value (Grönroos, 2011).

Many papers apply the term “value co-creation” but do not define “co-creation”, and then add the term “value”. Attention is then distracted from “creation” (Vargo & Lusch, 2016). This resulted in comparing “co-production” and “value-in-use”. Ranjan and Read (2016) have found that of the 149 papers they investigated, 71 papers focus on “co-production” and only 46 addressed “value-in-use”. A focus on “value co-creation” was only indicated in 32 papers.

After investigating all concepts relating to co-creation Ramaswamy and Ozcan (2018:200) provides the best definition for co-creation pertaining to this study:

“Co-Creation is the enactment of interactional creation across interactive system-environments (afforded by interactive platforms), entailing agencing engagements and structuring organizations”.

Ramaswamy and Ozcan (2018) postulate that the real value of creation does not only apply to co-creating artefacts but rather lies with the value that the new co-designed artefact can have for them within their own contexts based on their involvement in their own networks. This is particularly relevant for this study as the rural women co-create an ICT artefact based on their needs and they get value out of this co-creation process as it improves the quality of their lives.

Ramaswamy and Ozcan (2018) also highlight the relation between co-creation and Giddens’ structuration theory (Giddens, 1984), when they note the concepts of human agency and structure in their definition above. They also indicate that the test is to understand the role of both structure and agency and that these two concepts should not be juxtaposed but the value of both should be recognised as the interplay between them takes place. The idea is that agency and structure constitute responses that shape their orientations towards their contexts. This is also supported by Booyens, Hart and Ramoroka (2018) when they indicate that in South Africa agency has a role to play in innovation in developing contexts but that the involvement of the government is not very prominent to promote this. That is why some ICT4D studies do not acknowledge the innovation that takes place at an individual level as they develop products that are rooted in specific socio-cultural contexts (Jiménez & Zheng, 2018). In South Africa this is a challenge as the National Innovation System has to involve local communities when innovating (Booyens *et al.*, 2018).

As one collaborates during co-creation, people from various levels in society join one another to share their visions, in the quest to co-design and co-implement refined products and services that focus on deprived communities’ needs (Ranjan & Read, 2016). This can ensue in socio-economic prosperity and a specific challenge in a community is addressed (Ruhl, Richter, Lembke & Allert, 2014). Therefore Hood (2018) argues that when we scale we consider not only to identify the right innovation to implement, but also how best to adapt it to individual contexts. Fundamental to this work are two components: (1) the robust deployment of continuous improvement methods to promote iterative innovation, and sustained learning and progress; (2) and a systemic approach to collaboration through the creation of powerful and well-designed networks.

Traditionally ICT4D research focuses on women as users and beneficiaries, not as co-creators. In response the World Bank (2009:3) emphasise the importance of involving women in projects by stating that various studies have “highlighted the need to ensure greater continuity between design and implementation to integrate women more fully into mainstream development activities”. This is further supported by Jagtap and

Larsson (2018) when they indicate that women living in poverty suffer many problems as compared to men living in poverty, as women have different needs and perspectives on problems they encounter. This implies that design research in this field can benefit from developing gender sensitive co-design approaches. This can result in more involvement of women in co-design activities.

3. MODELS OF CO-CREATION TO CONSIDER

In some community-based models of co-creation, a central issue is the lack of power of community members who are involved. This is found especially when co-designing with technology, as well as in value co-creation. In each case, there are inherent power differentials, and this should be carefully managed in order to allow all involved to participate meaningfully in the co-creation process (Greenhalgh, Jackson, Shaw & Janamian, 2016). Value also lies in empowerment especially when you develop an artefact during collaboration as the participant's motivation and ambitions are enhanced (Novani, Putro & Hermawan, 2015).

Various models of co-creation exist (Edvardsson *et al.*, 2011; Andreu, Sánchez & Mele, 2010; Gebauer, Johnson & Enquist, 2010; Zwass, 2010; Payne, Storbacka & Frow, 2008; Zwick, Bonsu & Darmody, 2008; Prahalad & Ramaswamy, 2004), but according to Durugbo and Pawar (2014) and supported by Ramaswamy and Ozcan (2018) most of these focus on the dynamics between a supplier, customer and encounter domains during the co-creation process. Value is derived from value in exchange as well as value in use. Durugbo and Pawar (2014), however developed a unified model of co-creation (Figure 1) and they explicitly define the key role of existing value and technique selection during co-creation (unlike other studies on co-creation). This research proposes a 'unified model' when you formalise the process in co-creation.

Figure 1. A Model for co-creation (Durugbo & Pawar, 2014)

This model adds a new perspective on collaboration during co-creation and it includes themes like capability-, customer-, governance-, intelligence-, value-, role-, process-, service-, and community-focused. This model has particular reference to this study as co-creation within a specific community is all about dialogue, participation, knowledge sharing, sense making, needs and to create value to the community in the end, in use and in their context.

Various authors (De Koning, Crul & Wever, 2016; Putro, 2016; Novani *et al.*, 2015; Kijima, Rintamki & Mitronen, 2012) indicate that a co-creation process should include specific steps like identify, analyse, define, design, realize and evaluate or listen, identify, ideate, collaborate, evaluate and experiment. However, according to Kijima *et al.* (2012) and supported by Suryana, Mayangsari and Novani (2017), for co-creation to have real value your co-creation process steps should rather be: *co-experience*, *co-definition*, *co-elevation*, and *co-development*. When applying co-experience, the client and supplier should share their understanding of the nature of the problem, process and to comprehend each other's preferences, capabilities, and expectations so that they may co-define and share a common internal model (Putro, 2016). Co-elevation has

to do with the process of understanding the expectations of customers and abilities of the providers. The higher the expectation the greater the value. Thus, co-development addresses co-innovation that is the result of people who collaborate (Novani *et al.*, 2015).

True participatory design is more than just getting the users involved in the ‘how’ of implementation. They should also be involved in setting the agenda and deciding on the approach (Moens *et al.*, 2010). Full and active participation of the end users and local community in the design of an ICT artefact is crucial to ensure its usefulness at local level by directly addressing local needs, as well as promoting buy-in and the development of local champions (Booyens *et al.*, 2018; David *et al.*, 2013; Gurnstein, 2003).

4. THE ICT ARTEFACT

The ICT artefact in this paper stems from a project coined the Digital Doorway that has been in existence since 2002 and was developed with the main purpose of promoting digital literacy skills in deep rural areas. It has adapted the idea of ‘The Hole in the Wall project’ from India (Gush, 2018).

At the time of writing, sites are deployed throughout the nine provinces of South Africa and consist of 60 weatherproof walk-in containers with a built-in solar panel. To date more than 300 units have been deployed throughout South Africa, mostly in deep rural settlements. Internationally 30 Digital Doorways have been deployed in Uganda, four in Australia and one each in Lesotho, Ethiopia, and the Solomon Islands. The Digital Drum, a Digital Doorway in a 20 gallon drum developed with UNICEF for use in Uganda, was nominated by the Time Magazine as one of the top 50 inventions in the world for 2011 (Smith & Turpin, 2017). Most of the sites support VSAT Internet connectivity enabling them to transmit near-real-time data (comprised of many parameters) back to a monitoring server and support desk. There is thus a large amount of raw data on the who uses the machines and for what purposes available (Gush, 2018).

The current DDs include a satellite downlink and GPRS backhaul to access content and to log file retrieval. A Bluetooth dongle and GUI application allow a user to save files from the DD to a personal device. A user can create a personal account and enter their information (age, gender, home language). This data, as well as specific application usage is hosted on a server. A webcam allows users to create a personalised profile and they receive incentives for logins. This ensures the validation of demographic data. The system is based on Open source software, employing a modified Ubuntu Linux OS with the Xfce display. The Linux security mechanisms prevent unauthorised modification to essential folders and files (Gush, 2018).

The DD was selected as ICT artefact for this research project because it has proven itself to be very reliable and uniquely suited to the harsh environment of the rural areas in which the project will be conducted. The researcher’s on-going involvement with the DD was useful when hardware and software modifications based on the middle-aged women’s feedback needed to be made.

The DD was first installed at the Setsong Community Centre in August 2013, in a community consisting mostly of rural women over the age of 64 years. Currently the Setsong Centre is a place where the older women gather to work on projects such as sewing, beadwork, reed work (e.g. making brooms and baskets) and farming on a communal farm. The ICT artefact was co-created by through 7 site visits (*cf* Table 1) and refining the artefact based on feedback from the women and by applying the co-creation model as well as processes described in section 3 of this paper.

5. RESEARCH METHODOLOGY

A pragmatist research philosophy is adopted. Pragmatists are concerned with solutions to problems that work, and knowledge is viewed as a way to improve the world (Cresswell & Sheikh, 2013). This view aligns well with the Design Science Research (DSR) aim of changing the current situation into a desired one (Goldkuhl, 2012). In fact, some authors contend that DSR is essentially pragmatic in nature (Hevner, 2007).

The reason for choosing Design Science as a research methodology was to co-create the ICT artefact with the rural women by applying the specific DSR process of Peffers (Peffers, Tuunanen, Rothenberger & Chatterjee, 2007) (Figure 2).

DSR is used as the research strategy. DSR is a creative problem solving methodology that focuses on the production of innovative and new knowledge in order to solve a problem. DSR researchers are concerned with relevance and making an impact (Baskerville, Baiyere, Gregor, Hevner & Rossi, 2018).

Figure 2. Design Science Research Methodology as applied in this study (Adapted from (Peffers *et al.*, 2007) and (Herselman & Botha, 2014))

The focus of this paper is on Phase 2 of the process where the ICT artefact was designed, developed and demonstrated as well as evaluated to improve it, by the rural women in Limpopo Province of South Africa.

6. RESULTS AND DISCUSSIONS

The ICT artefact was co-created during 7 site visits ranging from April 2013 to October 2016. Visit 7 constituted an assessment and the building of a new site for the ICT artefact in order for the project to continue, since the building where it was hosted was severely damaged by a storm. The project is still in progress at the time of writing. The design activities that occurred during the site visits are summarized in Table 1. Note that ‘RURAL WOMEN’ is an abbreviation of ‘Elderly Rural Women’, the participant group for the co-design study.

Table 1. Design Activities during Co-creation of ICT Platform

RURAL WOMEN design activities	RURAL WOMEN activities	Site visit #	CSIR team activities	CSIR team design activities
Listen	Mma C (leader of the rural women) agrees to participate and involves the other 21 rural women	Prior	Prior learning from rural DD projects Identify need for RURAL WOMEN study Identify Mafarafara site Establish relationship with Mma C	Identify
Listen Evaluate	Rural women share contextual information and evaluate desirability of the project	1	Introduce project Obtain ethical consent	Listen Ideate
Collaborate Experiment	Help install ICT artefact Participate in training and share information on livelihoods	1a 2	Pre-installation site inspection Install ICT platform Give training Interview RURAL WOMEN on livelihoods First update of ICT platform	Identify Collaborate Listen
Collaborate Experiment Identify	Assist each other with use Maintain and clean venue Share info on use and further needs	3	Assess use of ICT platform Identify further needs	Evaluate Listen Identify
Collaborate Experiment	Share use experiences and info on further needs	3a 4	Upgrade solar panels Update information base Evaluate use of ICT artefact Identify further needs	Evaluate Listen

RURAL WOMEN design activities	RURAL WOMEN activities	Site visit #	CSIR team activities	CSIR team design activities
Identify	Assist each other with use	5	Evaluate use of ICT artefact Identify further needs	Identify
Collaborate	Share use experiences and info on further needs			Evaluate
Experiment	Assist each other with use			Listen
Identify		5a	Remove ICT artefact for maintenance and updates	Identify
Collaborate	Share enthusiasm for returned ICT artefact	6	Re-install ICT artefact	Evaluate
Experiment	Use updated ICT artefact and give feedback		Install new printer	
Define	Plan to upgrade Community center and lapa			
Collaborate	Share plans and activities towards new building	7	Assess storm damage	Listen
			Arrange temporary safekeeping of ICT artefact	Identify
	Progression with new building	After		

From site visits 3 to 5, there is a lot of repetition of activities: continued use of the ICT artefact on the rural women's side, and continued evaluation and further needs assessment on the CSIR's side. As time progressed and the rural women became familiar with the ICT artefact, they could provide more informed inputs related to further needs.

The CSIR team installed existing technology that was refined with and for the rural women who had unique user needs, in the process. As such, their design activities consisted mainly of evaluating use, listening to the users and identifying further needs. Because it was an existing product, not much ideation needed to happen.

The rural women's main activities consisted of trying out the technology that was totally new to them, thus they were experimenting. Throughout the project they did so in a collaborative manner, assisting each other to use the ICT artefact. Their use of the ICT artefact became integrated with their other collaborative activities at the community centre, such as sewing and weaving. Their continued use of the ICT artefact enabled them to better identify additional needs related to the information base and use of the ICT artefact.

7. UNEXPECTED FINDINGS

The women's feedback on the benefits of the ICT platform held some surprises. The first one was the pride that especially the illiterate rural women took in being able to type their name (their login username was their own name). The illiterate rural women could not use the ICT platform extensively, but they could perform some tasks such as playing games and watching videos. One of them reported that the training on the ICT platform enabled her to use an ATM for the first time in her life; previously she always required someone else to do her ATM banking for her. Activities such as these were a major accomplishment for some of the rural women that believed they were too old to learn, and would never be able to use computers because of being illiterate.

A second surprise was the pleasure they derived from playing games, many of which were educational. They did not only enjoy the games but believed that the games took away their stress as it made them forget about their worries. This is a major benefit to people who are in survivalist mode and who are regularly stressing about the next meal and other basic livelihood concerns.

There was a further unexpected benefit the rural women shared during feedback sessions, of exercising their bodies and fingers when moving between screens and having to type on the keyboard.

Lastly, from the interview data and site visit reports it became clear that visiting the community centre on a regular basis to use the ICT platform gave especially the retired women a sense of purpose.

The unexpected benefits were in a sense unique to the rural women: as a group they had high levels of illiteracy, a number of survivalist stresses and concerns, the retired person's loss of sense of purpose to their life, and age related ailments such as arthritis. Hence, the ICT platform project could be said to benefit the rural women in a unique manner, due to their unique composition but also due to the success of the project, without which they would not have adopted and regularly used the ICT platform.

8. CONCLUSION

ICT4D strategies and initiatives aimed at improving the situation rural women find themselves in, must place more emphasis on local realities such as power structures and indigenous sources of knowledge than has been done to date. For the women to benefit from 'new' knowledge such as that gained from ICTs, it must be integrated with their local knowledge within the context they are intimately familiar with. To make new technologies work for, rather than against women in rural areas it is important to take into consideration that they have different needs, capacities and skills than men. Consulting women when co-designing and co-creating with ICT is essential as this can empower them towards capacity building. Specific steps in the process of co-creation during the design process are crucial to follow as well as a specific co-creation model. Soliciting the views of RURAL WOMEN on new technology and involving them in the design can make the development of the technology more user-oriented and will improve the likelihood that they will adopt it.

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