"*Can You Make Me New Legs?*" Exploring Technology Opportunities by Identifying Power Dynamics within the Disability Ecosystem in Uganda

Lynn Kirabo
Carnegie Mellon University
kirabo@cmu.edu

Aaron Steinfeld
Carnegie Mellon University
steinfeld@cmu.edu

Introduction

Cities across Africa are steadily adding technology to government services [2,3] to improve service delivery, productivity, and well-being [6]. However, new technology has had double-edged impact, providing opportunities to close existing gaps while widening other gaps. Expanding gaps include economic differences, citizen diversity, and accessibility. This is in contrast to Goal 10 of the Sustainable Development Goals, which focuses on reducing inequalities [7]. New methods are needed to support research on closing these gaps.

In this work, we describe a modified stakeholder tokens method [5] from the Value Sensitive Design (VSD) framework [1] to examine stakeholder dynamics in the disability ecosystem in Uganda. We posit that understanding these dynamics will reveal those who hold power within the ecosystem and how technology needs might differ across the ecosystem.

Methods

Developing & Validating the Stakeholder Map

To develop the initial draft of the stakeholder map, we used the VSD stakeholder framework to construct an initial diagram on the questions: 1) Who are the communities involved? 2) Who are the groups involved? and 3) Who are the people involved? This initial diagram was created using local knowledge and past literature. We examined transportation, which has a rapid influx of technology in Africa.

We first piloted the map with 3 local researchers who work with vulnerable populations in Uganda. We asked whether the entities presented were an accurate representation of the current ecosystem. Over 3 iterations, 11 new nodes were added to the map.

The final diagram consists of the following entities: AID Partners, Non Governmental Organisation (NGO), Pedestrians, Activists, Veterans, Community Health Workers, Persons with

Disabilities (PwDs), Bus Drivers, Bicycle Operators, Taxi Drivers, Boda Boda Drivers, Hospitals, CSR Teams, Rehabilitation Centers, Technology Startup Community (TCS), Metropolitan Police, Traffic Police, Local City Authority (LCAs), Ministry of Health, Ministry of Gender, Labor and Social Development, School Teachers, Person with Disability's Family.

Interviews with Disability Stakeholders

We conducted 6 interviews over Skype. Due to incomplete data, only 4 of the maps were analysed. Details of the participants who were involved in the study are below. During the interview, we asked two questions: Is this a complete representation of the disability ecosystem and what are the relationships that exist between the different entities? A collaborative drawing platform was tried but dropped due to the diversity of screen sizes, resolutions and Internet connections. Instead, we supplied stakeholders with both pdf and jpg file formats. All the stakeholders were compensated for their participation.

	Disability	**Organisation**	**Experience**
P1	Mobility Impairment	Government	> 10 years
P2	Mobility Impairment	NGO Lead: Arts	1-5 years
P3	Albinism/Low Vision	NGO Lead: Disability	1-5 years
P4	None	NGO: IDP	< 1 year

Table 1: Participant Information

We generated maps by drawing the connections that each participant created (e.g., Figure 1). In the aggregate map (Figure 2), each participant is represented by a color and we documented how many times participants identified stakeholders they felt had no direct connections. We also gathered initial insights on the dynamics among stakeholders.

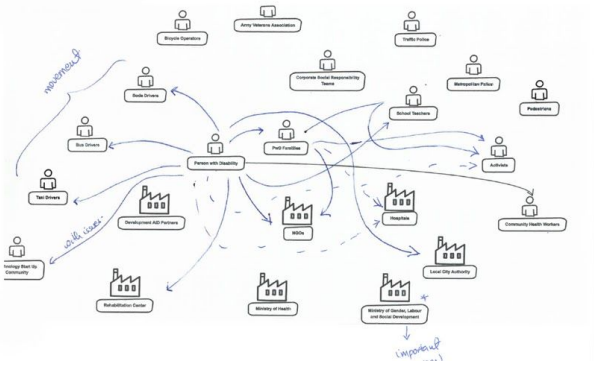

Figure 1: Response from one participant showing connections between different stakeholders

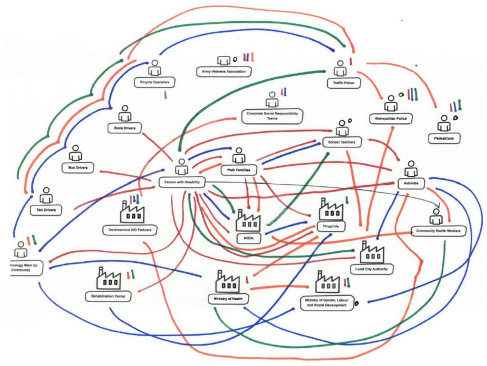

Figure 2: All 4 maps overlaid on top of each other. Each color represents a different participant

Findings

Key Stakeholders

For almost all participants, the ecosystem revolved around a person with disability (PwD). An unexpected result was the role different police organizations play within the ecosystem. The Traffic Police branch emerged as the second key stakeholder while three of the four participants thought the Metropolitan Police should not be included in the ecosystem.

There were several stakeholders that participants felt did not directly link to others on the map. All participants felt some should be excluded (e.g., the Army Veterans Association). There was a split agreement regarding other stakeholders (e.g., Corporate Social Responsibility teams, Metropolitan Police, Pedestrians, Development AID Partners, Technology Startup Community, Rehabilitation Centers, Ministry of Gender Labor and Social Development, Ministry of Health, Hospitals, Traffic Police, and Bicycle Operators).

Stakeholder dynamics

Participants connected stakeholders when they could identify a direct relationship between them. This resulted in participants justifying their connections with clarifying statements describing the relationships. These dynamics led to the creation of subsystems within the larger ecosystem.

In the first subsystem, the Technology Startup Community (TSC) was labelled as an advocate for inclusive innovation. Participants noted the role of the TSC is to translate inclusive policy (developed by the Ministries) into technology products that can be used by PwDs. A reverse flow

of this system saw the Ministries at the center of the sub-system working closely with TSC to create inclusive technology.

The second subsystem included both the TSC and the transportation agencies. Participants noted that accessible transportation will require that these two stakeholders collaborate with each other more.

The third subsystem involved connecting NGOs and LCAs and TSCs together. NGOs were perceived to work on the ground with PwDs in remote locations, giving them unique access to needs and opportunities unavailable to TSCs. Participants specifically noted that the TSC is supposed to help solve challenges faced by PwD. One participant stated an interest in 3D prosthetics, specifically asking whether new legs could be made for him. Some Rehabilitation Centers in Uganda have been known to use 3D prosthetics for persons with specific types of amputations (i.e., below the elbow and knee)[4,8].

Discussion

Our preliminary findings provide an example of how a modified VSD approach can be used to describe the key stakeholders within the disability ecosystem of Uganda. An understanding of who these stakeholders are, their connections, and the dynamics that surround them informs HCI researchers about power dynamics, opportunities for different technology, and opportunities to leverage lower-ranked stakeholders. Understanding these dynamics lowers the chance that new technology contributes to inequality gaps.

The map also offers preliminary insights about which stakeholders may be weak connections within the ecosystem. We do not claim that this has bearing on the function of these stakeholders – we propose that these stakeholders can use this as an opportunity to engage with and support the stronger elements in the ecosystem. A stakeholder that is notably missing from this ecosystem is the research community. It might be assumed that the TSC includes researchers, but participants specifically spoke of TCS as product-facing companies.

Furthermore, we believe HCI researchers can use this modified VSD approach to understand the technology expectations that stakeholders have relative to their position in larger ecosystems.

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