Exploring human centred design and its applications in an South African context

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ABSTRACT

In this paper, we are going to investigate human centred design and its applications in postcolonial South Africa. We are going to consider the complex social constructs that exist in the country and how designers can work around them to successfully interact with communities. Researchers and Designers are responsible for coming up with a plan to approach users, to choose the correct approach, they must understand not just the culture of the community but also the history of the people. We will discuss ways in which designers can earn the trust of community members and make the more accepting of ICT4D into their lives. This paper will critically analyse 3 human centred design approaches, their application constraints and benefits. We will also analyse successful ICT4D projects in South Africa to gain insight as to what is required from designers and communities for a project to be successful.

Keywords

Human-centered design; ICT4D; South Africa; emancipation; co design, ethnography; participatory design..

1. INTRODUCTION

The objective of this paper is to provide a review of the different human centred design(HCD) methodologies that are applied in ICT for Development (ICT4D) and ICT4D projects in Africa that have followed HCD. ICT4D projects are often difficult to implement as designers and users come from "different worlds", the difference in culture and to some extent socio-economic class creates a social barrier between the two. Software design methodologies have been thoroughly researched to find ways of breaking barrier [17].

There are many HCD methodologies that have been studied and they each apply to different sets of projects; however, each project has its own unique qualities and as such designer need to know a handful of methodologies so that they can decide which one is more suitable to their project. For my honours project we must design a Chef registration and administration system for Infinity Culinary School in Cape Town. The institution has no formal way to keeping track of future students, current students and alumni. They require a mobile application that will simplify their administrative duties, I will look at the design methodologies that can be applied for infinity Culinary School and ICT4D projects that have been implemented in South Africa.

The students are Infinity Culinary come from disadvantaged backgrounds, the program aims to empower them by providing them with the necessary skills to thrive in the professional world. This literature review aims to find the ways in which researchers, designers and developers can work with people from disadvantaged backgrounds to build systems that can help them. Failure in ICT4D projects often attributed to researchers not being able to interact well with users.

Social interactions differ from culture to culture, researchers must find ways to approach people from varying cultures and earn their trust. As one can imagine this is not a simple task, in this review we will discuss human centred development and its context in South Africa. In section 3, we will analyse three human centred design methodologies namely; co design; participatory design and ethnography. Section 4 will focus on the role of researchers and users in the design process, what researchers should understand when they are working with South African users. Specifically, those users from disadvantaged backgrounds. In section 5, we will discuss two ICT4D projects that have had success in South Africa. By the end of this paper one should be able to understand human centred design and what it means to apply human centred design in South Africa.

2. Human Centred Design (HCD)

2.1 What is HCD

Human Centred Design is a process for developing products for a community via obtaining information from that community [1]. HCD investigates the psychological and physical needs of people through research and data collection. Steen *et al* defines HCD simply as a design process in which developers and designers attempt to include users in their design efforts [11]. HCD aims to bring designers closer to user needs, abilities and challenges through interaction, data collection and or research [20]. As opposed to traditional design methodologies in which in which designers use their preconceived knowledge about user requirements [23], and do not involve end users in their design process. HCD obtains information from the community by approaching them as experts with a role to play in the design process [20].

HCD is a design process that can be applied to any field but for this paper we will only focus on HCD for software development.

HCD is an iterative design process, designers work with feedback from sers to improve the design from an early stage of design [11]. There are many ways for designers to collaborate with and obtain feedback from users. The most common methods include paper prototyping and usability tests [23]. The feedback from end users is what drives the project forward [11], in this way HCD is based on building a collaborative relationship between designers, end users and any other involved party [10].

A collaborative relationship requires that end users have an active involvement in the design process and understand their role in the process [11], it also requires developers to let go of fixed preconceived cognitive plans and schema [33]. Preconceived cognitive plans are those that designers make based on the knowledge developers have before interacting with community members [33]. They can pose a serious threat to an ICT4D project by creating a communication barrier between designers and users [23]. This will make it more difficult for users to give honest feedback about the design.

2.2 The benefits of Human Centred Design

HCD requires developers to initially get to know their users and have a working relationship with them [11], this makes them more willing to make valuable contribution to the project. This also allows designers to accurately capture use requirements [21], even those requirements they had not initially planned on designing for.

HCD requires users to understand the what the project is
trying to achieve so that they can be actively involved in the design [11],
developers need to be able to explain it in simple terms. When designers discuss the project with users, questions arise that remove any misunderstandings or ambiguity about the project that could exist among the team [2]. User involvement encourages the use of non-technological tools in the initial phase of the project [23]. Paper prototypes are often used to accelerate innovation and feedback from users, this way making changes in the design is simple and encouraged [2].

In ICT4D, there is often a problem with getting users to use new technology, HCD involves the users in the project so it is easier for them to accept it [21].

HCD does not require developers to follow a strict methodology [1], so developers have the freedom to reflect on their process and adapt it to the culture of the community it is designing for.

2.3 The challenges of Human Centred Design

For Although there are many good reasons to choose HCD, it also has its own challenges for developers and users. The biggest problem with HCD is breaking the communication barrier between designers and users [32].

HCD doesnot have a strict set of rules that designers must follow, so if designers do not document their own processes very carefully they may lose valuable information or simply not know how far they have come and how much work still needs to be done [6]. It also falls on the designer to determine how many users should be involved in the process. if there are too few users involved, their feedback will be over-emphasized resulting in an over customised product that will only be of interest to a selective group [32]. If there are too many people, the data collected from the users may be inconclusive and or overwhelming for the design team [21].

It is also difficult to find end users that will be motivated to go through the iterative design process until a final product is made [21]. In situations where users and designers speak different languages, it is often difficult to then find users who can articulate their feedback effectively [35]. Van Kleef *et al* warns that designers should be careful when involving users in the design problem, as users may not be aware of their needs

2.4 Human Centred Design in Africa

Like many African countries, South Africa is still in the process of decolonizing their cultures and restoring their sense of identity [27], some people fear that the rapid introduction of technology could potentially hinder the process of decolonisation if designers are not careful [17]. Moalosi *et al.* strongly argues that any ICT4D project should be an “exchange of cultures” and not designers imposing their preconceived ideas into communities. Similarly, Langmia says that we should not rush to using ICT4D to solve every African problem because this will restore the colonial mentality that “western culture is the better”. He also points out that the digital divide in South Africa is further widened by the absence of local languages in the internet. In a community where people are trying to restore their sense of identity, it is very important that new cultures be introduced to co-exist with the old ones [17].

Langmia argues that for Africans to fully utilise technology they must see it as a tool that also belongs to them [17]. This will encourage innovation and creativity by Africans in development. Moalosi also suggests that designers should do this by encouraging early user involvement, making sure that local culture is incorporated into technology and that African leaders should also encourage people to be more open to change. African culture and technology can co-exist, designers must carefully find the right balance of
the two.

3. HCD Approaches

There are multiple strategies that can be used to approach users in the design process. In this section, we will only analyse three approaches to human centred development. The approaches are not fixed and can be applied in any combination in the field. When choosing an approach designers must strategically choose an approach depending on the constraints of the project and the culture of the users.

3.1 Co-design

Co design is an HCD approach that based on the collective creativity of users and designers in finding a solution as a unit [31]. Co design stems from participatory design in that the users and designers combine their skills and knowledge to creatively solve a problem of interest [25]. It threatens the existing power struggle between designers and users by encouraging users to have a driving voice in the design process and not just usability testing [31].

The co design process takes place in a room with the whole team present [34], all team members are viewed as peers so that

everyone can contribute freely [31]. Elizabeth (2008) *et al.* says that the reason it has taken so long for co design to make an impact on the world is because of the pre-existing hierarchies in communities. The designers are often perceived as the better ones because they have more experience, this makes users feel less confident about their contributions [34]. It is the responsibility of designers to make an extensive effort to make the users feel welcomed and comfortable.

The tools used in co design are intentionally simple to use and colourful to encourage users to contribute [31]. Elizabeth (2008) *et al.* says the people have different levels of creativity and as such there should be different toy like resources for people to use, paper prototypes are
constraining [5].

Even though the designers and users are viewed as peers in co design, their roles differ because users are experts in their own culture and communities while designers are experts in system design [5]. Designers are responsible for driving tangible design, encouraging creativity and provide their expertise where necessary [31]. Users are responsible for teaching designers about their culture and using their experience to drive the design [5]. Both teams are however responsible for the success of the project [5], co design creates a sense of ownership by allowing everyone to contribute.

3.2 Participatory design

Participatory design was the first method to introduce users in the design process [30] in the 1970s, by trade unions to create a more democratic office work space and empower workers [25]. Participatory design sees to the development of the organisation and individuals [30], also seeks to ensure that the work on the workers is recognised by the organisation [9]. The issues that commonly occur in participatory design are: the politics of design; the nature of participation and then methods, tools and techniques users that are used to carry out the design process [9].

The politics of design is an issue that faces individuals and their own desire to have power over others, Kensing *et al*. describes this as managers finding new ways to have control over people. It is often difficult for people who have been labelled "in charge" to then treat their workers as peers. In her
journal about *Learning to talk to users in participatory design situations,* Luck *et al.* emphasises that it is crucial for designers to be motivating to users. Collaboration is at the core of participatory design and to teams to fully utilise this they should be empowered [25].

In participatory design the designers and users each have a role to play, designers are experts in design and users are experts in their own experience [7]. During the design process these roles should blur out [7], however the deeply rooted social hierarchy that exists among people tends to persist [25]. This is because designers in participatory design do not establish pre-existing relationship with the users [22*], unlike in co design users are not encouraged to have a sense of ownership with regards to the project.

Participatory design tools and methods depend on the nature of the organization and the product that they want to build [9]. Luck *et al* argues that it is not just the tools that people use in the design process but also that the environment itself should be stimulating. It is very difficult for people to be creative in a boardroom or any other formal setting. Pilemalm and Lindell *at al* suggest that the initial stage of the process should be on paper, the designers should use simple tools to explain the problem to users. From there they can work on more advanced prototypes.

3.3 Ethnography

Ethnography is a human centred design technique in which designers observe users in their everyday lives or natural settings as oppose to an artificial setting where users must try and explain their environment [15]. Ethnography is usually used in a setting where ICT is already taking place and the designers are finding ways to improve it [25]. In many new projects ethnography is combined with participatory design in workshops, so that designers can get a full view of the user's experience [25].

More designers and engineers are turning to ethnography because it tries to understand the "social" world and removes the communication barrier that often exists between designers and users [14]. It also solves the issue of users not knowing what they want or not being able to articulate their needs [15].

Ethnography presents many challenges and constraints to designers, Hughes and O'Brien *et al.* strongly argue that designers should analyse them carefully before choosing ethnography as a design process technique. Ethnography results in a concrete portrayal of the user' situation, as opposed to most design methods that only give an abstract understanding [15]. While this is helpful for designing a better solution, it takes up a lot of time and resources from designers in a large-scale project [15]. In large-scale projects Hughes and O'Brien *et al.* encourage designers to only go into as much detail as necessary for the project as the large data collection be overwhelming or even inconclusive. Alternatively, break down large groups into smaller groups and observe them separately [15].

4. HCD: A south African perspective

Human centred development is centred around people's interactions and therefore to gain a better perspective of HCD in South Africa we need to investigate the cultures and perspective of South Africans. For the interactions between any two groups of people to be a success they both must make an effort be sympathetic [18].

4.1 The emancipation of the ICT4D researcher

The colonial history of South Africa means that for researchers and communities to build successful relationships researchers should to put community members and their culture at the forefront of development [15]. Researchers and Designers should be aware that community members often see ICT4D as a western concept [18]. It is their responsibility to approach local communities with an honest interest in their culture and development, ICT should be incorporated into their culture [18]. Moalosi *et al.*
insists that designers should include socio cultural factors from the beginning of the design process.

South Africa has a large digital divide due to the inequality gap. Designers are perceived as the "haves" and users as the "have nots". The difference in socio economic standards is often what alienates communities from ICT4D researchers. Researchers must be aware of the different reality that users come from, more

specifically when the users are from rural communities. Researchers can try to immerse themselves in their user's culture and reality. In this way, the can honestly capture their requirements [18].

In their research of the emancipation of the ICT4D researcher Krauss *et al.* used a mixture of participatory and ethnographic methodologies. Their objective was to find ways in which ICT4D designers and researchers must be emancipated to build sustainable ICT4D. After their visit to Happy Valley, a rural community in Kwazulu-Natal they learnt that there 3 key tactics to self-emancipation. The first is to allow time to understand their cultures; the second it to remain critical and self-reflect on the data they are collecting; the 3rd one is to have good and honest relationships with the community members [18].

Krauss and Turpin *et al.* had to constant self-reflect on their own values and culture. There were times when their subconscious behaviour may have been interpreted as being rude, they had to also suspend some of their own personal beliefs to show a genuine interest to community members. Towards the end of their research the community members were more open to telling them their stories. They found that when researchers come into a community the community members put them on trial to see if they have an honest interest in the community or whether they just want to impose their ideas and believes. The best way to succeed in this trial is to follow the 3 self-emancipation tactics [18].

4.2 The readiness of communities

Technology has brought a wide range of opportunities to communities, ICT4D researchers are constantly trying to find ways to bring technology to people who do not have access to it. The question often neglected is how ready these communities are for ICT4D. The readiness of communities for ICT4D is described by their perception of ICT4D and their pre-existing relationship with technology in order words how willing a community is to adapt to new technology or to accept technology into their culture [13].

When entering a new community to do research or any other form of ICT development researchers need to assess the readiness of those communities for ICT4D, which technologies they already have, which IT projects are happening locally [19]. Krauss *et al.* argues that change is a cultural thing and some cultures are more resistant than others, communities in which mobile devices are already popular show strong signs to being prone to change. In some community's resistance to change is often due to the intense level of poverty, Krauss *et al*. says that people cannot even begin to think of the value of ICT4D when their basic needs are not being met.

5. ICT4D projects in South Africa

The success of an ICT4D project is a result of many factors. Although these factors cannot be easily templated we can critically analyse them to gain a better understanding of ICT4D development in South Africa.

5.1 The Siyakhula Living Labs

The Siyakhula Living Labs (SLL) in the Eastern Cape is among one of the most successful ICT4D projects in South Africa, it has been implemented in over 5 villages nationwide [28]. The Siyakhula Living Labs is a member of the European Living Labs Network. A living lab is an ecosystem for research and innovation that is open to user communities, researchers, solution developers, research labs, investors, local authorities and or policy makers [29]. Living labs are intentional set up to be diverse so that they provide large room for growth and opportunities [8].

The project site was, the Dwesa rural area was specifically chosen for the project because it has been the subject of many ethnographic research for many years. In the initial phase of the project students from Rhodes University visited the area for a week once a month learn more about the community and its culture. Community members and leaders were all consulted extensively before the initial deployment of the project. Schools were chosen as points of presence for the labs as they were the centre of knowledge in the community. Local communities agreed to take sole responsibility for the safety and security of the equipment used in the labs [4].

Over the years SLL has grown successfully, it is now a multi-functional platform for community members to communicate. The key to SLL's success is that researchers spent a lot of time in the community, learning their reality and day to day challenges [28]. From this they could gather enough information about them decide how ICT4D could be used to empower them. The user side of the labs was designed with the community members while the services side of the labs was designed with the various stakeholders [28].

5.2 The Khanya project

The Western Cape Department of Education (WCDE) aimed to ensure that all their schools had computer labs by the year 2005, from this many ICT projects immerged. One of the most prominent projects this far is the Khanya project [26]. It is an ict4d e-learning project dedicated to addressing the shortage of teacher capacity in schools by empowering teachers to use technology to deliver the curriculum to any learners [16]. The project provides schools and educators with the ICT skills and facilities to deliver the right curriculum to students in underprivileged schools in the province [3]. The project started in 2001 and in 2007 Isaacs *et al.* reported that the project was working in over 600 schools and in the implementation phase of another 200 schools

The success of the Khanya project has been mainly attributed to the research done by the WCDE about their local schools to find ways in which local schools could use ICT to innovatively improve their level of and access to education. The design process of the Khanya project was not explicitly human centred even though the government had information about the different communities. Local community members had to contribute to the establishment of the project in partner with the local government. For a school to be a Khanya School it must have the approval of the SGB, Principal and local community leaders, communities could not help to subsidise the project were excluded from the project [3]. During the implementation phase teachers had to go for computer literacy training with the WCDE to ensure that they could use the system effectively [3].

While there have been many success stories told about the Khanya project, there are also reports showing that there is room for improvement. In a report by Chigona &Chigona *et al.* the project community members often felt that Khanya was too restricting, it

uses its own schedule and the school must work around it. Not all subjects on the curriculum are on Khanya. Similarly, a report by Miller *et al.* also that the teachers were facing many issues with the system. Technical support was up to the school itself and its access to resources; some subjects were not prioritized by the system; there were some other costs that occur that schools did not necessarily anticipate such as software, internet and printing costs.

Miller *et al.* also reports that even after facing all these challenges a good portion of the teachers have a positive attitude towards ICT and are finding innovative ways to work around the obstacles it presents. Chigona & Chigona *et al.* also reported that teachers are showing a positive attitude despite all the difficulties that they are facing with the project.

6. Discussion

There are many approaches to including users in research, in this paper we discussed three approaches namely co-design, participatory design and ethnography. Furthermore, we discussed the strengths and weaknesses of each design approach. There is no framework for which approach to use for which project as each project is unique, however, the strengths and weaknesses of each one should act as a guideline for choosing an approach depending on the constraints of a project.

It is worthwhile noting that these approaches are not a fixed set of rules, designers should feel free to improvise and combine them to suit their projects. With that in mind it is also important to have a plan of action for documenting the design process, to avoid losing data that could prove to be valuable in future.

The key to success in ICT4D is also one of the biggest obstacles to overcome, working with users to achieve the desired goal. When researchers come into communities, especially rural communities they need to bear in mind the colonial history of South Africa and how is still plays a huge role in people's perception of technology and researchers. According to Krauss et al. it is the responsibility of the researcher to suspend their own beliefs while doing research, so that they can remain objective and sympathetic. Researchers must remember that they are not going into communities to change the culture itself but rather to try and see if there is room for technology in their lives and how it can be implemented in a way that is culturally sensitive. In other to achieve this they must have genuine relationships with them. As one can image it is challenging for researcher to be welcoming of other people's culture while having to suspend some part of theirs, but Krauss warns that if people do not see you warming up to their culture they may not open to you [18].

To give a more practical perspective of ICT4D in South Africa we studied two successful ICT4D projects in South Africa that were successful. The SLL approach was a combination of ethnographic fieldwork and co design, the community had been observed for years before for research purposes and they were included in the design process. So even though they were not technologically advanced they were more open to using it because they felt that it was designed for them. It solved their everyday problems and took part in designing it, the SLL is a shining HCD success story [4].

On the other hand, The Khanya project only involved users at the final stages of the project. Community members could decide on the actual infrastructure that would be used and not so much the design of the software being used. Teachers had to go and learn how to use the system and then adapt their teaching style to it, they could not even choose their own schedule [3].

These are basic system flaws that could have been resolved if the system had been resolved if a few schools were a part of the design process. The success of Khanya was due to the readiness of community members to implement the system, the need for ICT was already strong and as a result many schools are willing to work around the many obstacles it presents [3]. While the success of the SLL project was a mixture of the community's acceptance of ICT and the emancipation of designers [18]. It could be hypothesised that the SLL project may have had some design or technical difficulties but because community member had a strong sense of ownership of project they could easily look over it.

7. Conclusion

We have seen that human centred design is simply a design methodology that iteratively involves users in the design process. HCD has its strengths and weaknesses however the benefit if using HCD outweigh the challenges that would later be faced. The challenges that come with it are often the result of the relationships between developers and users. People's cultures are strongly influenced by history and Africa's history with westernisation is often what makes communities resistant towards ICT4D. This makes it more difficult for researchers to attain success in ITC4D in Africa [17].

The are many ways to approach involving users in design, they all depend on the constraints and requirements of the project. If there is a small group of users and not much of a time constraint then ethnographic fieldwork would be recommended. In cases where there are time constraints and designers do not have the resources to work through large quantities of data there is the option for participatory design or co design. Co design emerged from participatory design, co design leaves the politics out of the design process and gives users a sense of ownership [25].

In this literature review we have discussed the roles that the designers and users must play for ICT4D in South Africa to be a success. We have discussed the importance of the emancipation of the researcher, their reflective process and what is required from them. Researcher need to go to great lengths to prove to community members that they can be trusted and that they have a genuine interest in the development of the community, failure to do this can result in an increase in resistance from the community towards researchers. Researchers are faced with the difficult task of immersing themselves in the community's culture while constantly reflecting on themselves as their process as this is essential data for the project [18]. They must be honestly sympathetic to communities while suspending any contrasting

beliefs they may share to avoid conflict. On the other hand, communities need to be ready to accept ICT4D, their willingness to integrate it into their culture is what determines the success of the design process [19].

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