PLATFORM FOR EMPOWERMENT

ANDREW THEOBALD

HARAMBEE >>> PULLING TOGETHER

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PROJECT SUMMARY

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PROJECT OVERVIEW

To put my project in context, one has to understand the overall project.

The Design Innovation for Disability project is spearheaded by the School of Industrial Design with funding from the International Development Research Centre (IDRC). As part of this larger project, Harambee, my team for the 4th year major studio project has been invited by CANUGAN, an Ottawa based NGO, to look for design opportunities to aid the disabled in Uganda. CANUGAN works with a partner NGO in Uganda called KADUPEDI to provide people with disabilities mobility aids, canes for the blind, hearing aids among other things in rural Kasese.

In particular, CANUGAN has provided over 70 hand tricycles to those with disabilities in their legs. This is the greatest need and the greatest opportunity. Or team has chosen it as the focus of our project.

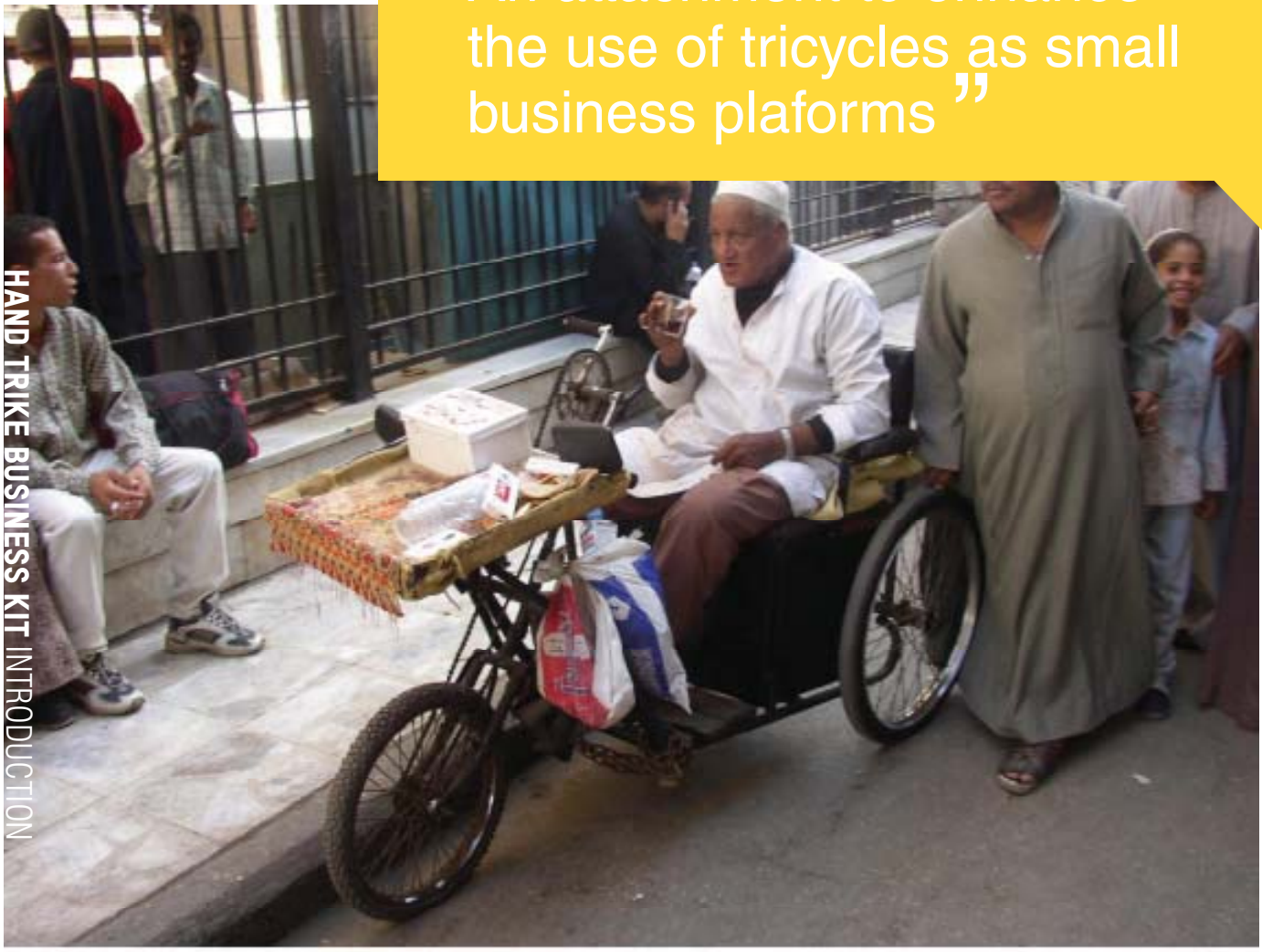
Navin Pradesh co-founded CANUGAN as a result of one woman, Biarra Gatrida, who stated she need a hand tricycle above all else to gain independance. Navin wrote about her on his blog, and his friends and community soon organized to provide Gatrida and many others with tricycles.

Kio is a local fabricator, welder, and mechanic who was contacted to make the tricycles. He has since made every one, improving his design each time (none of which have broke down). Kio is entirely self taught, and works almost entirely by hand, measuring with his fingers. He is our partner in this project, we aim to build his capacity for providing wheelchairs.

We have also partnered with the READ initiative at Carleton, which advocates for disability, as well as external mentors in humanitarian design. We also hope to work with the Makere Univeristy in to promote design for disability as an opportunity for young designers in Uganda.

“CANUGAN has provided over 70 hand tricycles in Kasese”

> “An attachment to enhance the use of tricycles as small business plaforms”



PROJECT BRIEF

This brief summarizes my individual project direction.

Background

In Uganda, people with disabilities face extreme poverty. Without any kind of government support and facing discrimination in the workplace, many people with disability resort to begging simply to survive. Financially, mobility aids and crucial medical treatment and rehabilitation are far out of reach for people with disability. However, a tricycle allows a disabled person to make a livelihood. Many do so by hauling goods for tens of kilometers, or selling wares hung off the tricycles in the market.

Opportunity & Users

There is an opportunity to open more options for income generation for people with disability beyond simply hauling or vending. In addition, Uganda has many different kinds of innovation micro-businesses that could be adapted for use on a tricycle. The tricycle itself adds the element of mobility to these businesses and could be leveraged, to give disabled users an advantage over other businesses rather than just parity.

Product Definition

I will combine a number of mobile technology microbusinesses (namely cellphone charging, GSM Payphones, and Mobile Money and Airtime sales) using the tricycle as a business platform. The design should be flexible in that it can be fitted onto difference tricycles and be adapted for use in other types of business. These modifications to the existing tricycle could be made by custom fabricators, or sold as part of a kit by Ugandan cellular companies (MTN, Airtel, Warid, ect).

Requirements

- All points of interaction must be reachable while seated in the tricycle
- The design must allow for interaction with customers and handling of transactions
- The must be considerations for security of equipment, cash, and inventory
- The electronics must be powered by a mobile “off grid” power source
- The customizations must not interfere with the tricycle’s primary purpose – mobility
- The design identity must be recognizable as a cellular shop for potential customers

Manufacturing

In Uganda, metal fabricators, mechanic shops, and carpenter shops are widespread. The level of craftsmanship is very high despite limited tools and equipment. Ideally, the tricycle customization could be performed at any fabrication shop, and not be limited to

FINAL CONCEPT

Mobile Technology Business Module

The tricyle MOBILE TECHNOLOGY BUSINESS MODULE allows people with disabilities to bring mobile technology services to rural areas while generating an income for themselves. It leverages local Ugandan innovations in technology use, combining a GSM payphone, solar phone charging service, and community information hub. The mobile platform of the tricycle is ideal for extending these services into rural villages that still lack technological infrastructure. The various technological components are packaged into a unified structure, complete with MTN (carrier) branding. It will be sold as a business kit, assembled, and fitted to existing tricycles. It is crucial that the final design accomodate the users interactions with equipment and transcations with customers.

In rural areas, many don't have access to cellphones,either due to poverty or poor network coverage. GSM cellphones bridge the gap, often with an attendant who times the call andcharges accordingly.

Many Ugandans own a cell phone but have no access to electricity. Entrepreneurs offer charging from a battery, generator, mains power, or solar panel for a small but profitable fee.

Community Knowledge Workers provide an important service in that they provide relevant information about agriculture prices, health, and community announcements to those without access.

"FIND NEW OPPORTUNITIES TO GENERATE INCOME FOR UGANDANS WITH DISABILITY LEVERAGING MOBILIITY, MICRO-BUSINESSES, AND LOCAL INNOVATION"

BUSINESS FUNCTIONS

INCOME GENERATING ACTIVITIES

PHONE CHARGING $ $ $

Phone charging is a very viable business in areas where there is cellular coverage but no electrical infrastructure.

AIRTIME SALES $ $ $ $

Prepaid airtime cards are a daily purchase for Ugandans. Authorized dealers sell on behalf of carriers at a decent profit.

GSM PAYPHONE $ $

GSM payphones are still relevant in rural areas with poorer coverage and due to upcoming bans on cheap counterfeit phones.

MOBILE MONEY $ $ $ $ $

Becoming a mobile money agent would allow a tricycle user to act as a mobile bank, via exchanging airtime for cash.

CO-DESIGN PROCESS

STAKEHOLDER PARTICIPATION IN DECISIONS

The design process facilitated decisions with local stakeholders including craftmen, NGOs, and existing tricycle users.

CONCEPT ITERATION

PHASED EVOLUTION THROUGH PROTOTYPING

V1. TESTING RIG

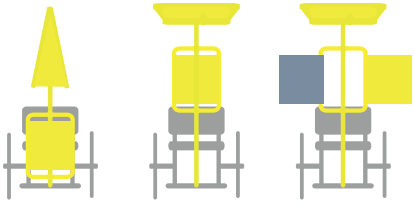
V2. USER DESIGN

V3. REFINED MODEL

TRANSFORMING USE MODES

RECONFIGURABLE ERGONOMICS FOR ACCESSIBLE USE

In order for a person with disability to particpate in small business using their tricycle, the design must allow for easy set up and take down, safe an unhindered mobility, and clear access to inventory and customers. To minimize trade offs, this design can change shape to suit each use case.



SETUP TRANSPORT TRANSACT

MOBILE TECHNOLOGY BUSINESS MODULE

ADAPTABLE CONCEPT FOR HAND TRICYCLE BUSINESSES

KEY ELEMENTS

MODIFIED CANOPY
Created using typical market stall umbrella.

SOLAR CHARGING KIT
Locally sourced ReadySet solar panel and battery.

GSM PAYPHONE
Available through carriers, reliable boosted antenna.

UNIVERSAL CHARGER
Created using typical market umbrella.

FOLDING STRUCTURE
Using umbrella mechanics and tube steel for telescoping and rotating


MOBILE
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SECONDARY RESEARCH

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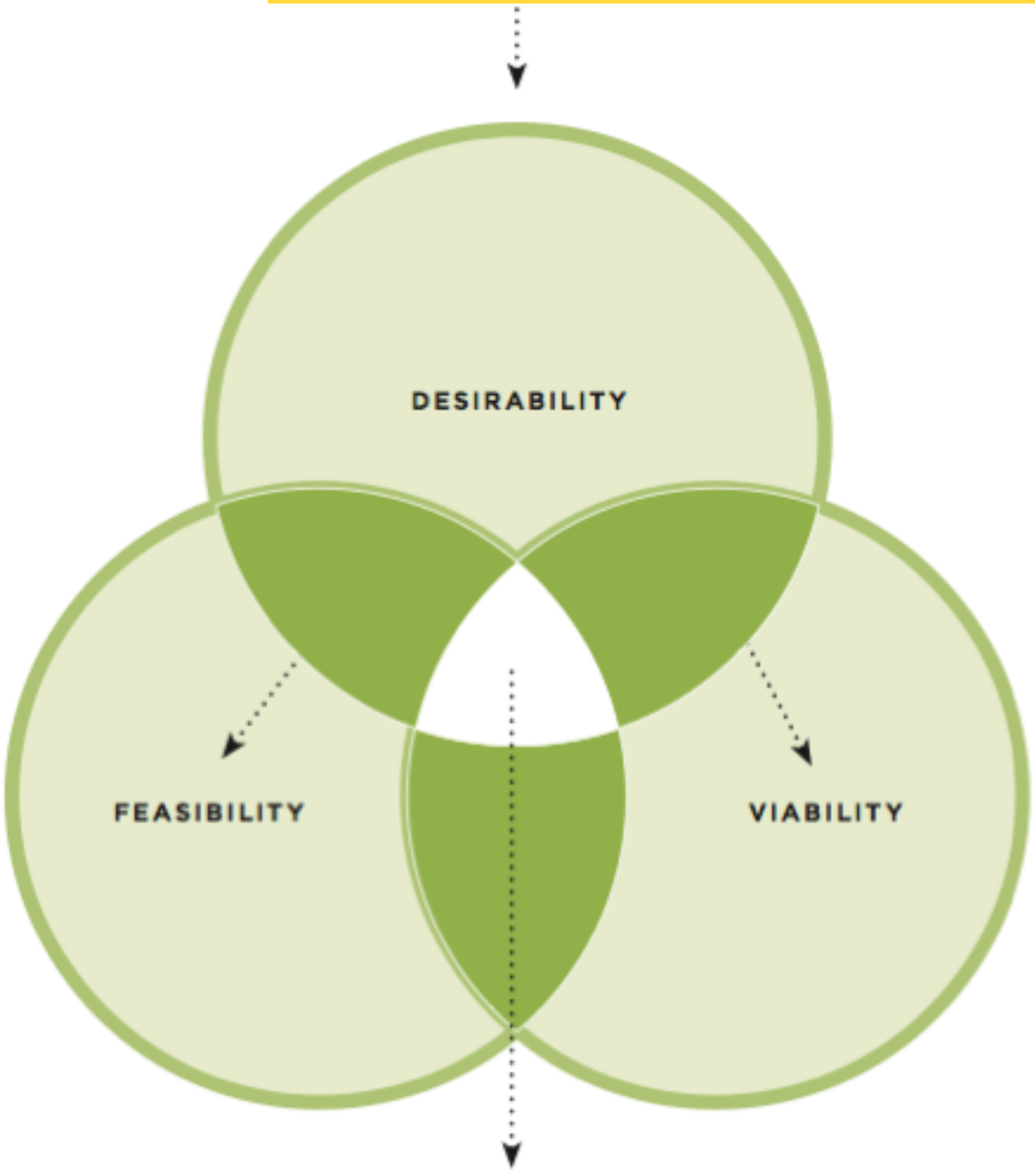
“ A free innovation guide for social enterprises and NGOs worldwide ”



The solutions that emerge at the end of the Human-Centered Design should hit the overlap of these three lenses; they need to be **Desirable, Feasible, and Viable.**

HUMANITARIAN DESIGN

Humanitarian design is a growing field, with an active debate around developing best practices.

Humanitarian design is an exciting field in industrial design that is only now starting to gain prominence. Top design firms and consultancies are creating, and sharing methodolgies for conducting humanitarian design, either on there own intitiative or on behalf of clients who want to demonstrate good corporate citizenship.

Human centered design is one such methodology and is a merger of tradional humanitarian design and user centered design. That is, it is aimed toward solving humanitarian and social issues but proceeds to do so by taking in the perspective of the end users via ethnography and field research. IDEO distributes its own HCD toolkit for free so NGO's and social enterprise can apply these principcals. I want to take such an approach to this project.

Meanwhile, scholars and professionals are debating the most ethical and effective ways to conduct humanitarian design. There is a real concern over "design imperialism", where people from poor countries are exploited while the designers benefit, or where design becomes a vehicle for imposing the designers' ideals upon vunerable groups.

Participatory design practice is also very relevant towards our project. It traditionally dealt with integrating non-designers professionals, usually clients, and executives in a design or design thinking process. However, participatory design is more often being applied to humanitarian design, often across cultures.

Having Kio as a local fabricator with experience designing and building hand tricycles is a huge asset for our project in that we can have a particpatory process in that our designs are "filtered" through his processes.

"Human Centered Design is a merger of Humanitarian and User Centered Design"

WHEELCHAIRS IN UGANDA

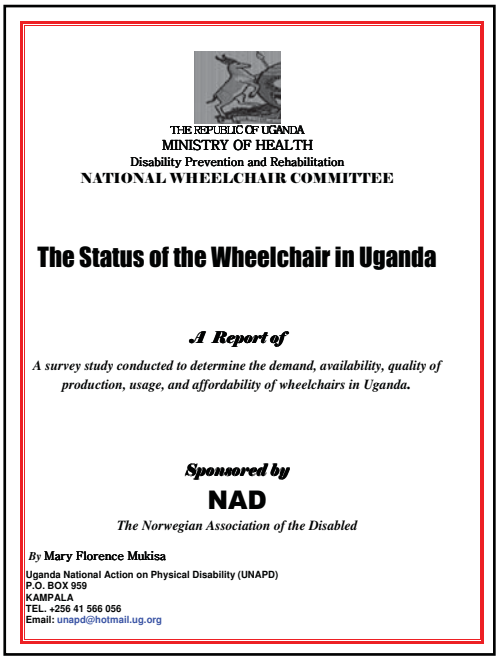
The state of the industry is ever-changing

There have been a number of studies on the state of the mobility aid industry in Uganda, as well as the status of people with disability.

As well, their have been many different projects to design, manufacture, and distribute appropraite mobility aids.

As funding is inconsistent many of the smaller workshops are more or less inactive, including the official government run Mulago workshop. The number one manufacturer of mobility aids today is the Kampala Chesire Home, which is also a rehabilitation center for children.

There are a few standard “local” designs, including the “huckstep” tricycles and wheelchairs, three wheelers, and Design knowledge is shared in education centers across east Africa


THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH
Disability Prevention and Rehabilitation
NATIONAL WHEELCHAIR COMMITTEE

The Status of the Wheelchair in Uganda

A Report of

A survey study conducted to determine the demand, availability, quality of production, usage, and affordability of wheelchairs in Uganda.

Sponsored by

NAD

The Norwegian Association of the Disabled

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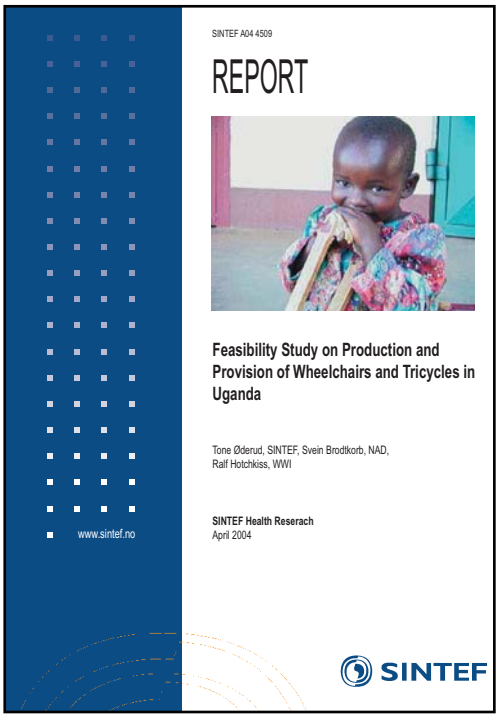
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REPORT

Feasibility Study on Production and Provision of Wheelchairs and Tricycles in Uganda

Tone Øderud, SINTEF, Svein Brodtkorb, NAD, Ralf Hotchkiss, WWI

SINTEF Health Reserach
April 2004

www.sintef.no

SINTEF


POWDER
PHOTOGRAPHS.

> “ Uganda is one the fastest growing economies in Africa ”

UGANDAN MICROBUSINESS

A country of mobile, micro, entrepenuers

In Uganda, over 90% of people are self-employed either through farming or small business. The majority of small businesses operate on a “micro” scale --- small streetside or market stools.

One of my key inspirations was innovation Uganda entrepreneurs who built their own “mobile” businesses on wheels, on carts, motorcyles, boards, boxes, blankets, or even balanced on their heads. To me, these inventions were true “Uganda Design for Ugandans” which was something I wanted to showcase in my project.

My thought process was that the tricycle would serve as a ideal platform for these kind of businesses, and I’d be able to leverage it’s mobility and carrying capacity.

For Ugandans with disability to participate in the Ugandans to provide a living for themselves, often incapable of physical farming labour, they must be included the micro business economy.

“70% of businesses in Uganda are on the micro level,”

> “The two main opportunities seem to be distance hauling and skirting reglations”

TRICYCLE ENTREPRENEURS

The need to make a dignified living is equally as important as mobility to give disabled users independance.

From my research the indication is that many people with disabilities in Uganda typically are engaged in some form of begging, even those provide with tricycles. Some essentially commute from rural areas to large cities to beg. In fact, it would seem to be the primary and most visible livlihood for people with disabilities.

However, there a numerous examples both in Uganda and around the world of individuals using their tricycles for small businesses. Gatrida herself carries and sells charcoal. Another CANUGAN beneficiary performs cross border trade.

From the case studies I assembled there seemed to be two major business models: long distance hauling (from supplier to market) and skirting regulations (i.e. at border crossings). The authoritiies take pity on people with disabilities and except them from certain rules, like selling wares outside of approved market areas in cities.

"Many PWD's are engaged in some form of begging"

Vending to tourists can be a profitable business and many African governments are trying to regulate and tax the trade. The possibiliy of having a business on wheels becomes a more compelling strategy if it be a competitive advantage.

Small vendors and street hawkers are common in Uganda and are refered to as "Batembeyi". Make shift stalls sell fresh produce by the roadsides, little grills sell bbq, chapati, sweets and "rolexes" a popular omlette snack. Hawkers wade out into stalled traffic and sell small goods to passengers of of pin boards. Children have little businesses to help pay their school fees, some make intricate mechanical toys out of wire. Vendors buy cheap imported goods from china, like socks, sunglasses, and pocket radios. You can purhase cell phone "AIRtime" card, or pay to use a phone, or to charge your own. Water vendors sell water at exhorbitant rates when the public taps run dry.

The examples of resourceful entrepreneurialism in Uganda are endless. The challenge is find the the perfect model to adapt to tricycle based vending, given it's advantages and disadavantages.


MTN Mobile Money
AVAILABLE HERE
MTN Mobile Money
MTN
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Money
UAG 554N

MOBILE TECHNOLOGY

Ugandan creativity overcomes limited manufacturing infra-structure.

Everywhere in Uganda you see micro-businesses relating to cellular technology. They sell “air-time” scratch cards to top up minutes, cellphone charging, paid calls, mobile money service and various cellular accessories.

MTN is the largest carrier in Uganda, and relies on private vendors to provide it’s services. It offers business kits and training to those wanting to to act as vendors.

NGO’s have recognized the value of this for income generation and have partneredwith MTN to provide kits to the rural poor.

MTN maintains a consistent brand identity across its stores, signage, even its employee uniforms. MTN is so instantly recognizable, that even home built little stalls are painted MTN yellow and stencilled with logos so customers instantly realize the business model. This form of signalling is crucial whether or not the tricycle is “official”. It’s important the design fit the MTN aesthetic and there fore it’s necessay to have large surface areas to place branding andinformation.

Some unique innovations in mobile technology in Uganda are in fact in advance of ours. Mobile Money and mobile payments allow Ugandans to use their phone as a bank account, and transfer money to any other phone. Meanwhile, local music and videos are shared SD to SD card and local music shops allow you to load up on the latest tracks from a computer.

CASE STUDIES

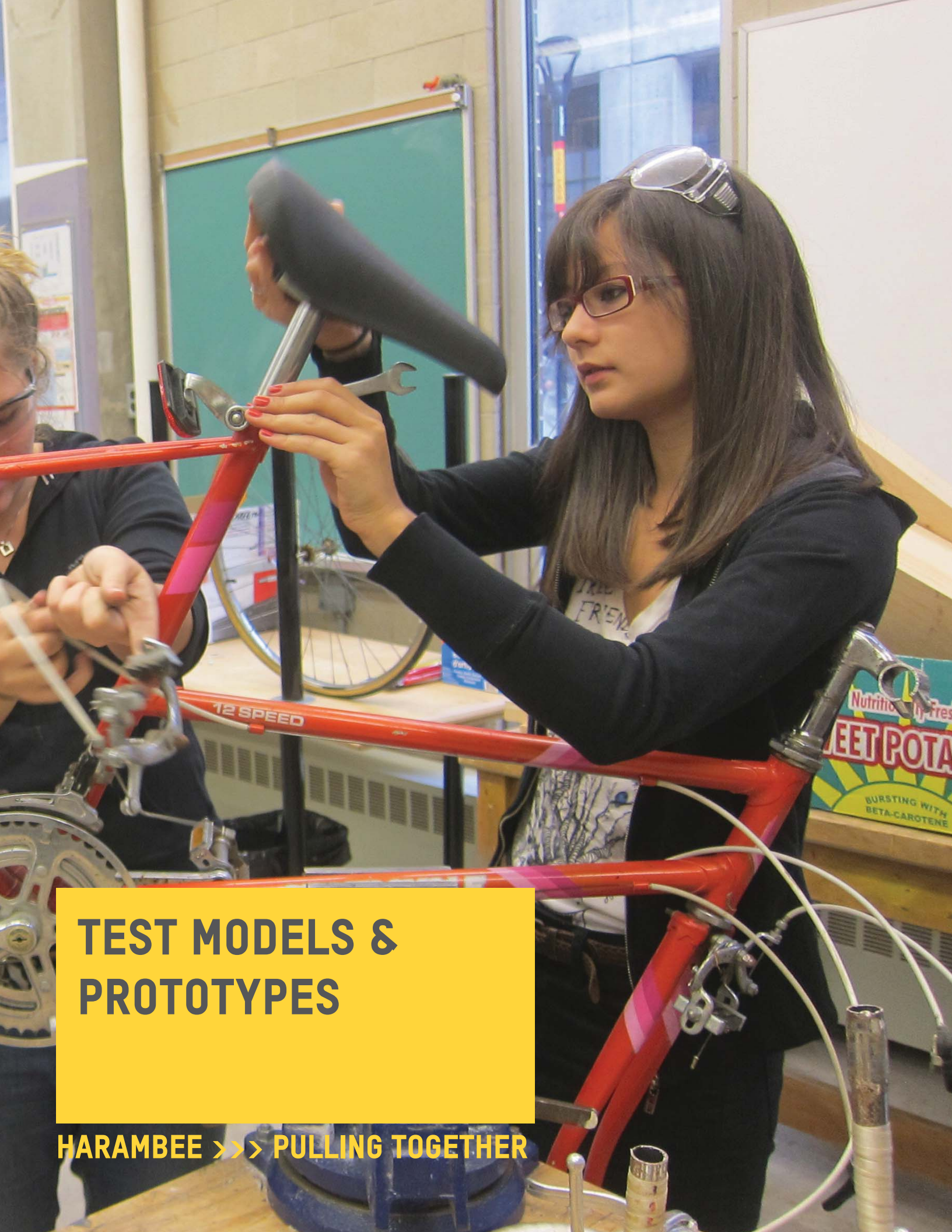
Similar projects provide lessons and analogies

A number of projects have focused on expanding “last mile” electrical and cellular infrastructure to remote areas. Mobility allows for these services to be delivered to remote areas that wouldn’t other wise support a permanent business, and to seek out customers outside of trading centers. or at busy events (market days, community events).

The Village Phone was implemented in parnership with the Grameen foundation to great success. It offered enterpreneurs a kit with a cellphone, battery, and booster antenna to bring telephone services to remote areas without network coverage.


MTN


EXIT



TEST MODELS & PROTOTYPES

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EXIT
Main Office

REPLICA TRIKE VS. WHIRLWIND

Assembling, testing, and comparing both prototypes was extremely valuable to out project.

At the beginning of the project, we immediately made a test prototype to investigate some questions we had about Kio's design (of which had a scale model) and of the fabrication process.

Aaron Wieler brought in his more advanced prototype and allowed use conduct some testing.

Each prototype taught us alot, and being able to make the direct comparison was even more valuable.

Most relevant to my project was that if you keep the bike stem perpendiular to the ground and attach a cargo rack to the frame of the bike rather than the rotating part, it is a completely stable platform. This allows it to be used as POS display without tipping or bouncing off the merchandise.

Some Other Key Lessons:

- avoid compound bends, join tubes for easy of assembly
- "tiller" steering is more stable and ergonomic BUT it forces you to lean out of the turn and tip.
- pushing a brake lever to stop is a postive feedback loop, better to pull
- tandem versus offset crank is easier, but not as steady power
- two wheels in front requires rear wheel drive
- pushing the back wheels directly provides an adequte low and reverse "gear", if they have traction


Tutoring

CARGO + POS MODELS

Using Models to explore and evaluate alternatives.

Perhaps my most valuable exploration was through model making. I was able to quickly experiment with different configurations of POS and cargo carrying accessories merely by strapping the same elements in different combinations with zip ties.

I used recycled “scrap” materials like shipping palettes, boxes, cardboard to emulate the kind improvised user customization methods I would expect in Uganda. The key part that would have to be fabircated is some equivalent to the articulating and folding tv table I used in my model.

A number of my core assumptions turned out to be wrong, and I was able to revise my project.

Key Findings:

- A front mounted cargo tray is quite stable and manouverable, and it doesn’t add much “length to the bike”, however it is very hard to reach.
- A back mounted cargo tray that extends out, or trailer makes the trike feel uncomfortable to drive as its hard to locate your “load”.
- A side mounted tray is the most ergonomic and actually does not interfere with steering or balance
- Transforming between “modes’ open interesting possibilites
- Details like a space fo signage and a canopy are key to the product identity of vending

COFFEE TRIKE TESTING

Gaining a sympathetic perspective on the use case.

Having the opportunity to use a fully operational vending tricycle prototype I decided to conduct some sympathetic testing by selling coffee around campus. The environment and context are completely different from Uganda, however it helped provoke a better understanding for "what it's like" to try and solicit business in a tricycle. I also tied my legs so as to not have use of them.

Overall, people were not receptive to this unfamiliar form of coffee shop. Some seemed to assume I had disability and I was treated differently, often avoided or condescended to. However, functionally it was a great success, and i was able to set up, ride around, sell coffee, and take down without much difficulty.

Lessons Learned:

- The "charity" factor kicks in with a mobility aid, people pay more
- Carrying cargo in the leg space is cramped and causes soreness
- It is useful to be able to set up and take down the vendor "mode"
- Often staying in one spot is more effective than vending while rolling.
- If the business creates garbage, it's important to have a receptacle
- Signage is key, otherwise it takes a lot of shouting of "x for sale!"
- It can be embarassing to solicit customers in a tricycle, this may discourage PWDS from vending versus other businesses

FEEDBACK: PIA, ULRICH + RUBY

Ugandan students at Carleton share their perspectives

In order to gain some insight into what development disability, small business, and innovation looked like in Uganda. I sat down with Ugandan students here at Carleton. These are excerpts of what I learned.

PIA

- PWD's are often seen in the street begging. They usually have some kind of wheelchair or ever a tricycle. Often they'll have their children help them around. Some are worse off, they want on their hands with pads.
- For small business, you're seeing more little shops inside buildings, and rents are getting higher. But you have people who set a tray on the grounf or sell things in traffic. People sell produce form their gardens (not big farms) by the roadside. Children will seel things to raise money for school.
- One thing i'm impressed with when i go to Uganda is there's alot of very quality art. Painting, sculptures, hardwood furniture. You have large craft markets like African Village. Organizations help women make the crafts and sell them to larger shops and galleries.

ULRICH

- Batembeyi are stree hawkers. They going out in traffic jams and sell cheap items on display boards. I'm not sure a tricycle could naviate ugandan traffic.
- PWD's unfortunately are mostly beggars, or they stay at home and you don't see them. Many commute to the city from rural areas to svae money, then go back.
- Aid can be a disservice, in that it perpetuates dependace, so economic empowerment is the right approach. Encouraging innovation is the key.
- Things are gradually getting better, but the greatest problems is corruption, from top to bottom
- The difference between the city and a village is night and day. Some places the road is the highest technology. People are poor, but happy,

RUBY

- In Kampala PWD's can't cross traffic, difficult for everybody, even the elderly.
- Things have changed, there's much more asian immigration much morre motorcyle traffic
- Middle class people generall live in compounds, with guard dogs.
- Finding Jobs is very difficult for everyone, particularly university grads.
- People don't understand disesses and disability, the think it is a curse, especially albinos
- Uganda culture is starting to proudce more of it's own media, tv, movies
- School is very important and very competitive, no school is free, very common to go to a boarding school


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OCTAVO

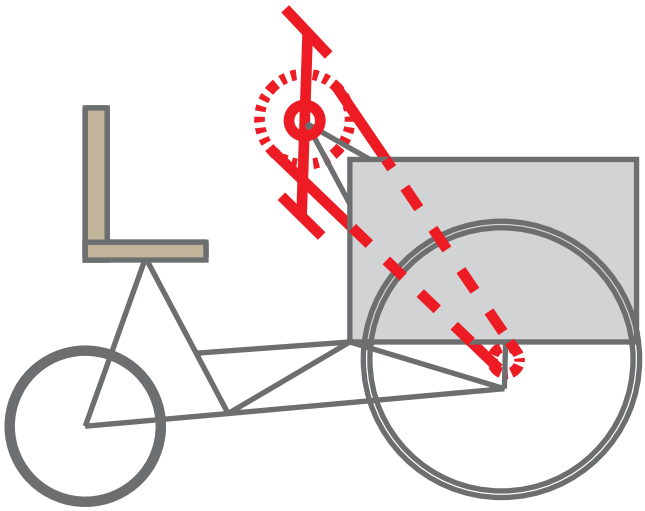
FEEDBACK: PETER + KIO

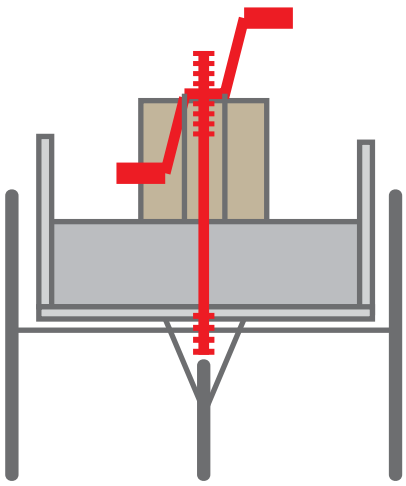
Our Partners in Uganda share their opinions and help evaluate our design direction.

Although we suffered some technical difficulties, via skype we managed to talk to Kio and Peter from KADUPEDI. In this meeting we discussed the overall project, our project direction, and some concepts that we sent over for evaluation. For me this was a watershed moment in the project in changing my intended solution from an entire vehicle to an accessory.

Peter seemed very enthuiastic about the focus on economic empowerment, stating it was top concern fo tricycle users. I was relieved to hear such strong validation from the perspective of the users.

However, Kio said that my proposed design -- with two wheels in front and large cargo area was too complicated mechnicallly (drivetrain) and too expensive in steel and labour. Kio also felt that the current tricycle design, which he has iterated 70 times, was fairly optimized. Peter asked whether we had thought beyond physical disabilities. They seemed uninterested in redesigning the entire tricycle -- so naturally I felt i should not design an entire tricycle around the vending use case. Instead I would design an accessory for the current tricycle. I had wanted to “re-invent the wheel” but I realized it wasn’t beneficial to the users.



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TAXI
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ETHNOGRAPHIC RESEARCH

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RESEARCH MISSION OVERVIEW

Ethnographic and Contextual Research to Inform my Project

For me, it was crucial to move forward with my concept only after gaining a real understanding of the context and the issues of disability in Uganda. Over the winter semester break I conducted an inidividual 6 week ethnogrpahic research mission.

There I partnered with Jackson Damba, founder of Great Hope Disability International. Jackson himself is disabled, and he lived for a time in the United States. He was an invaluable guide and faciliator, and as a well known member of the disabled community was able to introduce me to a network of people living with disability and experts.

Overall my mission was a fantastic success and exceed my expecations.

RESEARCH GOALS

To gain an understanding of the context, environment, and culture of Uganda.

To investigate the nature of small business, and tricycle businesses.

To meet with NGOs advocating for disabilty, and rehabiliation facilities.

To meet and assess diferent mobility aid manufacturers in Uganda.

To meet with people with disability, especially in rural contexts.

To prototype, test, and distribute a tricycle in Uganda.

To identify the core issues and opportunties for design.

UGANDA CONTEXT

Forming an overall understanding of Uganda

Driving this project was the aim to gain an understanding of the Ugandan context and to apply it in a unique way.

One the the main aims of my initial research trip was to understand the day to day environmment of life in Uganda. Immersion in the culture gave me countless insights I wouldn't otherwise have gained. The following are some of the major ones.

It is important to understand that poverty does not mean misery. Uganda is an incredibly fertile country, so villagers with a small plot of lands may live a happy simple life while only making enough money for the occasional tin of kersone for light or drink of waragi.

Foreign aid and NGOs are everywhere, and would seem to float the entire economy. Starting your own NGO is perceived as a great source of income, equivalent to a small buiness. Corruption and mismanagement is rampant, even with large international foundations and especially in government run programs. This has had a distorting effect not only on the economy but on the culture and perceptiion of foreigners. Many Ugandans are frustrated at being portrayed as helpless or starving, and at a growing culture of graft.

Uganda is a very religious country, and is experiencing a revival of "born-again" Christians due to a influx of American missionaries. Many preachers and spiritualists offer to procure jobs, spouses, or foreign sponsors for hefty fees.

The global economy is laid bare in Uganda --- containers full of "bails" of used goods come in through the vast Owino Market in Kampala and distributed to smaller markets across the country. Ugandan value used goods from Europe, America and Japan over new goods from China and India.

Transportation in Uganda is handled on Matatu, privately licensed Toyota Minibuses that drive set routes and leave when they're full. The conductor leans out the window indicating free seats and charges customers by distance. Also famous is are the boda boda motorcycle taxis, which have replaced their bicycle predecessors. A modified with bench seat carries two passengers or any cargo possible to balance.

Uganda is the youngest country on earth, and it becomes immediately apparent as you are surrounded by children. There is a missing generation of the middle aged -- lost to AIDS and war.

REHABILITATION & ADVOCACY

There are other priorities than mobility aids

My first mission was to talk to several different organizations that advocate for disability.

One of the more humbling realizations that came of my research trip was the fact that issues facing people with disability go far beyond any product design. Rehabiltation, access to medical treatment, and advocating for inclusive policy are in fact more important.

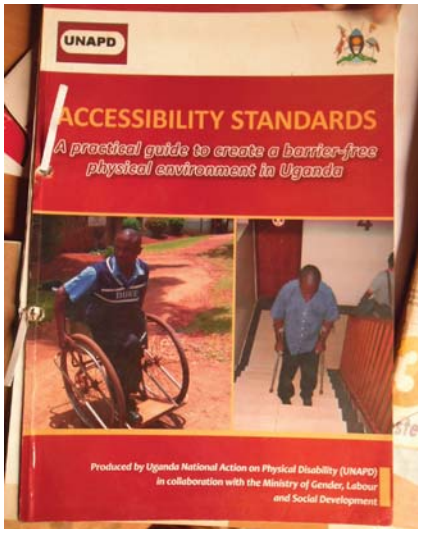
There was a time in Uganda where the disabled would be provided medical treament, mobility aids, and access to education. Today, lack of government support has meant all these things are severely lacking.

The importantance of rehabilitation and medical treatment cannot be understated. Often, disability can be prevented or managed if dealt with during childhood. Polio has been largely eradicated, but cerebral palsy (often from malaria), osteo-malaitis, elephantitis and club foot are common.

The problem with donated mobility appliances is that without proper fitting and therapy -- they can in fact worsen the disability.

A stigma of the disabled being "cursed", or even contagious still exists in a culture that does not leave much room for coincidence. However recent programs have made great progress, and families are more accepting of disabled children.

Accessibility is the other key issue for people with disability. Standards are in place, but not implemented. Access to transportation makes life very diffcult. Many PWDs would pay double for a folding wheelchair that could fit in a matatu. Public buildings are not accessible making it diificult for PWDs to access services. Bathrooms are another key area, many people with disability choose not to go to school or suffer extreme discomfort without accessible toilets.



MANUFACTURERS

The state of manufacturing infrastructure

While on my research trip, I visited three different workshops: the Mulago Hospital Orthapaedic Work (government), the Katelemwa Chesire Home (NGO), and Action to Postive Change (private).

The Mulago Workshop was the largest, but is largely inactive, lacking funding due to loss of foreign partnership and government corruption. It was once the provide of custom fit orthodics, crutches, wheelchairs, and tricycles for the whole country. A community of disabled people established itself in the surrounding neighbourhood. It also serves as the school for training new technicians.

Action for Postive Change is a a tiny workshop run by retired members of the Mulago Workshop. They service the local disabled community at a meager profit. Most of the technicians working their are themselves disabled but possess a hig level of skills and knowledge.

The Katelemwa Chesire home is a rehabilitation cneter for disabled children including a workshop. Currently it is the largest provider of wheelcahirs in Uganda, fufilling large orders for other NGOSs. It has succeed where other NGO workshops have failed to sustain funding and operations.

BUILDING A TRICYCLE

Effiicient processes with limited tools and materials

I commissioned Action to Positive Change to build a hand tricycle in order to document the manufacturing process. Their design and processes were both extremely elegant in their simplicity and efficiency.

The technician specialized in building tricycles was an an amazing individual. He himself was deaf and mute, but directed his coworkers with hand signals. He could build the tricycle from memory, and friction fit components so he didn't require clamps. He performed alignments by eye, or with a tape measure.

The primary cost of the tricycle was the bicycle components required to build it. Electricity for welding was also a significant cost, and and obstacle due to regular outages.

Cost of materials: 270 000 UGX

Overhead + Margin: 230 000 UGX

Time to completion: 3 days


UGANDAS FINEST

TESTING IN CONTEXT

User issues with the existing tricycle

Having built the tricycle it allowed for a number of user tests on actual roads in Uganda. The tricycle was tested by disabled users, non disabled users, and my self.

One of the key issues of tricycle use was just how difficult and tiring is to use. Even slight grades quickly become exhausting, and it easy to be stuck at a hill or pothole. The mechanical advantage could be geared down, as full speed is already dangerously fast. Interestly tricycle users typically have a helper who pushes when needed, or rides on the back downhill -- the fact that the user pedals and steers lets them keep a sense of control and independance verus a wheelchair.

Another key issue is center of gravity. Particularly on this protoype, the tricycle tips on even or “domed” Uganda roads. This is a crucial realization went on to inform my project to keep the center of gravity as low and centered as possible.

After testing was complete, I donated the tricycle to a middle aged woman named Margaret. On her first day, she managed travel twice as far I as had, around the nieghbouring villages. She sent me an update and is in fact already using the tricycle for some small business.

CONCEPT RE-DIRECTION

How the research findings re-shaped my project

Speaking to people with disability, I heard time and time again that finding a source of income was the most crucial issue for PWDs in Uganda. The are the poorest and most vunerable. Other major issues centered around tranportation, and accessible environment. Likewise, most were enthusiastic about tricycle based businessses.

However, this was not a novel idea. Particularly my idea of a tricycle vending cart had been implemented one way or another by most every tricycle user. Some had gone on to make modifications to their tricycles that were more appropriate than any general design I could come up with.

In one sense my project had he validated. In another, it had been obsoleted. It was at this point I would have to take the tricycle business concept further and more specific something feasilbe yet novel. I realized that carrying a large quanity of good compounded the diifcultly of using the tricycle. These insights allowed me to finalize my direction to focus on a tricycle utilizing mobile technology businesses.

CO-DESIGN & USER TESTING

HARAMBEE >>> PULLING TOGETHER

COMMUNICATION

Communication with Imagery and Modelling

When I arrived in Kasese, I brought a series of images that allowed me to explain the narrative of my story without expressing a specific solution. With these as well as basic drawing and sketch models I was able to to engage my users in the design process.

The use of imagery allowed me to communicate despite language barriers, across English, Lukonzo, Luganda, and sign language.

Overall, this face to face communication proved to be very effective in forming a design concept. I was delighted in how enthusiastic the various stakeholders (users, craftsmen, care workers, nieghbours, and onlookers) were to contribute to design decisions.

"Imagery can transcend language barriers"

CODESIGN PROCESS

Taking the role of 'designer as facilitator'

Having communicated my design intent. I wanted to conduct a partipatory design process to set the requirements and determine the best configuration of the different elements. I was fortunate to be able to able to have all different stakeholders -- tricycle users, builders, and disability experts -- to input on design decisions. Lively debate and creative compromises lead to a prototype that incorporated the needs of all.

The methodology I chose was to mockup different elements in cardboard and found materials then to use them in and informal "design by building" workshop. Once the best arrangement for the different elementswas determined they were translated in real materials (steel, wood).

"Allowed stakeholders to input on design decisions"


ALL NETWORKS
AIRTIME
SOLD HERE
PHONE CHARGING
PUBLIC
PAY PHONE

CONSTRUCTING A PROTOYPE

A result of colloboration

The co-design protoype combined the features required by actual tricycle users and the necessary functional elements.

> A sign for advertising services

> An adjustable/removable sun shade

> A storage box with fold out shelf

> A box for the battery

> An an adjustable solar panel mounting

Kio played a key role in realizing these features in simple and efficient ways. This included clever telescoping elements with locking nuts --- something that would be central to my final design.

“Kio realized the features in simple and efficient ways”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USER TESTING

Finding opportunities for refinement

Having a prototype that embodied the functional, manufacturing, and user criteria I was able to conduct testing and identified areas of improvement for my refined final design.

> the position of the box interfered with powering and manouvering the tricycle.

> the box itself was found to be less desirable than a wearble pouch.

> hanging a bare bulb from the canopy risked breaking as the tricycle bumped up and down.

> the solar panel and canopy was not adjustable by the user while seated.

> the charger under the seat made cable management and setup difficult

> the solar panel was exposed and vunerable to damage (rocks ect)

> manouvering the entire tricycle to a postion the solar panel was not desirable


BEHR
ATTENTION
BEHR
ATTENTION

FINAL DESIGN PHASE

HARAMBEE >>> PULLING TOGETHER


MTN


MTN
ReadySet

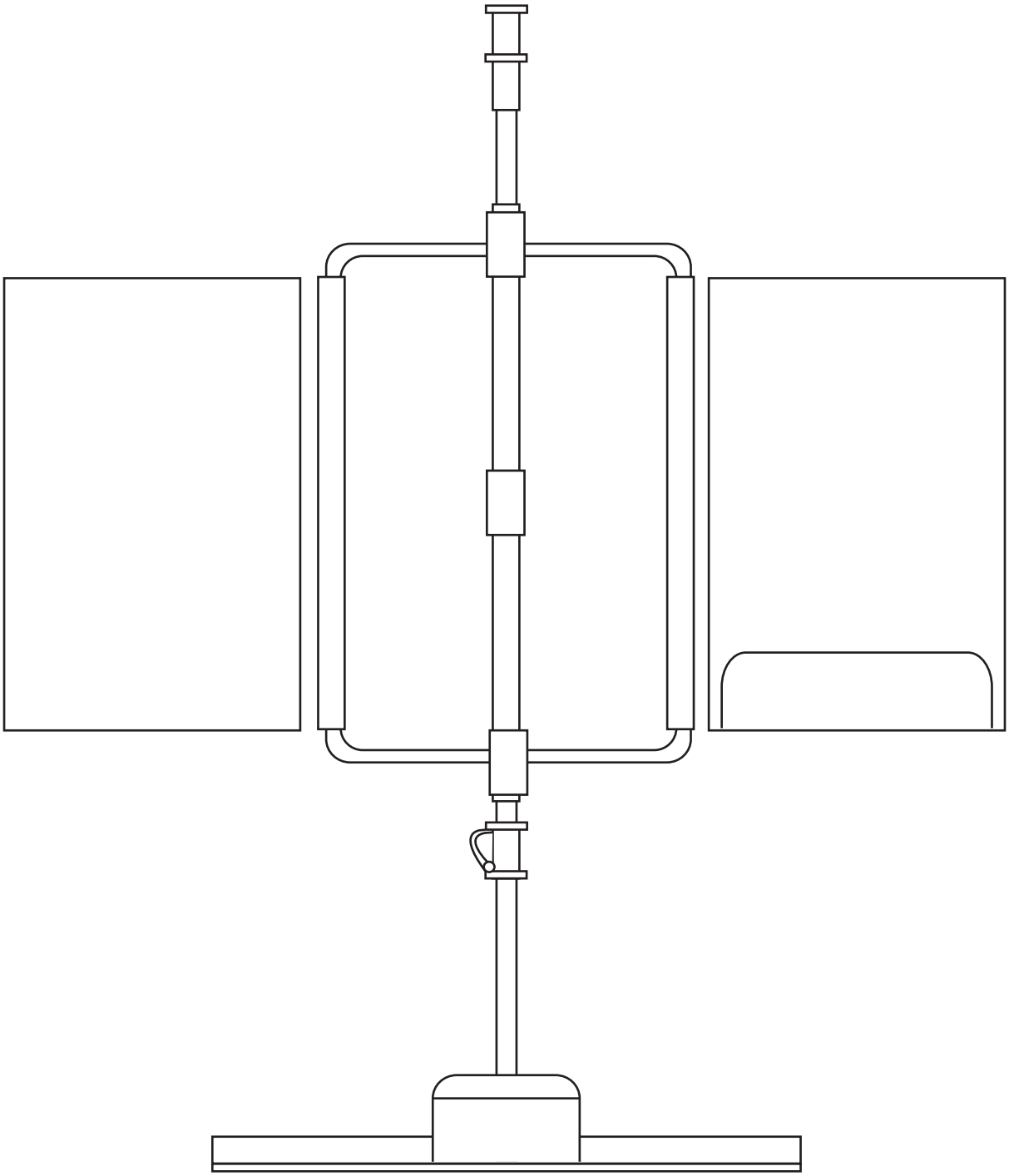
KEY COMPONENTS

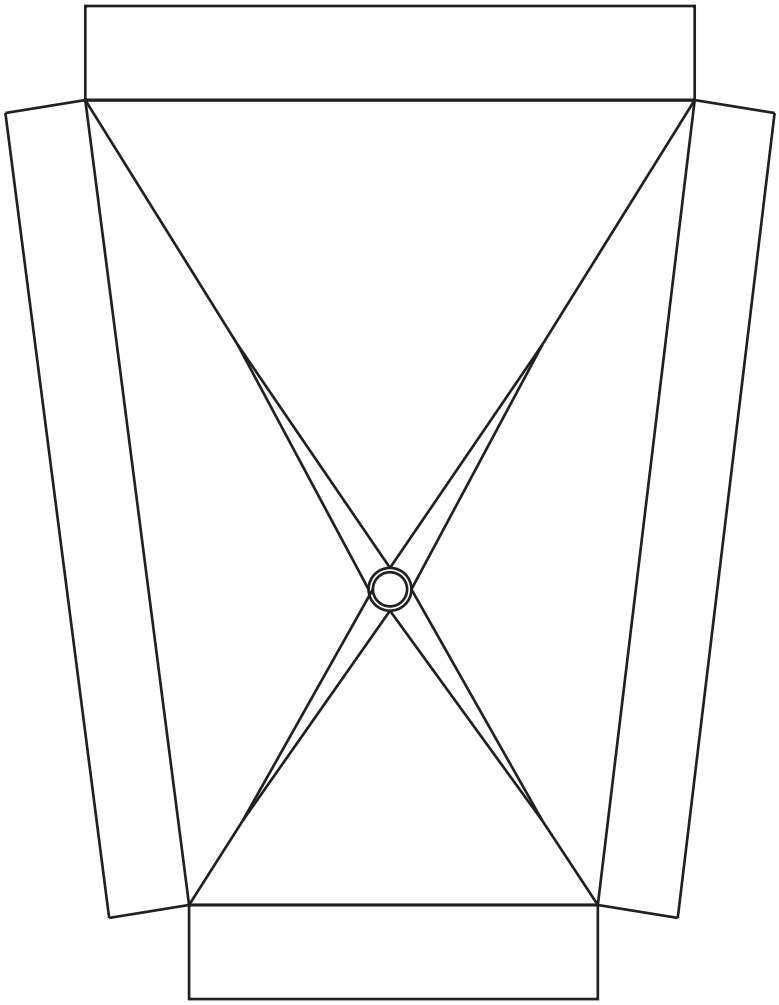
Key functional components

MTN offers GSM payphones, specially developed for emerging markets, that are a hybridbetween a cell phone and corded home phone. The antenna is more powerful to function inareas with limited cellular networks. Built in features calculate calling rates, and can send SMS messages and access SMS based services. Vendors purchase and register the payphone with MTN and then can sell calls at a profit.

The ReadySet charger was developed by Fenix international after a successful kickstarter campaign. They have since partnered with MTN to distribute it in Uganda. The kit includes a ruggedized solar panel, integrated battery and power control, along with light and universal charging cables. The kit can charge ten phones per day, and can serve as a source of supplemental income. Many NGOs have found the ReadySet to be much mor eeffective to improvised solutions using stock car batteries, panels, and chargers which are difficult to maintain and hence made the businesses unsustainable.

STRUCTURE AND CANOPY





FINAL MODEL

Hands on, Kio Inspired Design

My final design was refined through the process of building. I took the example of Kio in seeking the most simplae and robust methods to achieved the outcome I desired. Through a form focused on light weight, balance and articulating elements it achieves a strong design identity without being inappropraitely “overdesigned”.

The entire module removes from the tricycle, and then further disassembles for secure storage. The hinged and telescoping parts are the simple overlapping pipes and operate robustly on low tolerances.

I decided to paint my module by hand to retain a certain authenticity to being made in Uganda. The canopy could be easily made in uganda, or replaced by a standard market umbrella.

Ultimately this design is an idea to be shared, and my expecatation is that tricycle users in Uganda would build their own custom versions for their particular businesses and needs.

THANK YOU