CO-DESIGNING IN RURAL UGANDA: MOBILITY AIDS AND INCOME-GENERATING DEVICES FOR PEOPLE WITH DISABILITIES

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Abstract

This paper examines a two-year collaborative project concerning innovative design for people with disabilities (PWD) in the Kasese district of Uganda. It is estimated that 15% of people in Uganda have some form of disability. Although the number of those in extreme poverty is being reduced, studies indicate that PWD are being left behind. The project involves several international stakeholders including: universities, NGOs, and grass roots organizations for people with disabilities in Uganda and Canada. The project works with CanUgan, a Canadian NGO that works directly with the Kasese District Union of People with Disabilities, a self-organized group of people who advocates for the rights of PWD and provides devices to assist them. Through a process of co-designing with end users in Uganda, students have shown that uniquely designed products suitable for local needs can be developed successfully. Working with a local manufacturer allows prototypes and products to be tested with end users, leading to iterative improvements and quick changes to the design. Follow up work by a graduate student focused on researching knowledge transfer, capacity building, design efficacy, and the sustainability of the project. Specifically, one of the first products envisioned, a hand powered tricycle that also functioned as a solar powered cellphone charging kiosk, was provided to a number of recipients. The researcher was able to investigate how well the products would hold up in the field, how much money could be generated, and whether this could be a sustainable design from the point of view of business. Research methods included prototyping, questionnaires, personal interviews, and meeting with all of the stakeholders involved during a field trip to Uganda. The main conclusion is that though new innovative products may be well received initially, follow up research and continued involvement is necessary in order to create sustainable success.

Keywords: *Participatory Design, Design with the Majority, People with Disabilities, Uganda, Income-Generation.*

Introduction

The Design for Disability in Kasese (DIDK) Project was a two-year collaborative effort between Carleton University in Ottawa, Canada and stakeholders in Uganda and Canada. It was funded by a generous grant from the International Development Research Centre in Ottawa, Canada. The project was started through the Research Education Accessibility and Design (READ) Initiative at Carleton University and began as collaboration between Carleton's School of Industrial Design and an Ottawa-based NGO called CanUgan that raises money to support the Kasese District Union of People with Disabilities (KADUPEDI) in western Uganda. KADUPEDI is made up of volunteers who have

disabilities themselves and whose goal is to advocate and to assist others with disabilities in their region. One of CanUgan's main efforts is to support the local manufacturing of hand-powered tricycles, which are used to help people with mobility impairments transverse the rough terrain in the area. Whereas the School of Industrial Design initially became involved in the re-design of this locally made tricycle, it became clear that the design of new devices for people with disabilities in Kasese should consider economic empowerment as well (Hallgrimsson et al. 2013).

Although Uganda is progressing well towards its Millennium Development Goal of halving those who live in extreme poverty by 2015, it seems that people with disabilities (PWD) are being left behind (World Bank, 2014). It is estimated that 15% of the population in Uganda is disabled in some way (United Nations [n.d]). There is an undeniable link between disability and poverty, especially in the majority world, where 90% of the world's population resides. Disability is also the result of environmental pollution, lack of nutrition, and insufficient access to medical care (International Food Policy Research Institute, 2009). People with disabilities are often unable to access the traditional job market, and must be cared for by their family, which leads to stigmatization and marginalization. This project aims to provide PWD with unique new devices that assist them in mobility while also affording the opportunity to make their own income, in order to empower them to contribute to their family and gain independence.

There are many reasons to manufacture these assistive devices in Kasese. Local production reduces transportation costs, makes repair and maintenance throughout the product lifecycle possible, and creates local jobs. These jobs are not limited to those who build the devices, but include the recipients since the devices are built with economic empowerment in mind. A central tenet of the project involved designing *with* stakeholders, instead of just *for* end-users. By designing with input from the community, the manufacturer, local organizations, and through discussion with end-users, some of the original ideas completely transformed throughout the process, to better focus on the needs of the people who would receive the devices.

Methodology

Two cohorts of four undergraduate students from the School of Industrial Design participated in the project as part of their final year capstone project (Figure 1). The students spent a year researching needs, working directly with CanUgan and KADUPEDI, and travelling to Uganda as part of a field trip in the winter semester of their studies, before returning to Canada to complete their designs (Harambee Uganda Project 2013).

Each student was responsible for the design of a unique device that could assist those with disabilities in the Kasese region of Uganda. The students started by researching many relevant issues, such as: Uganda, agriculture, disability, gender, income generation, and access to technology and education (Design with the Majority 2014). They then exchanged emails and participated in Skype calls with KADUPEDI, to verify product needs as well as making sure that the materials and processes of manufacture would be available in Uganda. Drawings were sent to a local manufacturer so that he could create initial prototypes before the field trip to Uganda.

Figure 1: A summary of the first cohort of fourth-year student projects during the 2012/2013 school year (Harambee Uganda Project, 2013).

Once in Uganda, the students worked with local stakeholders including the manufacturer to validate and test the locally built prototypes. By working together with Kio, the manufacturer, they were able to iterate and make changes to the design quickly, thereby improving both the usefulness and manufacturing process for the device. Device recipients were invited to Kio's shop to give their input, by testing the devices and offering functional feedback. The students were also able to visit these recipients in their own homes, giving them a better understanding of what the lives of PWD like in the local community. This opened their eyes to the extremely basic living conditions and the reality of these peoples' lives. Back in Canada, the students used the new discoveries and insights to create final prototypes for their year-long project that in turn could be reproduced in Uganda.

Whereas the design projects were diverse in their scope, they primarily addressed mobility and income generation. Table 1 shows a list of eight projects done by the Carleton students as well as one project completed by a student from Makerere University in Kampala who joined the effort in the second year.

Year	Student Name	Project Description
2012/2013	Andrew Theobald	Solar-powered cell phone charging kiosk tricycle
2012/2013 2013/2014	Carmen Liu and Perez Magoola (Makerere)	Ground nut grinding attachment for the tricycle
2012/2013	Alyssa Wongkee	Re-design of the original hand-powered tricycle
2012/2013	Ruby Hadley	Rollator for the disabled and elderly
2013/2014	Jennifer Vandermeer	Wheelchair that converts to a hand-powered tricycle
2013/2014	Charles Williams	Ground nut shelling attachment for the tricycle
2013/2014	Luis Garcia	Self-propelled stool for kitchen gardens
2013/2014	Zoe Krug	Baby carrier seat attachment for tricycle
Table 1: Carleton University Student Projects (CanUgan Project) – 2012 to 2014		

The graduate students work focused less on creating specific design details and more on the big picture and long-term success of the project. The main considerations included capacity building, knowledge transfer, sustainability, and design efficacy. Specifically the research focused on a detailed follow up of two undergraduate student projects completed in the first year that had exemplified how tricycles not only provide freedom, but can also be adapted to serve as platforms for income generation. The first project was a system for harnessing power from the hand-operated tricycle to do some other useful work. This was demonstrated through a grinder that could be attached to the drive-train of the tricycle in order to grind ground nuts into flour (Figure 2). The second project was a design that used the tricycle and a solar panel to create a kiosk where a person could charge mobile phones for a fee (Figure 3). The primary research methodology included building multiple devices of the solar-charging kiosks within a 12-month period and giving these to recipients to use in their everyday lives.

Figure 2: Tricycle with ground nut grinding attachment, designed by Carmen Liu (Harambee Uganda Project, 2013).

Figure 3: Tricycle with solar-charging attachment for cell phones, designed by Andrew Theobald (Harambee Uganda Project, 2013).

The research was broken down into the following four key questions: how does the device affect the recipient in both social and economic ways; does the device create independence or dependency; is the design appropriate for the user and their environment; and what can we learn from this type of cross-cultural, interdisciplinary “Design with the Majority” project? The research methodology was aided by a co-supervisor from the Institute of African Studies at Carleton and included three main sources of qualitative data that was triangulated for insights. Data was generated through questionnaires, observational research and interviews (Martin & Hanington 2012). Local volunteers

from KADUPEDI helped the researcher by distributing questionnaires that were filled out for each potential recipient (a total of 7) before and after the devices were given out. The researcher also did field work in Uganda for two weeks in February of 2014, in order to make observations and conduct in-person interviews with many different stakeholders (Bernard 2011). These included meetings with Makerere and Kyambogo universities in Kampala, with faculties related to mechanical engineering, fine arts, and disability studies. A workshop was held in Kasese with other disability organizations (including specific groups for women, children and land-mine survivors) and government officials in related departments. The research also included detailed discussions with members of CanUgan and KADUPEDI about their thoughts on the current states of affairs for PWD in Kasese, and what they would like to change in the future. The research thus examined many different factors that might influence a person's life, including; household income, daily chores/tasks, family structure, access to services in the community (water, electricity, etc.), physical ability (and type of disability), and future aspirations.

Key research findings

In terms of design process, undergraduate students learned many lessons that were noted by students, faculty and CanUgan representatives in follow up discussions. These focused primarily on the immense importance of designing with end users and other stakeholders, including the manufacturer. They also gained a new appreciation of how resourcefulness in manufacturing and creativity can overcome the lack of specialized tooling and processes. The students noted how they could not truly appreciate the culture and everyday life and reality of living in Kasese without the field work. Their ideas had been vetted and reviewed by CanUgan, KADUPEDI, and Kio Metalworks prior to their arrival in Uganda, however, the designs needed additional development that could only happen in the local setting. A prototyping mindset was essential in order to allow for much needed iteration of the design in the field (Catapult Design 2013). The most important aspect of this is that it shows incredible resourcefulness both by the manufacturer and the students to work together and find solutions that are context appropriate. Many of the adaptations that were envisioned for income generation are in fact what set the products apart and make them especially meaningful. These small volume adaptations are also something that the manufacturer now can envision on his own and has resulted in an interest to propose new and useful devices that he himself has designed including a charcoal powered popcorn machine and hand operated tool grinder unit. The idea of encouraging design innovation was noted by members of Makerere University as well.

Additionally the graduate student work provided much needed research into the deeper underlying issues associated with this project. Follow up research provided insights into the daily lives of the recipients and underscores the importance of how any organization that wishes to be involved in this kind of design project should stay involved past the initial design hand off. In the case of a not-for-profit type design project, this follow up becomes an extra challenge and cost for the project.

Subtle insights have a large impact on the success of the project, as shown by the following findings of research on recipients of solar powered kiosks. Before the project, it was unclear how much money the recipients could generate from such a business and how this could be tracked. Contrary to the presumptions of the design and research team, recipients were found to keep accurate daily records of their profits in a notebook. They were able to account for how the devices were being used and how much income was generated. This in turn allowed the researcher to compare sales results. The recipient with the highest average generated income was able to make five times the amount of the

lowest income generating recipient on average per day. This likely had many causes, including location, price charged, and time allotted to selling the service each day. The recipient with the lowest sales results lived in a more rural community, charged a lower price, and was also responsible for taking care of her family as well. At the same time both recipients had improved feelings of self-worth. Even just earning a very small income allows others to think of them as a contributing family member instead of being seen as a “burden” in their community (Cox 2014).

While visiting recipients it became clear that there were also other aspects to income generation that had not been foreseen. Whereas tricycles were brought inside at night in order to prevent theft, this also served another purpose of using the battery powered by the solar panel to light the houses at night. This was seen as a great advantage, since kerosene is still used for this purpose in the villages, but is both costly and harmful to indoor air quality. Research also uncovered issues with maintenance. Although the tricycles worked very well, routine maintenance was not always considered from the beginning, such as changing the tires or minor mechanical failures. The solar-charging electrical components also ended up being much more expensive than originally anticipated, necessitating more research and sourcing in order to bring these costs down in the future. These types of issues highlight the importance of more involvement from local authorities and universities. In order to make the project more sustainable in the long run, discussions have been initiated with Makerere University, due to the proximity of their campus and their willingness to use their technical expertise to help with these types of projects. One such project was already initiated and looked at how the ground nut grinder, which was designed and developed in the first year, could be improved and built completely from locally sourced materials as opposed to using an adapted maize grinder from overseas.

The most important aspect of these types of projects is continuous and long-term monitoring and evaluation. Although a project may originally be well-received, it is likely that problems will occur down the line. Some devices were found to end up breaking and subsequently being unused. Follow-up also allows designers to see how people are using the products, and modify them to better fit into the lives of the people who will use them (Figure 4). It is also important to do small prototype runs of products for testing before implementing on a wide-scale, which prevents unnecessary mistakes from occurring. This follow up can include questionnaires and interviews and can now be greatly aided by KADUPEDI.

Figure 4: Fauza - A current tricycle user with a solar-charging attachment (Photo Credit: Amanda Cox).

Conclusion

This case-study taught us (and our partners) many new things about the convergence of design, development, poverty, and disability. However, since it was a small sample-size, it is essential for others to conduct similar research in order for people to understand the effects of design and products on the field of international development. The researcher would like to encourage other designers to start thinking about design for the majority world. Not only are these projects beneficial for device recipients, they also offer a financial incentive, and empower people with disabilities in poor regions in a variety of ways as shown through the results. It is important for designers to understand that these projects are not easy, and that there are many complexities involved in projects that span cultures, languages, disciplines, and continents. However, by bringing together a group of partners who are committed to achieving a goal that is beneficial for everyone involved, groups can work together to ensure equal access to design for all.

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