

**The Reality-Producing Dynamics
of the Mobile Phone in Uganda**

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The Reality-Producing Dynamics of the Mobile Phone in Uganda

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ABSTRACT

The expectations and visions of the mobile phone in a development context is vast. International development institutions such as the World Bank, World Summit of the Information Society and International Telecommunication Union together with business conglomerates Google and Facebook have all invested their perspectives and visions of how the information and technology community should unfold in Uganda. How do their perspectives merge, interfere and contrast with the perspectives and visions of actors in Uganda?

The research objective is to explore the feminist and postcolonial technoscientific practices of the mobile phone in a Ugandan context. In my exploration I use ethnographic, participatory and narrative methods to study the imaginations and real-time uses of the mobile phone among actors in the ICT community.

I ask how actors in technology hubs in a low-income country relate to local innovations and design processes. Using a diffractive method for analysis I discuss how stories of corruption and responsibility are entangled with the development of mobile applications for the local context and the relation of designers and users.

I ask how the mobile phone is changing the socio-technical relations of gender, technology and development. Using diffraction, intersectionality and figuration as cartographic nodes for discussion I examine how the initiatives Girl Geek Kampala and Women in Technology Uganda renegotiate and reconstitute the understandings of gender and technology.

I ask how the mobile phone is creating and changing the infrastructuring in Uganda. I address the situatedness of the mobile infrastructuring by departing in the generic properties of an infrastructure by Star and Ruhleder (1996). The mobile phone is being used for entertainment purposes, developmental goals and marketing strategies and cannot be singled out as a device that represents a uniform vision of the information society. The examination of situatedness suggests that the strength of understanding the mobile infrastructure lies in the ambiguity of sustaining and transforming relations simultaneously, or better yet, a posthumanist performativity where human and non-human forms of agency are taken into account.

The entanglements of postcolonial information and communication technologies, feminist technoscience and design form the basis for a discussion on how we invite collaborations between policy makers, business entrepreneurs and civil society organizations that engage and shape the futures we are responsible for. My ambition is to develop ways of re-thinking social innovation and technology development, which interfere with linear economic development and raises the participatory paradigm in science and technology policy.

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INTRODUCTION

The research study concerns the transformation process of the mobile phone. When the mobile phone first entered my life, I believe I got my first phone in 1998, I was in my late teens and I mostly used it for texting friends. When I switched phones a few years later on I was introduced to more advanced interfaces. I started reading my e-mails and Facebook updates on a daily basis. I played games and hooked up my RSS feed so I could easily access news and blogs. As the years went by, I became more and more immersed with my mobile phone and today it feels like I use it for everything. I am together with my mobile phone far more hours than any other object. Banking services, public transport services, satellite maps, Wikipedia, social media, music and film streaming, your basic needs and then some are covered. Feeling and being always available, always accessible, always connected to the mobile network and the World Wide Web makes me very cyborgian, “a hybrid of machine and organism, a creature of social reality as well as a creature of fiction”(Haraway, 2004, p. 7). The mobile phone has made dichotomies of place and non-place and private and public more fluid, less static (Case, 2007).

The imaginations of the mobile revolution lead me to my research objective. With the so-called mobile revolution came the expectations of ICTs being a powerful tool for development. When the Millennium Development Goals (MDGs) were disseminated ICTs became a front figure when discussing how the goals could be reached. Questions such as *How can ICTs help end poverty* became part of the global agenda. The emphasis on technology to be the solution made me think of the Arab Spring. Social media played a central role in organizing demonstrations, disseminating information and

shaping political debates during the wave of protests and demonstrations in the Arab world (Howard et al, 2011). Still, it was the people who disseminated the content. Social media was the intermediary tool, the platform for making this knowledge sharing possible. ICTs is entangled with politics, economic development and ecosystems and is a part of network, not an instrumental network in and of itself. The mobile phone is transforming, and being transformed by, individuals as well as infrastructures.

Mobile technologies for development (M4D) has arisen as a field within and alongside ICT4D that focuses on the mobile phone as a tool for socioeconomic development and poverty reduction (Donner, Verclas & Toyama, 2008). ICT4D research has traditionally been focused on increasing the access to landline telephones and computers and have now included the mobile phone as a tool for development. Many development initiatives are making use of the mobile phone in a multitude of communication platforms (radio, TV, internet) to increase the reach and accessibility among users thereby blurring the distinctions between M4D and ICT4D projects.

The East African countries are in the forefront of many innovations that make use of the mobile technology. Two former conferences on mobile technologies for development show that various stakeholders (NGOs, academics, government institutions, private sector) in the East African region consider the mobile phone to be an excellent tool for socioeconomic development and are prone to use it for various local and regional initiatives (Pettersson, 2008; Svensson & Wicander, 2010). Hellström (2010) has written an extensive report on the innovative use of mobile applications in East Africa. In the executive summary he writes the following about the region in relation to mobile technology development:

East Africa has more than 120 million citizens with a large majority living in rural areas. Almost half of its population is under the age of 15 years and about one third of the grown up population is illiterate. The region is characterized by general weak infrastructure, such as bad roads, poor transport systems, non-existent electricity, few health units, financial institutions, weak public offices etc... Yet, by the end of 2009 there were almost 50 million mobile subscribers in the region resulting in a mobile penetration of 40% of the total population. This makes mobile phones one of the most widely available platforms for information dissemination and interactive communication. (Hellström, 2010, p. 9)

To answer the question why ICT4D is important I refer to our increasingly digital society. Social, economic and political life is immersed with ICT tools and services in various forms. In several countries we vote, pay our bills and chat via the mobile phone. The digital divide is a recurrent reference in the defense of ICT4D. Everyone should be included and have access to ICT. The World Summit on the information society in 2003 lists in their vision that the challenge

is to harness the potential of information and communication technology to promote the development goals of the Millennium Declaration, namely the eradication of extreme poverty and hunger; achievement of universal primary education; promotion of gender equality and empowerment of women; reduction of child mortality; improvement of maternal health; to combat HIV/AIDS, malaria and other diseases; ensuring environmental sustainability; and development of global partnerships for development for the attainment of a more peaceful, just and prosperous world. We also reiterate our commitment to the achievement of sustainable development and agreed development

goals, as contained in the Johannesburg Declaration and Plan of Implementation and the Monterrey Consensus, and other outcomes of relevant United Nations Summits. (World Summit of Information Society, 2003, Geneva Declaration of principles, §2)

The expectations of ICT have been tremendous. Already before the World Summit on the information society in 2003 infodev, a global multi-donor program in the World Bank Group, had funded more than a hundred ICT pilot projects in various countries (World Bank, 2003). The high hopes of ICT being a quick fix to development and poverty reduction explains the vast number of ICT pilot projects initiated in many low-income countries. In 2003 infodev commissioned a review providing descriptions of seventeen infoDev ICT4D projects and their impact on poverty reduction. Many of the impact factors correlate to economic growth as a means of eradicating poverty. A project in the Philippines created an e-marketplace for fishermen, farmers and small and medium enterprises to access trade products and market prices. Several of the key factors mentioned as a poverty reduction outcome relate to economic growth, for instance, the marketplace providing information on market prices thereby helping farmers increase their revenues through competitive prices (Batchelor, 2003). One lesson learned in this Philippine project was the aspects of training. Instead of one participant per computer, three participants proved more effective. They complemented each other in the learning process and could share his or her experiences of the trainings. The lessons learned from reviewing the seventeen projects are familiar to many in the ICT4D community by now - involve target groups, think about the overall infrastructure, use existing technologies, focus on rural areas, financial stability is important if you want to scale up. These examples would easily fit into the ICT4D 1.0 phase as explained by Heeks (2009) in his ICT4D manifesto. The early phase of ICT4D took a top-down approach, where new technologies were placed rather than incorporated in development contexts.

The debate about ICTs and development has grown. Some say that the use of ICTs is enabling citizen empowerment and rapid economic growth while others suggest that ICTs is a quick fix for the historical and structural complexities of poverty. Poverty is about marginalization, exclusion, discrimination and inequality, all an aggregation of political, economic and social phenomena which cannot be rectified by one-dimensional approaches such as ICTs. Clarke, mentions as “the international community plans the role of ICT4D post-2015, multistakeholder holistic planning remains vital in order to draw out the strengths of ICT4D and avoid its limits” (Clarke et al, p. 66). There is still a tendency to create ICT4D projects focusing on short-term progress rather than long-term scalability. Clarke, Wylie and Zomer (2013) mentions “[o]ne conclusion of several decades of development thinking is that ending poverty requires the active involvement of poor people themselves and that poor communities must organize and empower themselves to chart their own course out of poverty. This should apply equally to urban and rural dwellers, online and off-line communities” (p. 66). The emphasis on the poor people themselves is how Heeks (2009) describes the next phase of ICT4D 2.0 in his ICT4D manifesto. The next phase focuses more on technology-in-use in order to understand how existing technologies are being used in different communities. The reasoning behind this shift is a need for new worldviews

for action. Heeks (2009) expresses the shortcomings of ICT4D 1.0 can be located in the disciplinary worldviews, which the field grew from. ICT4D projects with a basis in computer science have been quite techno-centric, the technical systems are functioning but the humans are left out. Information systems and development studies are better integrated in computer science with the social, political, contextual perspectives of the ICT4D field. ICT4D 2.0 is about reframing the relationality of the poor. The ICT4D 1.0 era marginalized the poor and viewed them as a passive consumers. The ICT4D 2.0 age consider the poor to be active producers and innovators. “There is no sharp dividing line to let us say, “ICT4D 1.0 stopped here; ICT4D 2.0 began here”. On the ground, there is a sense of evolution, not discontinuity. And yet ... something messy, fuzzy but new is emerging” (Heeks, 2009, p. 28).

The reference to the concept messy leads me to Laws discussions on messiness in social science research. Law (2004) writes “if we want to think about the messes of reality at all then we’re going to have to teach ourselves to think, to practice, to relate, and to know in new ways” (p. 2). His methodological aims converge with mine – “to broaden method, to subvert it, but also to remake it (p. 9). My research objective places the emphasis on the phenomenon of the mobile phone in a Ugandan context, regardless of whether there is a “developmental” goal or not. However, it is important to note several of the actors I met are working for non-governmental organizations with a specific development goal as part of their strategy. Thus my basis lingers in-between the field of ICTs and development and ICTs for development. The concept of development is a tricky one and while I may consider all actors to be working with development in some way or another, they will not all fit into a development based economic growth. This lingering between fields as Heeks (2009) mentions in his ICT4D 2.0 manifesto makes my basis in feminist technoscience a perfect fit. Feminist technoscience expands technology development by underscoring knowledge as a situated practice. To increase accountability and transparency in the design development process more actors, businesses, disciplines and civil society organizations should collaborate and take part in shaping futures together (Gibbons et al, 1994).

RESEARCH OBJECTIVE

The research objective is to explore the technoscientific practices of the mobile phone in a Ugandan context.

This objective is approached from four different perspectives:

- How do I, as a researcher, approach the technoscientific practices of the mobile phone in a development context?
- How do actors in technology hubs relate to local innovations and design processes?
- From an intersectional perspective, how is the mobile phone changing the socio-technical relations of gender, technology and development?
- How is mobile infrastructuring situated in a Ugandan context?

THEORY AND METHODOLOGY TOGETHER

Feminist technoscience

Feminist technoscience is a transdisciplinary field that was born out of feminist critiques in how science is conducted and performed. It is a field that opposes the positivist perspective to knowledge production and the dichotomy of basic and applied science. This dichotomy has been with us since the renaissance where natural science was given the role of pure, basic science and all other sciences became impure or applied research such as technology or engineering (Trojer, 2002; Åsberg & Lykke, 2010).

Before Natural Sciences took the leading part in the academic landscape there were four branches of knowledge during the renaissance: Philosophy, Medicine, Law and Theology. This historical example shows how disciplines present in today's academia have been and still are embedded in a power struggle that has been going on for centuries. Lykke (2010) states that "...disciplinary borders come to represent power relations rather than rational cuts in the body of knowledge. Analogies to national borders become obvious" (p. 20). The term 'technoscience' was coined with the purpose of challenging the separation of 'basic' and 'applied' science. Haraway (1997) explains the implosion of science and technology that it "designates dense nodes of human and non-human actors that are brought into alliance by the material, social, and semiotic technologies through which what will count as nature and as matters of fact will get constituted" (p. 50).

Feminist research within technoscience focuses on theories, methodology and knowledge production.¹ Feminist technoscience have moved from an epistemological point of discovery to considering research as “context of production” (Trojer, 2002, p. 31). We are part of the knowledge we create. Our research activities - how we choose to define ontology and epistemology, selecting our research methodologies and conducting problem-solving analyses - are implicated in a knowledge (re) production (Trojer, 2002). Knowledge cannot be interpreted in a singular form and any study of science entails various perspectives and stories, leading to new subjective understandings of knowledge production.

Situated knowledges are about communities, not about isolated individuals. The only way to find a larger vision is to be somewhere in particular. The science question in feminism is about objectivity as positioned rationality. Its images are not the products of escape and transcendence of limits (the view from above) but the joining of partial views and halting voices into a collective subject position that promises a vision of the means of ongoing finite embodiment, of living within limits and contradictions-of views from somewhere. (Haraway, 1988, p. 590)

It is necessary to re-conceptualize science as an objective representation of nature towards a thinking of science “as a system of practices” in order to keep social and political systems accountable and credible. Situated knowledges is one of Haraway’s key concepts and is a response to valuing difference in politics. To be accountable is to acknowledge how knowledge is produced. Haraway does not imply that this perspective connotes an ‘anything goes’ relativism. Instead it highlights that knowledge is always created somewhere and is a move away from essentialism and universalism.

Haraway’s most famous figuration and the one I am positively inclined to use in my research is the cyborg. It is the breaching of boundaries that makes the cyborg so intriguing, a fusing of the organic and the technological. Haraway (1991) explains “[t]he cyborg is resolutely committed to partiality, irony, intimacy, and perversity. It is oppositional, utopian, and completely without innocence” (p. 150). The cyborg is a trickster figure, that resides both in the informatics of domination and as a figure of hope blurring the boundaries integral to a Western worldview. The cyborg goes further and asks the epistemological question, what are we made of?

Posthumanism

One of the core themes for a posthumanistic perspective is a refusal of a priori creating dichotomies of nature and culture or researcher and research object (Åsberg, Hultman & Lee, 2012). Giger (2010, p. 35) poses the question: “What happens with the view of ourselves as human creatures if we do away with the binary between nature and culture?”

The theorists within posthumanistic plethora consider methods to be performative - performative because of how methods themselves construct and interfere with

¹ For examples of feminist technoscientific research see the research division Technoscience studies at Blekinge Institute of Technology. Website here: <http://www.bth.se/tks/teknovet.nsf/sidor/research-and-projects>

how knowledge is acquired (and created). Barad (2003) explains “a performative understanding of discursive practices challenges the representationalist’s belief in the power of words to represent preexisting things” (p. 802). Åsberg (2012) suggests posthumanism as a critique of anthropocentrism and imperialistic logics of humanism. Humanism is often viewed as a universalism, which becomes very problematic since universalism traditionally has implied a European cultural imperialism - a very racist and discriminatory perspective to the world and its inhabitants. This cultural essentialist view holds an illusion of a generic person, an abstraction behind categorizations such as class, nationality or gender and disregards the physical environment. Taking matter into consideration, socio-technical networks are of great importance for my research. How can I study the situatedness of mobile without considering the relation between human and mobile phone? What is the relation between the mobile phone and the soil? The earth is changing as a result of buried fiber cables. Used mobile phones are part of the electronic waste that is an increasing environmental problem.

The prefix post in posthumanism should not be read as something that comes after humanism. On the contrary, posthumanism is grown out of humanism and continue to overlap and include the implications of how humanism was once constructed. Posthumanist studies are often tentative, meaning making, partially mapping and seek ongoing processes (Åsberg, Hultman & Lee, 2012). To understand how mobile development is enacted, we have to map how the heterogeneous socio-technical practices are created. Development just as economics is not static. It takes different shapes depending on context. Development strategies, mobile phones, sim cards, sellers together generate one set of realities. A material-semiotic practice is part of the onto-epistemological turn where objects of study are entangled with the enactment of the researcher. In my research I work against proper objects and subjects as I question the normativity of essentialized research objects. I deconstruct geopolitical differences and merge monodisciplines, I question humanity by introducing concepts of cyborg figuration and diffraction. The performative positioning in posthumanism proposes an onto-epistemological ethics. How I talk and write about the world means I am partly responsible for creating the world. Barad (2003; 2007) writes how ontology and epistemology cannot be viewed as two separate things. The categorization of which entities exist in the world and knowledge production belong together. She explains this inseparability as intra-action in her theory agential realism.

[Agential realism] is an epistemological and ontological framework that extends Bohr’s insights and takes as its central concerns the nature of materiality, the relationship between the material and the discursive, the nature of “nature” and of “culture” and the relationship between them, the nature of agency, and the effects of boundary including the nature of exclusions that accompany boundary projects. (Barad, 1998, p. 89)

When Barad talks of material-discursive practices discourse should not be read as a synonym for language as this would bound the meaning only to what is said. Barad (2003) writes “discursive practices are specific material (re)configurings of the world through which *the determination of boundaries, properties and meanings is differentially enacted. That is, discursive practices are ongoing agential intra-actions of the world through which local determinacy is enacted within the phenomena produced*” (p. 814).

In other words, discourse is what enables or limits what can be said (and done). The heterogeneous practices of an apparatus such as the mobile phone intra-act with several stories of how for instance counterfeit phones have entered the Ugandan market. The Ministry of ICT and Uganda's Communications Commission have banned counterfeit phones with arguments of health risks and illegal sales. The users of counterfeit phones probably think otherwise and are positively inclined to finally own a phone. Counterfeit phones present a health risk because of poor sub-standard materials² and untested batteries and charges. Still, they provide a cheap alternative to popular brands. Aside from providing a health risk for the individual they often break and have poor connectivity. They are also an obstruction for the global mobile market in terms of competitiveness. "The rise and fall of counterfeit mobile phones has vividly demonstrated that an industry without core competitiveness will not be able to withstand the test of the market," according to Wu Yixin, a researcher at the Shenzhen Academy of Social Science.³ Domestic phone companies have subsequently drawn lessons from counterfeit manufacturers and invested heavily to shore up their competitiveness. The material-discursive practices, in which the counterfeit phones exist within, change over time and what was possible to buy a few years ago has now become increasingly harder to come by. Standardizations, policies and laws are put in place to conform the regulations of who is allowed to sell mobile phones and subscriptions, how people access the mobile networks and what kind of software content will be available.

Postcolonial ICT

"A continent that has long accepted technological hand-me-downs from the West is increasingly innovating for itself." (The Economist, 2015)

When I think of postcolonial theory I think of it in a similar way as posthumanism. There is no end to colonialism or humanism. We are still residing in an anthropocentric worldview where technological determinism and cultural essentialism uphold unequal power relations. The post-prefix is there to show how we choose to interfere with this worldview. Anderson (2002) writes that " [...] the 'postcolonial' does not imply the end of colonialism; rather, it signals a critical engagement with the present effects – intellectual and social – of centuries of 'European expansion' on former colonies and on their colonizers" (p. 644). How can agency, materiality and onto/epistemological politics encourage alternative worldviews - worldviews that are less hierarchic and more rhizomatic (Åsberg, Hultman & Lee, 2012)?

Rydhagen (2004) questions the summary from the report *Gender and the Information Revolution in Africa* (2000) where it is suggested that the information given to rural women with the intention of improving their livelihoods needs to be carefully repackaged and locally adapted (i.e. local language) in order for the women to even comprehend ICT. Rydhagen's criticism lies in the fact that the summary, although probably

² <http://www.gsma.com/publicpolicy/buying-a-counterfeit-mobile-phone-could-be-deadly>

³ http://usa.chinadaily.com.cn/business/2012-12/17/content_16025909.htm

not intentionally, gives a sense of a colonial one-sided thinking where rural women in a developing country are unable to improve their own lives through ICTs and instead should wait for a ready-made package provided by outside donors.

Postcolonial perspectives of unequal power relations are visible in the underlying reasons behind ICT4D. Richard Heeks (2009) presents three different reasons for giving priority to ICT for the poor in developing countries. First there is the moral argument. The poor are those most affected by global problems, climate change, conflict, terror and poverty. ICT benefit the rich and it should benefit the poor as well. Secondly, we have an enlightened self-interest. The problems poor have today will be the problems for the rich tomorrow. An economic growth benefits not only the poor. When more people can buy goods and services from the 'developed' countries, the rich become richer. Thirdly, personal self-interest. Heeks (2009) suggests that designing a system for an African community is a much more satisfying experience than doing the same for a company in the global North. These examples tell us a story of universal dominance and oppression. My inquiry into the technoscientific practices in a Ugandan context attempts to interfere with this universality. There are always more things going on and the stories of the Ugandan ICT community shows this.

A postcolonial analysis provides insights into how the dichotomies created under colonial eras continue to effect ICT practices in Uganda. Anderson states that “[t]hese binaries still operate in terms of global/local, first-world/third-world, Western/Indigenous, modern/traditional, developed/underdeveloped, big science/small-science, nuclear/non-nuclear, and even theory/practice” (Anderson, 2002, p. 644)

In this study the local/global and urban/rural dichotomies are especially noticeable because of where the actors are located. Anderson (2002) phrases it with thinking “in an old colonial way, that the ‘local’ would be a property only of what used to be called the ‘periphery’ – but the ‘centre’ in the multi-sited imaginary of postcolonial accounts is just as local, and should be considered as another node in a network” (p. 652). The actors and I have used terminology such as local innovations in our conversations. The concept of providing a prefix such as local risks abiding to hegemonic practices that reconstitute a story of where the center of power is. This center is merely a colonial imagination but a very forceful one. Anderson (2002) proclaims that multi-sited, interdisciplinary studies of technoscience are needed now more than ever. He refers to the decline of the nation-state and the notion of a center of power has become less sustainable. The situatedness of technoscience suggests that all networks, or infrastructures, are “local at all points” (Anderson, 2002, p. 651). In the papers I seek to understand and interfere with the complex architecture of master narratives, fragmented stories, cultural determinism, hybrid identities and performative agency.

Located accountability

The Cherie Blair Foundation and GSMA Development Fund published a report in 2010 that quantifies the gender gap in mobile technologies. The report shows that

21% women are less likely to own a mobile phone than a man in low and middle-income countries, 93% of women reported feeling safer because of their mobile phone and 85% of women reported feeling more independent because of their mobile phones (GSMA, 2010). With data like this, postcolonialism and patriarchy constitute hegemonic factors in the continuous unequal power relations worldwide where categorizations such as class, nationality and gender stand as barriers for equal access. Moving from results and data to the work among those creating development policies and ICT projects, how does the design-process between human and non-human actors inflict upon these kind of statistics? Suchman outlines the development of technology production and use and propose located accountability for transformations in technology design. Suchman (2002, p. 101) exemplifies these transformations with the following list:

1. Recognizing the various forms of visible and invisible work that make up the production/use of technical systems, locating ourselves within that extended web of connections, and taking responsibility for our participation;
2. Understanding technology use as the recontextualization of technologies designed at greater or lesser distances in some local site of practice;
3. Acknowledging and accepting the limited power of any actors or artifacts to control technology production/use;
4. Establishing new bases for technology integration, not in universal languages, but in partial translations;
5. Valuing heterogeneity in technical systems, achieved through practices of artful integration, over homogeneity and domination.

Referring to Law's messiness and Haraway's situated knowledges, Suchman's located accountability brings forward the design process of a development infrastructure as a heterogeneous practice that is in need of a reconfiguration. This need implies taking responsibility for our own participation in the development of knowledge and technology use.

Writing-as-method

The ethnographic life is not separable from the Self. Who we are and what we can be - what we can study, how we can write about that which we study - are tied to a knowledge system disciplines itself and its members and to its methods for claiming authority over both the subject matter and its members.
(Richardson & St. Pierre, 2005, p. 965)

I struggle with possessing and being possessed by a language that is bound by concepts of modernity and colonialism. In an effort to move beyond this concepts, or at least face them, I work with writing as a method alongside diffractive, intersectional and posthumanist analyses to engage with world as a meaning-making practice. Lindström & Ståhl, (2014) uses the figuration patchworking in their research on publics-in-the-making and explain that "patchworking is not only about understanding or knowing mess, but to intervene in order to know, speculate on and participate in the enactment of what is not quite yet existing" (p. 100). Using Haraway's cyborg figuration in my

text has helped me in thinking and doing differently. St. Pierre explains the usefulness of figurations in writing-as-method for nomadic inquiry:

Figurations are not graceful metaphors that produce coherence out of disorder but rather cartographic weapons that tear through the orderliness of humanist language; they scatter sureties; they prod and poke at positivities and foundations; and they perform curious transitions between disjunctive proximities.
(St. Pierre, 1997, p. 407)

The field site as a network

In my research I situate myself as part of the research process. By doing so I need to define how I refer to my field site. Burrell (2009) presents the field site as a network “that incorporates physical, virtual and imagined spaces” (p.181). There has been a shift among ethnographic scholars I am in favor of, from the notion of culture as essentialist to a culture formed by intersection and flow (Burrell, 2009). My objective of exploring the technoscientific practices of the mobile phone implies multi-sited ethnographies. The mobile phone is embedded in several networks - communication, social, technical – and I chose to study its parts. Similar to how Haraway explains situated knowledges, contemporary ethnography is a study, a research process of parts rather than wholes, where there “are a multitude of possible ways to define the connection between researcher and researched” (Burrell, 2009, p. 194).

Burrell (2009, p. 189) writes that “the network as a concept is quite compatible with the aim of ethnographic work to escape the concepts, categories, hierarchies, and the presumed relations that structure quantitative methods and formal surveys”. At first I nod my head approvingly then I read Burrell’s text again and frown. I would prefer using the concept of interference instead of escape. The idea of escaping categories and hierarchies doesn’t fit well with my line of thought. In my work the very core is to confront and remake the categories bounding us and creating unequal power relations.

Transdisciplinary research

My research objective is to explore the technoscientific practices of the imagined expectations and current activities of the mobile phone in developing countries, specifically Uganda. To do so I need to traject disciplines. I move between interdisciplinarity and transdisciplinarity in my texts. Lykke (2010) defines “interdisciplinarity as research that transgresses borders between disciplinary canons and approaches in a theoretical and methodological bricolage that allows for new synergies and transversal cross-disciplinary dialogues to emerge between heterogeneous fields of theory and methodology” (p. 27). My conversations between the disciplines feminist technoscience and ICT4D above attempt to do just this.

Transdisciplinarity refers to involved knowledge producers situated both inside and outside academia (Gibbons et al. 1994) My transdisciplinary approach is most visible in my methods where I use diffraction in my article “Design-games”, figuration in “Girl Geeks” and infrastructuring in “The situatedness of the mobile phone”. The

questions posed in these articles refer to the epistemology of how ICTs is constructed. How are the applications developed? For whom? By whom?

I have used ethnographic methods such as interviews and field notes to converse with my actors and my network. My empirical material consists of interviews and conversations with affiliates at the telecom companies Warid Telecom, Orange and MTN; the NGOs Wougnet (Women of Uganda Network, Witu (Women in Technology Uganda), Brosdi, Girl Geek Kampala; the technology hubs Outbox and Hive CoLab; the non-profit Grameen Foundation Uganda, Unicef; the mobile application company Kola Studios; the state agencies UCC (Uganda Communications Commission) and Ministry of ICT; the Makerere University; the networks Mobile Monday Kampala, I-network and the social enterprise Text to Change. I have also held an Open Space Workshop introduced in the paper *Design-games and future-making*. Furthermore I posted online ethnographic notes on a Tumblr blog <http://thehybridself.tumblr.com>.

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THE ARTICLES

In **Paper 1** *The visionary narrative of a feminist and postcolonial technoscientific researcher* I discuss my insider/outsider role as a technoscientific practitioner in relation to my research objective.

This essay was written for the Intergender workshop Writing Imaginaries, Making Futures, March 2012.

In **Paper 2** *Design-games and future-making – a feminist technoscientific exploration among Ugandan technology hubs* I use diffraction as a method of mapping how actors in technology hubs in a low-income country relate to local innovations and design processes.

This paper has been submitted with comments to the journal The Electronic Journal of Information Systems in Developing Countries (EJISDC).

In **Paper 3** *Girl Geeks, mobile phones and figurations the two organizations Women in Technology Uganda (Witu) and Girl Geek Kampala*. Using diffraction, intersectionality and figuration as cartographic nodes for discussion I examine how the initiatives Girl Geek Kampala and Women in Technology Uganda renegotiate and reconstitute the understandings of gender and technology.

This paper will appear as a book chapter in the forthcoming book Wamala, C., Stark, L. (Eds.) (2016). *Intersections of gender, development and mobile technology: social context and relations of power*. Routledge Advances in Feminist Studies and Intersectionality.

In **Paper 4** *The situatedness of mobile infrastructuring in Uganda* I diffract stories from my conversations with stakeholders in the ICT community in Kampala. I connect the stories with the generic properties of an infrastructure as suggested by Star and Rohleder (1996). I argue that the use of these properties as cartographic nodes are affective for illustrating the relational aspects of an infrastructure. The examination of situatedness suggests that the strength of understanding the mobile infrastructure lies in the ambiguity of sustaining and transforming relations simultaneously, or better yet, a posthumanist performativity where human and non-human forms of agency are taken into account.

This paper will be presented at the conference Living in Technoscientific Worlds, University of Vienna, Austria, December 3-5, 2015.

The visionary narrative of a feminist and postcolonial technoscientific researcher

All I want to be is subversive. Out of control and in everyone's face. Fighting, struggling and questioning why we are headed the way we are headed. Modernization theory has put everything to an end. We continue to abide to rules that make no sense. Rules that feed on colonialism, imperialism and male supremacy. I want to challenge these rules by questioning the current state of affairs in the world. I know it's going to be very difficult and quite uncomfortable. I do it because I am a woman who loves technology and I want to play too, and for that to happen the rules of the game must change.

I will challenge the rules through the networks of technoscience; networks that not only involve research and development but also that of industry and society. The research itself will be active not descriptive. My actions, and that of others, will conjoin with Donna Haraway's perspective of technoscience as being intermeshed between everyday actions and epistemological concerns (Haraway, 1991). My narrative is of an inter- and transdisciplinary kind. I'm roaming in and between several disciplines (feminist technoscience, postcolonial technoscience, information and communication technologies for development (ICT4D), mobile technologies for development (M4D), science and technology studies, intersectionalities, social sciences and anthropology) so that I can better understand and address the situated knowledges and the sociomaterial relations of ICTs and development.

The term technoscience challenges the separation between the 'basic' and 'applied' science and emphasizes the obvious link between the two in that untouched 'basic' science is just as intermixed with society and politics as 'applied' science is.¹ "[...] technoscience, in partnership with global capitalism, generates major historical transformations, including new ways of conceptualizing what it means to be an embodied human subject in a globalized world" (Åsberg & Lykke, 2010). My focus of interest is on the sociomaterial relations of the mobile phone in a development context where I'll be crossing boundaries and interfering with people's expectations, dreams and fears of mobile technology and development; facing stakeholders in the private sector asking about their strategies for gender-sensitive development practices, talking to University students about mobile phones as an extension of themselves and discussing with mobile application developers on their roles as developers and their relations with their imagined beneficiaries.

Technoscience acknowledges the researcher as a regenerative force whose actions defines and implicates the knowledge producing practices of who I am and what I become a part of. In other words, I'm not trying to position myself and have some sort of out-of-body experience where I travel to what's out there and study an object of interest; I am my research and what I do and produce have implications. The insider perspective

¹ See more technoscientific projects at the Research Division of Technoscience Studies at Blekinge Institute of Technology. <http://www.bth.se/tks/teknovet.nsf/sidor/research-and-projects> See also Åsberg, C., Lykke, N. (2010). Feminist technoscience studies.

of me as a technoscientific practitioner is characterized by my role as a PhD student at the department of Technoscience Studies at Blekinge Institute of Technology, my background as an interdisciplinary undergraduate student focusing on globalization and cultural studies in developing countries and as a Manager Web & New Media at an international medical company. I work with theories, methods, knowledge processes and practices within technoscience turning the issues of gender and sex in science and technology to the science question in feminism (Harding, 1986).

Besides being situated as a technoscientific practitioner I regard myself more a narrator and less an ethnographer but I will still adhere to ethnographic methods and as such want to highlight certain important shifts in ethnography as a research field that are relevant for my undertakings. Marilyn Strathern, feminist anthropologist, questions the traditional concept of ethnography where the representation of a society or a culture based on a fieldworker's experiences and observations were enough for analysis and theory by introducing the opposing perspective of the term evocation. Evocation emphasizes that the ethnographic experiences can only be conceived as fragments of discourse and no longer as wholes. If representation was a stronghold for unity and objectivity then evocation in postmodern terms underscores individual subjects, imperfection and fragments. However, Strathern (1991) is not quite satisfied with just flipping the coin and explores a third way for the personifying ethnographic experience where she asks herself: "What image would contain within itself the idea of a person capable of making connections while knowing that they are not completely subsumed within her or his experience of them? That of itself can then be neither one nor a particle in a multiplicity of ones, neither sum nor fragment?" (p. 27)

Strathern turns to the image of Donna Haraway's cyborg as an explanatory figure for a personifying ethnographic experience and a road for stronger objectivity. Recognizing bodies and machines not as separate entities but as systems that are extensions of the other it's easier to see the relevance of embodiment and the possibilities of making connections in ethnography. At one time I'm in my body thinking about feminist discourse of mobile phone development and at another time I'm thinking about the life of a mobile phone and where it goes when the phone has filled its purpose, surpassing my own physical body and altering the common notion of one body and a single mind.

By acknowledging the partiality and locality of knowledges and considering different perspectives, different rooms, different bodies, I will be several steps closer to objectivity. Objectivity through irony that is. In case you didn't know, we can't all be at one place at the same time. Haraway (1991) explicates that "irony is about contradictions that do not resolve into larger wholes, even dialectically, about the tension of holding incompatible things together because both or all are necessary and true. Irony is about humour and serious play" (p. 149).

The cyborg overrides the dichotomies that have been set up between nature/culture, body/mind and human/machine. The cyborg represents a different way of viewing and living things and once we've started thinking that way we can't just turn it off. If

I recognize this new conviction that knowledge is partial and filled with contradiction I can embody the mobile phone as part of us. Just as gender is a relation so is science and technology.

A connection between entities implies that the mobile phone and I mobilize each other, we create a relationship through interaction with each other, comparing this relation with “the relationship between a person and his or her thoughts, or of one’s thoughts and how one converses with others” (Strathern, 1991, p. 39) The extension in these relationships is not equal to the origins of each entity. A relationship isn’t just mirroring an already existing relationship but should be considered a form of regeneration that builds new connections and irregularities of yet another set of connections.

I am consequently already a regenerative agent of my own research - creating, interfering and extending relations with others - creating fractals in several worlds - and both seeing and not seeing the structures I want to challenge.

The transformative and embodied mobile phone

The mobile phone is changing how we communicate with each other, effecting our relations to different actors and spaces - our self, humans and non-human entities (i.e. the mobile phone) and time/space. The social and cultural embeddedness of technology very much defines our ways of knowing and I see this as a critical perspective when exploring people’s stories of mobile phone adoption. Jonathan Donner, mobile phone researcher at Microsoft Research India, elaborates on the blurring between lives and livelihoods and how individuals do not only consider the mobile to be a tool for socioeconomic development and/or productivity but is also very much a tool for self-expression, empowerment and increased social connectivity. Donner (2008) also states, “for many researchers, mobiles are (like other technologies) best understood as co-constructed phenomena; there are interrelationships between what the technology is and how people choose to use it” (p.15)”² The intermediary processes of co-construction between mobiles and people can be referred to Haraway’s assimilation of the term situatedness.

Deleuze & Guattari’s concepts of collective assemblages of enunciation and machinic assemblages are of great help in formulating what I’m interested in featuring. Professor Levi Bryant (2011) explains the concepts collective assemblages of enunciation as referring to the language of the symbolic i.e. laws, philosophies, ethics or the order of language while machinic assemblages refers to “the domain of physical objects, how they interrelate, and how they affect and are affected by one another”.³ I especially am interested in Deleuze & Guattari’s performative aspects of language which they call “incorporeal transformations”. Nothing changes in the bodies for which the transformation occurs but the transformation occurs in the situatedness and social relations

² People are using mobile phones for both productive and personal uses throughout their daily routines. Donner (2009).

³ Quote available here: <http://larvalsubjects.wordpress.com/2011/02/20/two-types-of-assemblages/>

of the bodies. Incorporeal transformation is all about what language does and how it transforms a person.

Just as I'm interested in the incorporeal transformation in ICTs for development I'm also interested in the actual corporeal transformation. Anne Balsamo (1996) addresses how important it is to consider the body when exploring sociomaterial relations of power and domination from a feminist perspective. Taking into account the body of the mobile phone as a gendered and material embodiment temporarily located in history and time I want to diffuse how mobile phones reshape the human/machine binary and how the relations with mobile technology shape (and re-shape) gendered relations.

An illustrative example of how machinic assemblages create incorporeal transformations is showcased in the quote below, extracted from GSMA: s report *Women and Mobile: A global opportunity* (2010).

"I used to wonder about this machine called a mobile phone, but once I began to use it, I realised its many advantages. I can immediately call the wholesale market to inquire about prices and place direct orders. I have eliminated the middleman. I am now recognised as a businesswoman, growing and selling sesame seeds and not just as somebody's wife or sister." Jasuben Malek, a member of the Self Employed Women's association (SEWA), Gujurat, India. (GSMA, 2010)

The mobile phone has transformed Jasuben Malek and she is now recognized as a businesswoman. Her interrelation with the mobile phone affects her social role in her relation with other people and she is no longer only perceived in relation to another person. She has become someone else.

Still the incorporeal transformations that occur among mobile phone users in a development context are inevitably coerced with the current systems of technology and development, which leads me to the disheartening issue of Western and male dominated knowledge systems and infrastructures in ICTs for development.

I challenge Western and male dominated knowledge systems and their implications towards the invisible women in the periphery of mobile technology and development.

The mobile phone has taken the developing world by storm. The number of mobile phone users in low income countries and lower-middle income countries has by far exceeded all expectations and academics, politicians and journalists are excitedly telling the world how the mobile phone is being used for improving livelihoods and socio-economic development (Wicander, 2010). The mobile phone is almost considered a savior tool giving millions of people access to information, plain and simple - information that provides people with universal knowledge on how to get a grip on their lives and become self-sufficient and well-paid entrepreneurs without a care in the world.

I like my mobile phone. I appreciate the innovative enterprises the mobile phone provides for me. The phone is an embodiment of me, designed for work and play, that creates corporeal and imaginative experiences whether I have it in my hand or I forgot it at home on the kitchen sink. The phone enables experiences and transformation but it can only do that through me and our mutual knowledges. I certainly don't consider

it my lone savior. Nor should we consider *the* mobile phone in itself the solution for poverty reduction and socioeconomic development but we can view it as a creative machinic assemblage that can enable incorporeal transformations in livelihoods and social change.

The usability of the mobile phone is far from universal, and definitely not accessible, to all. Nor is the information being spread through the mobile phone. Language is something that is just as situated as our actions and the interrelation between people and objects require something more than just reading words of a screen. We also have the obvious factors of connectivity, reliable network systems and affordable services that are needed for successful mobile usability. Ken Banks et al⁴ addresses factors that are equally determinative including textual and technological literacy, power infrastructures, cultural context, gender, communications workflows, marketing, and local capacity (Banks, McDonald & Scialom 2011, p. 7-12).

I've already acknowledged the relevance of situatedness in terms of *cultural context* and *communication workflows* and when it comes to marketing it will have to suffice with saying that if I can make all the other factors work together marketing will follow. In my next chapter on user-centered design practices, *local capacity* and *textual and technological literacy* will come into focus. I now want to address the factors of *power infrastructures* and *gender*.

The mobile technology itself may be relatively new but the Western dominated perspectives of knowledge and technology transfer is not. In her text on *Postcolonial ICT - a continuum or a rupture?* Birgitta Rydhagen (2004) questions the summary from the report *Gender and the Information Revolution* in Africa from 2000 where it is suggested that the information given to rural women with the intention of improving their livelihoods needs to be carefully repackaged and locally adapted (i.e. local language) in order for the women to even comprehend ICT. Rydhagen's criticism lies in the fact that the summary, although probably not intentionally, gives a sense of a colonial one-sided thinking where rural women in a developing country are unable to improve their own lives through ICTs and instead should wait for a ready-made package provided by outside donors.

A top-bottom approach in development strategies for the Third World is still quite common. Knowledge and technology production are treated as ready-made food packages to be sent down from airplanes in a state of emergency - a view disrespectful to people's needs, people's knowledges and to technology itself. So how can we change this one-sided approach and create a knowledge platform that is more inclusive and more lucrative for both humans and objects?

Studying how mobile phone users engage with their phones just isn't enough. It doesn't answer the question on how the absence of women in directorial positions such as funding, design and management affect the research and development of ICTs, which ultimately affects the end-user's mobile phone adoption? Harding mentions that

[...] the gender relations of the societies sponsoring and conducting scientific and technological research in colonial and imperial contexts would shape the nature of the knowledge such inquiries produced. The absence of women in these kinds of directorial positions affected the selection of scientific problems, hypotheses to be tested, what constituted relevant data to be collected, how it was collected and interpreted, the dissemination and consequences of the results of research, and who was credited with scientific and technological work.⁵ (Harding, 2009, p. 401-421)

Harding addresses a weak spot in feminist research for which I've taken upon myself to answer: how are non-Western women's experiences affected by Western sciences and technologies, and how are their own knowledge systems affected and transformed by outside knowledge systems?

Ultimately, technoscience provides the most satisfying pieces of the troubling development puzzle when placing focus on the epistemological infrastructure by questioning the realms of objectivity in research & development, emphasizing the importance of integration between knowledge systems and advocating local, partial and situated knowledges (Trojer, 2002). Existing frameworks of development practices are in need of a change on an epistemological level before factors such as gender equality and democratic innovations can really be considered sustainable agents for social change.

The transdisciplinary path of co-producing knowledge production follows the path of technoscience. Not only am I walking between different academic disciplines I am also crossing the borders between academic settings and society. Knowledge cannot be contained in compartmentalized disciplines shutting out each other. Knowledge needs to talk to each other (Giger, 2010). Transdisciplinarity acknowledges science as driven by politics and ideology and should therefore be performed as such. I address knowledge production in mobile technologies for development through a dialogue between different actors in society (academics, industry, government, NGOs etc.) encouraging openness and transparency in scientific knowledge (Novotny, 2006). The dialogue is formed and organized through my (re)-generative role as a technoscientific practitioner. "Technoscience can be said to be at issue in any system if recognized as infrastructure that shapes what gets said and not said, done and left undone, produced and circulated" (Fortun, 2006, p. 310).⁷ I am therefore holding myself accountable for being an interfering, ever-changing, context-based practitioner pushing through space and time and encouraging multiple views and knowledges.

Locating unbalanced power structures in mobile technologies for development means approaching and challenging male domination in management and Western dominated knowledge transfer in top-bottom initiatives. For me it also means approaching the designer/user dichotomy in mobile application practices.

⁵ Harding. (2009). Postcolonial and feminist philosophies of science and technology: convergences and dissonances. *Postcolonial Studies* 12(4): 401-421.

I challenge the systems development in mobile application design processes and ask for the users to become the designers.

Just as the power relations between stakeholders on a level of management and development are distorted so are the relations between designers and users in design development. Placing the factors of *local capacity and textual and technological literacy* in the forefront of a successful design practice I want to take it one step further and ask that the users become the designers.

It's time that the designers and users meet and have an actual conversation. Let's dissolve the designer/user opposition and create a learning platform for cross-boundary activities of mutual learning where the designers become less creators and more students and the users become collaborators and teachers, and where designers and users can disregard any notion of a universal language and respect the enterprise of partial translations between each other - an alternative platform that can introduce a more productive working relationship leading to more inclusive and gender-sensitive design processes. Please bear in mind that this platform doesn't exist. It's still all in my head. Taking shape for me to have some sort of direction when dwelling on how systems can be challenged, changed and improved.

Today most mobile applications are being built in a closed environment i.e. in front of a big computer screen in an air-conditioned office at the fourth floor in an urban area, far away from the users to whom they are producing for. There is a great need for crossing boundaries between technology production and use so that the applications being created will have any chance of actually being *useful* for where and by *whom* they will be used. The task is extremely difficult because just as knowledge is being perceived as objective and neutral in 'basic' science so is knowledge in technology production and development. Coming to terms and viewing knowledge as consisting of multiple, located, partial perspectives is necessary for a successful design approach.

The common view among designers is to ignore social relations, view technology only as objects and consider yourself as the master and creator of the object. Lucy Suchman explains that going from designing from nowhere to designing from somewhere means taking responsibility for your actions and acknowledging the situated knowledges that you are a part of and transform as well as acknowledging the designer's reality producing aspects.⁶ "By extension, the only possibility for the creation of effective objects is through collective knowledge of the particular and multiple locations of their production and use" (Suchman, 2002, p. 96).

Looking through the lenses of Science and technology studies (STS) and postcolonial studies Irani et al (2010) have restructured different design processes in several case studies where they suggest for an alternate formulation of design work that stresses the themes of engagement, articulation and translation. Although I'm very restrictive with aligning myself to any design methods I find their themes useful as references for articulating some design issues in ICTs and development.

⁶ See technoscientific research activities at the Research Division of Technoscience Studies at Blekinge Institute of Technology. <http://www.bth.se/tks/teknovet.nsf/sidor/research-and-projects>

Engagement addresses the connection with users and transcultural encounters in design. Participatory design (PD), for instance, originated as a design method in Scandinavia because of the long-term traditions of how the union organized at workplaces and which considers the cultures and practices of the location from which it evolved. Placing the PD method in a different location can have completely different outcomes than first intended or may not work at all (Irani et al, 2010). I am therefore trying to avoid suggesting any design method and instead focusing on the relations between designers and users, and how users can be acknowledged as active participants and not passive recipients.

Articulation is very much about the ontological framing of a situation as designers. Interpreting imagined targets such as needs, wants or opportunities and reframing them so that they can function in a culturally specific design practice. Postcolonial computing is not a matter of finding the right ethnographic informant or the true way of articulating users' ontologies. It is a matter of grappling [...] with how to design when the certainty of perfect intercultural translation is not possible (Irani et al, 2010, p. 1318). The term articulation needs to consider the situated knowledges, the partial perspectives, in order to make proper ontological, political, and economic commitments for successful design processes.

Translation refers to both linguistics and geometry - culturally situated translations between languages and the actual movement of a person from one place to another. Just as engagement and articulation have a tendency to ignore important factors of cultures and situatedness and view design - products, processes and methods – as universal so do translation. These three aspects of situated design practices highlight how uneven power relations take place and how crucial it is to assert cultural and social locality to design processes. A CHANGE⁷ seminar at the University of Washington, highlights top reasons, such as lack of local ownership, cross cultural communication problems and cultural translation problem, for why ICT4D projects fail and the reasons clearly resonate with the mentioned issues of design practices (Magassa, 2012).⁸

To be successful sometimes means taking a risk and creating imaginary platforms where we can test unconventional methods and allow ourselves to travel far from the existing and faltering norms of objective rationality in order to come closer to a situatedness filled with emancipation, fractals and innovation.

I challenge the epistemological infrastructure of today so that we together can create mobile futures on more equal terms.

I can't predict the future. No one can. We especially can't own the future even if we sometimes want to believe so. Le Guin (1989) mentions a quite common view of imperialism in the science fiction genre where space and future are considered alike and just as we exploit, conquer, and colonize space we believe the future is ours to own and

⁷ Change is a group at the University of Washington exploring how technology can improve the lives of underserved populations in low-income regions. <http://change.washington.edu/>

do what we want with. This view holds no real ground since it would require that we already know and can see into the future.⁹ I want to share my dreams and thoughts of a future filled with change and action with others so that we together can learn from the successes and failures in ICTs for development from the here and now and create visionary futures that involve more integrated knowledges of mobile technologies for development. Futures filled with less pain and more democratic innovations.

Below I quote Professor Levi Bryant about the possibilities of incorporeal transformations in society, a quote which I've then fine-tuned to fit my own research aims.

Through the concept of incorporeal transformation we are able to explore the expressive assemblages upon which the sorts of incorporeal transformations the social constructivist wishes to critique are based, without reducing those actors upon whom the incorporeal falls to the order of the signifier. In this way we're also able to think the transformative possibilities that remain in the face of these incorporeal transformations. (Bryant, 2011)

Once again with my fine-tuning and italic emphasis.

Through the transformative impact of what language does I am able to explore expressive assemblages such as knowledge systems in development practices, the interrelation between gender and technology and design/user dichotomies upon which the sorts of transformations of Western knowledge domination, male supremacy and undemocratic innovation systems the social constructivist wishes to critique are based, without reducing those actors such as women, mobile phone users or non-Western people whom the expressive assemblages falls to the order of the signifier (men in top management positions, management in ICTD projects or designers). In this way I'm also able to think the transformative possibilities like women inclusion in top management, gender-sensitive ICTD projects or democratic and situated mobile development in design practices that remain in the face of these incorporeal transformations.

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Design-games and future-making – a feminist technoscientific exploration among Ugandan technology hubs

Abstract

The argument for this study is to find out how actors in technology hubs in a low-income country relate to local innovations and design processes from a technoscientific perspective. A technoscientific approach is relevant as it is not enough to count the number of members at the technology hubs or the projects listed at a hackathon event to determine innovation in mobile development. The context itself is relevant for understanding why certain applications are developed and others are not. Different perspectives on how to define a context are given in the paper. The research question is how is situated knowledges among entrepreneurs in Kampala integrative with mobile co-development and innovation?

The empirical material for this study was chosen through the use of ethnographically linked methods and analyzed diffractively. Based on the analysis I discuss how various power relations and infrastructures are intertwined with the actors at the technology hubs and their design processes. The innovations occurring, as ideas and real life prototypes, are being made by and for people in Uganda. The developers are able to take into consideration their own situatedness, not merely physical, in the co-development of innovative mobile technologies.

Keywords

diffraction, mobile development, technology hubs, situated knowledges, technoscience, Uganda.

Introduction

The massive diffusion of mobile phones in low-income countries the past decade have created a lucrative market for mobile services, where businesses, NGOs, and academia change people's everyday practices through money transfer, SMS campaigns, new communication and transport patterns (Castells, 2007). In some cases organizations, through the use of mobile phones, have improved people's living situation with better access to healthcare information, political news and among farmers up-to-date stock information (Wicander, 2010). There is a mutual process going on where the mobile artifact is not only changing social patterns but also where socio-political patterns are changing the mobile phone and its directionality e.g. dual sim card systems, content and as electronic waste.

Already in 2001 Uganda had more than 210 000 mobile subscribers. This was more than triple the amount of connected fixed lines (Mwesige, 2003). In 2011 the number of mobile subscribers were approximately 16,7 million, which is more than half the

population (34,5 million)¹. Local innovations such as M-pesa, a mobile-phone based money transfer, in the East African region have led to an increase of technology hubs and incubators focusing on mobile applications. The technology hubs are attracting a young, educated crowd in the urban cities of East Africa with the idea of providing co-working spaces, networks and in some cases mentorship programs.

This study and its stories are based on the ongoing activities taking place at technology hubs in Kampala. There are currently three technology hubs in Kampala that target young entrepreneurs and their business ideas within mobile and ICT technologies. Hive CoLab, located in the outskirts of Kampala, was established in 2010, and is described as an open collaborative co-working space for the tech community². Mara LaunchPad, located opposite Makerere University, started in early 2012 and works with entrepreneurs on all stages of the business venture; students, early-stage innovators and later-stage ventures³. Outbox, is the newest hub, started summer 2012 and has the most central location on Lumumba Avenue⁴.

The mentioned three hubs define their interest groups with terms such as entrepreneurs, technologists, developers, designers and innovators. However the hubs have slightly different focus. Hive CoLab offers services for entrepreneurs at a very early stage and the office space is free of charge as long as the entrepreneurs and developers become members, whereas at Mara LaunchPad and Outbox you rent your office space for a fee. All hubs are funded by external investors, foundations and/or international NGOs.

The hubs often hold different events such as hackathons⁵, speaker programmes, community meetings and different kinds of training related to mobile application development⁶.

It is difficult for the entrepreneurs to receive any long-term funding for their ideas and applications, which usually make them rely either on bootstrapping⁷ or hackathons for temporary income. Hackathons are competitions predominantly directed towards people in software development and usually lasting between a day and a week in length. After the participants are introduced to the topic and objectives of the hackathon, they form teams and together they design and build a prototype relating to the presented theme. When for instance Mara Launchpad held a hackathon in early 2013 their theme was Mara Business hackathon. The event organizers explained the

1 Uganda Statistical Bureau of Standards; <http://www.worldbank.org/en/country/uganda>
Accessed May 2, 2013

2 <http://hivecolab.org/> Accessed May 2, 2013

3 <http://www.mara-launchpad.org/index.php/about> Accessed May 2, 2013

4 <http://outbox.co.ug> Accessed May 2, 2013.

5 The word “hackathon” is a combination of the words “hack” and “marathon, where “hack” is referred to as exploratory programming.

6 <http://www.techpost.ug/1406/uganda-technology-hubs/> ;<http://www.outbox.co.ug/>
Accessed May 2, 2013

7 Relying entirely on one's efforts and resources. <http://dictionary.reference.com/browse/bootstraps?ts> Accessed September 2, 2013

theme as “*an event that’s bringing a community of innovative individuals to develop products, services and business solutions to solve challenges and exploit opportunities in Uganda currently*”⁸. Many of the young entrepreneurs I met with at the technology hubs had won prize money from a hackathon and were by this income able to continue working with their prototypes.

Many of the start-up companies focusing on mobile technologies can’t rely on their mobile applications as sole incomes and offer various services in the field of information and communication technologies, such as web and desktop software applications, graphic design and network maintenance. Some of the applications currently being developed at the hubs are Walimu, a healthcare application that will deliver guidelines for care of severe illness, Inforex, a business application that provides the latest forex information to the public and Matatu, a game application that is based on a popular card game in Uganda.⁹

This paper is structured in the following way. The first section is an introduction on mobile phones and technology hubs in Uganda followed by a second section on post-colonial ICT. The third section introduces the transdisciplinary field feminist technoscience. The fourth section concerns research methodologies and the fifth section contains design stories of diffraction where the empirical material is analyzed. The sixth and final section involves a discussion of the analysis.

Postcolonial ICT

Postcolonial theory usually refers to the socio-political systems transferred and enforced from one context to another with little emphasis on the techno-political aspects of movement. Rydham and Trojer (2004) underline that “for development the change of position from merely technology transfer to co-development is strongly in demand.” The implementation of technology hubs in Kampala suggest a co-development between different actors – entrepreneurs, investors, academics, politicians – that encourages local innovations and weakens the unbalanced power relations in international technology development.

Anderson (2002) states that “A postcolonial perspective suggests fresh ways to study the changing political economies of capitalism and science, the mutual reorganization of the global and the local, the increasing transnational traffic of people, practices, technologies, and contemporary contests over ‘intellectual property’”. Fresh ways means bringing alternative knowledges of how and why technology and knowledge in mobile development is being interpreted and implemented the way it is.

Donner (2010) describes the dual heritage of the field mobiles for development (M4D) “around two distinct phenomena: the phone (as an enabler of choice) and the computer (as a system to alter social contexts)” and further explains that new “mobile systems

8 <http://www.techpost.ug/999/mara-business-hackathon-its-not-a-code-hackathon-its-a-business-hackathon/> Accessed September 2, 2013

9 List of projects available at Outbox: <http://outbox.co.ug/node/58/> and Hive CoLab <http://hive-colab.org/projects/> Accessed September 2, 2013

are emerging, at scale, with millions of users, which may not be assessed adequately via either the user choice [the phone] or the embedded directionality [the computer] frames that have served M4D so well". Donner suggests a synthesis of the two phenomena as a way of increased interaction and better development outcomes. The synthesis becomes prominent in management tools such as Frontline SMS, Ushahidi and M-PESA where two-way communication is prominent and dependent on their users for content and exchange.

A postcolonial perspective also becomes relevant when studying the digital divide not only between countries but also within a country. The commercialization of mobile devices and mobile application tends to focus on urban areas leaving large communities behind in terms of access and sharing of technology and knowledge (Mwesige, 2003). The existing technology hubs in Uganda are all located in Kampala; what implications does this have for how local innovation is created and for whom?

Feminist technoscience

This study explores power relations in relation to design processes in mobile development through the lenses of feminist technoscience. Feminist technoscience focuses on the technoscience itself – such as theories, methods, knowledge processes and practices – and the regenerative and embedded role of the researcher, or in other words, the context of production and implication (Trojer, 2013). Haraway's (1988) concept of situated knowledges further elaborates the understanding of knowledge practices as something being partial, and fragmented, focusing on position and context rather than universality and a place of nowhere.

Sometimes people read "Situated Knowledges" in a way that seems to me a little flat; i.e. to mean merely what your identifying marks are and literally where you are. "Situated" in this sense means only to be in one place. Whereas what I mean to emphasize is the situatedness of situated. In other words it is a way to get at the multiple modes of embedding that are about both place and space in the manner in which geographers draw that distinction. Another way of putting it is when I discuss feminist accountability within the context of scientific objectivity as requiring a knowledge tuned to resonance, not to dichotomy. (Haraway 1998, p. 71)

Björkman (2005) emphasizes what Haraway writes about the situatedness by using situated as an "epistemological standpoint". It is not only the physical place that the situatedness refers to but also to the practice and knowledge production of the research field. Trojer (2013) mentions that "Science is (co-)creating society and is thus political. [...] As a scientist I have to see myself as a producer of realities for myself and for all others in society".

Studying information and communication technologies from a technoscientific perspective means exploring the technology permeating us and how it changes our everyday practices, which eventually creates new realities. The design processes of mobile application development are relevant for understanding which actors enter in and out of a project and when. The actors that appear at the technology hubs are investors, developers, organizers, programmers, project managers. The actors themselves are constructed and compartmentalized through various enactments and it's important to understand why these corresponding actions occur and what directions they take.

Research methods

Empirical methods

I have used an ethnography inspired approach of gathering material, for the purposes of exploring how themes of mobile development and user design come into being and change how young urban people with an interest and knowledge in mobile application development innovate and pursue their ideas, During the fall of 2012 I spent two months in Kampala studying the sociotechnical infrastructuring of the mobile phone from various perspectives. Part of that study took place at Outbox and Hive CoLab, two of three technology hubs, in Kampala. I never physically got to visit the third hub but I was in contact with one of their developers via e-mail.

During my visits at the hubs I interacted with young entrepreneurs, discussed their mobile applications and design processes, and gathered data through interviews and live field notes. The data collection consisted of both more traditional data collection such as handwritten field notes and participant observation as well as netnographic data collection (Kozinets, 2010). My netnographic field note data consisted of observational live field notes on an online blog with text and photos.

I conducted audio recorded interviews with the project managers at the technology hubs Outbox and Hive CoLab. Other material gathered includes audio recordings of an Open Space workshop I held on the theme “The Mobile futures of Uganda: sharing visions and challenges for today and tomorrow” at the technology hub Outbox. After the stay in Kampala the data collecting continued online through email correspondence and social media streams (Twitter, Facebook and blogs).

Analytical methods

Diffraction is a feminist figuration presented as an alternative to reflection and originates from Haraway (1997) and is further elaborated by Barad (2007). Whereas reflection in research bounces separate entities between each other and the researcher remains an outside observer, diffraction is an interference “of practices/doings/actions” (Barad 2003) establishing connections of a heterogeneous history (Haraway 1998; Barad 2003; Timeto, 2011; Alander, 2007).

My understanding of diffraction corresponds to Björkman’s (2005) interpretation:

...if I am the grating, where my different positions and perspectives are the slits through which the material I study, as well as my experiences, pass, this will create many images on the ‘screen’, i.e. the stories that I tell. This is thus a diffraction pattern, where some stories are stronger than others, some stories disappear, but many stories exist. The broad light beam (the initial story, the source) is diffracted into several stories. The slits make it possible to see parallel and different, diffracted, stories.
(Björkman, 2005, 37)

One of the most important aspects of feminist technoscience is the onto-epistemological practice, the merging of theory and practices, performed through diffraction. Sefyrin (2012) presents another aspect of how diffraction can be understood as a metaphor for research:

“If diffraction is understood as a metaphor for research, the empirical material is the light, and the slits in a screen are research practices, such as the practice of formulating the purpose and research questions of an study, practices for gathering empirical material, the situatedness of the researcher, the choice of theories and the methods, and the format of the text. Hence if these are changed, so does the interference pattern that is the result of the diffraction. When diffraction is used as a research methodology the result may be that alternative patterns become visible.” (Sefyrin 2012, 715)

First and foremost, a diffractive methodology is a critical practice for making a difference in the world. It is a commitment to understanding which differences matter, how they matter, and for whom. It is a critical practice of engagement, not a distance-learning practice of reflecting from afar (Barad, 2007). I will use diffraction similar to Sefyrin (2012), “as a method to ask for several stories, interpretations, angles, or perspectives, and to look for complexities and richness in the empirical material, for several layers of meanings and realities” (p. 715-716). This means that I have analyzed stories and figurations that bound the expectations, demands and visions of young entrepreneurs in Kampala. I have asked for, and at the same time created, stories on the relation of ICTs and innovation, design processes in relation to mobile application development, and the type of mobile applications being developed in the context of the technology hubs.

Design-games and infrastructuring

The concepts of design-games and infrastructuring are useful for how the developers act and relate to their designs and surroundings and vice versa. Ehn (2008) defines design-games as a concept for exploring design processes and is useful for understanding the socio-material aspects of design objects, designers and users and the process of infrastructuring. Leigh Star (1999) defines infrastructure with a list of properties that underscores its relationality to human organization. For mobile application development infrastructures such as programming languages, internet communication protocols, interfaces, wireless network, and hardware support are all more or less transparent models intertwined with the actions and directions of how a developer designs its application. Ehn (2008) further befriends the two concepts of design-games and infrastructuring:

An infrastructure, like railroad tracks or the Internet is not reinvented every time, but is ‘sunk into’ other sociomaterial structures and only accessible by membership in a specific community-of-practice. Infrastructure or rather infrastructuring is a socio-material public thing, it is relational and becomes infrastructure in relation to design-games at project time and (multiple potentially conflictious) design-games in use. (Ehn, 2008, p. 5)

I am interested in how socio-material infrastructures affect the developers and what kind of terminology is used that can be interpreted and rephrased as power relations among the developers.

Mobile stories of diffraction

In the following section, I present a variety of stories that relate design processes, innovation and mobile applications development in the context of technology hubs in Kampala.

An Open Space Workshop

On the evening of Wednesday, October 31st, 2012 I held an Open Space workshop on the theme “The mobile futures of Uganda: sharing visions and challenges for today and tomorrow” at the technology hub, Outbox, in Kampala. The schedule was created together with the 17 participants and the topics ranged from *mobile apps crazy; corruption and innovation to go native or not; and investors & mobile apps*.

I have selected discussions from the workshop that refer to the themes of mobile application development and innovation as they become relevant for the study on design processes and future-making. The titles of each discussion are based on the content from the discussions and are not the titles of the chosen topics during the workshop. The participants are not mentioned by name due to the anonymity of the workshop. They are however differentiated by markers where [P1] stands for Participant One, [P2] stands for Participant 2 and so on.

Local knowledge and corruption

[P1] No, but I think software is not being put so much into consideration.

[P2] It's not put so much into consideration, because first of all even the software that we use most of it is outsourced from other countries.

[P1] Exactly.

[P3] Really, like which one?

[P2] Most of the software that is used.

[P3] Like what?

[P2] Look at AppGIS. It's an enterprise software. They brought it here, as in they buy the software from another country. Even just building a system, just a simple web system. They bring guys from out [read: outside of Uganda] to come and build something here.

[P3] But I think that is changing, because if you check the RapidSMS groups¹⁰, some local government was looking for a RapidSMS developer and they preferred a Ugandan so they forwarded the thing to UNICEF and because UNICEF knows its people UNICEF forwarded [the job ad] to their [mail] groups so I think they are shifting focus but again that also depends.

[P3] They wanted RapidSMS, RapidSMS is Python¹¹. You know very well the Universities they don't teach those kind of languages so I it all zeroes down to how many other foreign companies are there and what kind of influence they have on whatever.

[P3] And then also this is an agrarian economy, they are still thinking agriculture. If

¹⁰ RapidSMS is a free and open-source framework for rapidly building mobile services for scale.

For more information see company website <https://www.rapidsms.org/>. Accessed September 27, 2013.

¹¹ Python is a programming language commonly used for mobile application development.

you ask the President what the backbone is, he will tell you he wants a family to be able to have cows. I think change will happen maybe when I'm president but as for now, we still have some time to go, twenty more years, this guys they are still on agriculture and you know, the sad thing is they will start waking up when Rwanda is already shooting up.

[P4] But Rwanda is moving so fast in tech.

[P3] I mean, they will wake up when Rwanda has exploded.

[P4] Seriously, in Rwanda it takes three days to register a business, in Uganda it takes 27 days.

[P5] Actually, they changed it. It's no longer three days it's actually a couple of hours.

[P4] Rwanda is practically ahead.

[P3] They finished us.

[P4] That whole initiative of one laptop per child means they encourage tech from the grassroots.

[P3] I think they are really somewhere.

[P6] And why do you think Uganda isn't there yet?

[P2] Ugandans are thieves.

[P3] I think corruption.

[P2] Yes, that's what I think too.

[P3] You can look at the status quo. The governments of Sweden, Ireland and those other Scandinavian countries they gave 10 million Euros...

[P2] Yeah.

[P3] ...for the rehabilitation of Northern Uganda and someone diverted it to their private account.

[P6] Yeah, I read about that. They had to start to freeze all funds.

[P3] If you have such a corrupt economy and in Rwanda they don't tolerate corruption at all. Rwanda attracts investors, all kinds of investors. So actually I heard some funny thing "Good laws are made in Uganda, and they are implemented in Rwanda".

This discussion covers a lot of the ongoing fluctuations in Ugandan society. There are various actors such as foreign IT companies, the local UNICEF and the President in the mobile infrastructure that affect how innovation in mobile technologies can be interpreted. The young entrepreneurs are looking for answers to why the progress for job careers in programming for Ugandans is so slow and by doing so differentiate themselves from people working with and in agriculture. This notion of someone else working with agriculture reflects their living status in the capital and how their studies or work in technology are almost put in opposition to agriculture. One of the partici-

pants even claims that because of the majority of the country working with agriculture, Uganda will be left behind compared to other neighboring countries i.e. Rwanda. Not only is agriculture considered an issue in terms of technology and innovation but Uganda's problems with it are also seen as a hindrance in ICT development.

Referring back to how the entrepreneurs are becoming enablers of their own situatedness is the example of the programming language Python. According to one participant the language is not taught at any of the Universities he is familiar with, which means that you either need to be self-taught or you will need to receive your education abroad or outside the university. Instead the developers located at the technology hubs learn the programming languages in their own spare time. The hubs also hold programming courses making them a knowledge base for mobile application development outside of the University arena.

Personal responsibility and issues of commitment

[P1] For me, these days, we hear a lot of people pointing fingers and everyone blaming the government, blaming someone, but for me I think some of us, like you guys who are developers, some of you are lacking personal responsibility. So you want to develop an app because you are sure that someone is going to find it and so people are not taking personal responsibility. And for me I think, taking it on yourself to fix problems is going to be the way out because if you wait for the government to help you it's not going to happen, if you wait for a donor who's going to bring terms and conditions nothing happens...

[P2] Speaking as a software developer, some of our ideas come from very far, but to get it into the platform we have to brainstorm the idea. Washreporter came from Waterhackathon. Waterhackathon was sponsored by WorldBank and other key investors. And one of the things they said they would elect a Water Ambassador who is meant to report to all the projects out of the hackathon, there is only one project that is leaving and that is Washreporter. [...]

An agent of personal responsibility is here addressed in relation to development. Examples of someone *blaming the government* or thinking that *Ugandans are thieves* can be an act of removing any personal responsibility for development. One workshop participant sees relevance in solving problems oneself and that developers should stop waiting for the government or a donor to provide for them.

Many of the workshop participants are in their early twenties, some still attending undergraduate studies at the University. They may not have had any courses in entrepreneurship or had little experience in problem solving from a business perspective. In the educational system it is still mostly common with one-way communication rather than a base for knowledge sharing, where the students can provide and share knowledges with their teachers. This means that when the developers, who have studied software engineering or similar, are encouraged to participate in hackathons or develop an idea for a mobile application, they may have little knowledge of how to solve problems, i.e. sanitation management or micro-finance, that are far from their

scope. Another participant provides an example of a hackathon where only one project remains. The understanding or the encouragement for a sustainable thinking after hackathons remains small. Either you win a hackathon, as in the case of Washreporter, and you can continue with your idea for a few months with the prize money or you don't win and your ideas tend to wither away due to lack of funding.

The power relations in this example come from how terms and conditions are being setup by donors, companies, organizations or as funders of a hackathon. Through frustration and short-term funding the entrepreneurs are trying to create a base for their own innovations, where they become more resilient and can rely less on occasional prize money and more on long-term investments with partners.

A personal interest above all

[P1] Sometimes in tech we want to take it easy. We want to do something and then you run for funding. At least look at it from a traditional game business. Sometimes you don't really start with that much amount of money so I've been going back to that thing of 'let's start from zero'.

One participant compares their mobile application business with a traditional game business, where independent developers start without any financial resources. That is a good starting point for any developer. This comment reflects back on who the developers are developing for. Themselves or their users or both? It would seem that this participant thinks the development itself comes first.

Ehn (2011, 40) writes that *"there are two kinds of outcome of a design thing: there is the engineering outcome: devices providing access to functions, but at the same time there is the architectural outcome; "things" modifying the possible spaces of interaction (functional, aesthetic, cultural, etc.)"*. A so-called design thing. The various elements of design-games, design-by-doing, design-by-playing and design-after design are not equally apparent at the technology hubs or among the different developers (Ehn, 2007, 2011).

Who is the end-user?

[P1] One thing about the way we build our platforms here is that we do not look at this thing, the end-user experience. When we build we assume that the guy who is going to use the application is an elite guy. For example the Farmer's application that was built by Grameen, tell me how many farmers are using that application?

[P2] The thing with Grameen, they go and interview the guys, I think I wouldn't front Grameen because these guys know what they are doing. They have experience dealing with the poor, so at least they go down to the grassroots and find out how we do it, this is how we should do, and they train those guys.

One workshop participant doesn't think the developers are considering who their users are but are making certain assumptions about the future user, and referring to the user as someone elite, a male. Perhaps someone who has a smartphone, is familiar with many application interfaces and knows English well. Perhaps. If the developers are looking to themselves first and developing and designing an application that they themselves like, then the elite guy is the developer.

This is cause for concern as this comment implies that the developers are only looking towards themselves when developing an application. Even though they may be creating applications that they want to thrive in the market system, they are not involving users early in the design process and are thus unaware how their innovations will be received. The imagined perception of who this participant wants the user to be, reflects a bias for urban city users accustomed to smart phone interfaces.

Grameen foundation AppLab¹² is brought up as an example of providing an application for farmers in Uganda. While one participant is questioning if it is really being used and if they have any knowledge of their end-users, another participant quickly counters this notion by describing Grameen's work and that they have experience working on a grassroots level and have built a sustainable application that encourages training among farmers.

A country filled with problems is a country filled with opportunities

[P1] My main issue with the Kenyan tech scene is this, they have reached that point where the problem is they lack problems to solve. That is why I'm happy to be in Uganda cause we have so many problems. We have so many problems and that is the beauty of it.

There are several comparisons with neighboring countries such as Rwanda and Kenya throughout the discussion on innovation. The brief comment above about the Kenyan tech scene indicates an interesting approach to the developer's own community. The participant shifts what would commonly be viewed as something negative to something positive for the developer. The participant sees a problem-filled society, such as Uganda, as a strength and thanks to this believes that the Ugandan tech scene is at an advantage over Kenya's tech scene.

Understanding the national context and how it is intermeshed with how the tech scene in different countries is built is important for how the developers choose to explore and define their own innovations.

Bodapay

This story originates from a focus group discussion with the team that created the mobile application Bodapay, the team's website and a newspaper article in the local newspaper Daily Monitor¹³. Bodapay is "*a mobile app that helps the user to estimate the cost of his intended journey while using public means of transport in Uganda*".¹⁴

12 Grameen Foundation AppLab, famous for its Village phone program, is a non-governmental organization that has been active in Uganda since 2007. Website: <http://www.grameenfoundation.org/>. Accessed September 27, 2013.

13 Kalungi, Nicholas. "Using an app to save on transport costs." Daily Monitor, February 19, 2013. <http://www.monitor.co.ug/Business/Prosper/Using-an-app-to-save-on-transport-costs/-/688616/1698416/-/5jgdel/-/index.html> Accessed September 27, 2013.

14 <https://play.google.com/store/apps/details?id=brudan.bodapay.version1&hl=en> Accessed May 2, 2013

I chose the story of this application because of its relevance for the local context. Bodabodas are motorcycles used for public transportation in Uganda and especially in Kampala. Due to the heavy traffic in central Kampala and recurring problem of traffic jams on main roads, many people turn to Bodabodas for a shortcut. The drivers move between cars and rarely follow the traffic rules. Few people wear helmets and the drivers are the cause of many accidents. Still, many people think it's worth risk of taking a Bodaboda for the sake of getting to work, school or a meeting on time.

The idea for the mobile application Bodapay came from one of the team members of the company Brudan digital. He exclaimed that he was tired of getting ripped off by the Bodaboda drivers all the time and that the price kept changing depending on who he was riding with. Bodapay is a solution close to a fixed rate system. "BodaPay will help you estimate the average amount you are supposed to pay against a distance in kilometers that you plan on travelling while using a motorcycle (Bodaboda). It will also show you the route you will use via Google maps".¹⁵ The team studied the behavior of Bodaboda users while developing the application and they have plans for creating a similar app for cabs and buses.

The application Bodapay is a direct result of the living conditions in Kampala. The consistent problems with corruption in the government have led to a decline on road maintenance, which in turn has led to a heavy increase of potholes in all roads of the city.¹⁶ The potholes makes the traffic go slow and when it rains it is almost at a standstill. A response to this problem has been the introduction of Bodabodas. Without a government organ surveying the Bodaboda drivers, there are no fixed prices. The drivers set the price they see fit and their customers either abide to the price or choose an alternative means of transport. Bodapay "puts in account fuel, repair charges and a rider's profit. From our research, a motor cycle uses one liter of fuel on a journey of between 20 and 30 kilometers. The app considers this before giving the estimate".¹⁷ Thus instead of the drivers having a fixed price system it is left to each customer to determine the price as summed up by the application before each journey. Although it may seem time consuming with the application when having a discussion on the price, without the application it may be just as time consuming and far more costly.

The idea for this application sprung from a frustration of a very visible infrastructuring in a localized context. Leigh Star (1999) presents the relationality of infrastructure from a variety of properties, one of them being visibility upon breakdown. In this case the recurring problems are failing road maintenance and an ever-expanding traffic in

15 Kalungi, Nicholas. "Using an app to save on transport costs." Daily Monitor, February 19, 2013. <http://www.monitor.co.ug/Business/Prosper/Using-an-app-to-save-on-transport-costs/-/688616/1698416/-/5jgdel/-/index.html> Accessed September 27, 2013.

16 Ahimbazwe, Roderick and Kakebe, Mubiru. "Kampala City Centre has 2,489 potholes." New Vision, November, 22 2010. <http://www.newvision.co.ug/D/9/183/738680> Accessed October 1, 2013

17 Kalungi, Nicholas. "Using an app to save on transport costs." Daily Monitor, February 19, 2013. <http://www.monitor.co.ug/Business/Prosper/Using-an-app-to-save-on-transport-costs/-/688616/1698416/-/5jgdel/-/index.html> Accessed September 27, 2013.

the central region of Kampala. The developers, just as many other young people, are forced to use the Boda Boda to get around, if they want to get where they are going without too many delays. And in doing so, they want a fair price for their rides.

A property of infrastructure that Star (1999, 382) states is embeddedness where one infrastructure seemingly co-exist in “*other structures, social arrangements, and technologies.*” The application Bodapay was developed within an infrastructure of mobile technologies but the ideas and conceptualization of the application stem from infrastructures of traffic and road maintenance and economic systems in the city. Bodapay as a commercial product is changing how the BodaBoda drivers are communicating with their potential customers and ultimately how they will get paid. The customers are getting a system that will provide them with a fixed price for the fare instead of the previously back-and-forth price negotiation.

The survival of the application resides on many factors and not least the interest of the developers. Many mobile applications in Uganda are developed and utilized by non-governmental organizations and income-generated through donors and external investors. Although the technology hubs may be donor-funded the developer teams are usually not, except for the occasional prize money, which makes it difficult to sustain the projects financially.

Discussion and further research

Paradoxal differences of power relations and conflicting situatedness

The power relations of donors, national policy makers and a University curriculum set certain limits to how the entrepreneurs can develop their applications. The limitations consist of minor funding, corrupted bureaucracy and exclusion of certain programming languages in the University curriculum relevant for application development. However, the very same actors are also providing opportunities for the entrepreneurs in terms of donor-funded hackathons, ICT policies and Universities that encourage local innovation.

Uganda is a low-income developing country filled with problems of conflict and corruption, bound by external donors and investors¹⁸. Uganda is also a country with a flourishing tech scene where young entrepreneurs and the technology hubs have

18 According to CIA World Factbook population below poverty line is 24.5 % (est 2009) and the external debt is \$4.514 billion (2012 EST). <https://www.cia.gov/library/publications/the-world-factbook/geos/ug.html> . According to the Social Watch Report 2013 “In 2005, the World Bank estimated Uganda loses to corruption at 510 billion shillings (USD 204 million), while the Global Integrity Report (2006) doubled the amount to one trillion shillings. The East African Bribery Index issued in August 2012 by Transparency International ranked Uganda first among the five countries of the region: 40.7% of the respondents said they encountered bribery incidents in the public sector”. <http://www.socialwatch.org/node/15669> Accessed October 1, 2013.

attracted an interest in international news¹⁹. Those entrepreneurs who acknowledge and accept these somewhat paradoxical differences of power relations and conflicting situatedness, are most probably able to sustain longer in the world of business and can adjust their innovations and business plans accordingly. Many of the mobile applications are being developed in a closed setting of hackathons or secluded workspaces which makes a user focus quite vague and limits who can finally use and comment on the applications.

The entrepreneurs see mobile applications development both as a source for personal interest and as a business opportunity. If they want to become more sustainable in the market, the actors, both entrepreneurs, representatives of technology hubs and University students, need to be physically more present and engaged with their potential users to understand their needs and interests and eventually what kind of design-games (Ehn, 2008) that can be utilized in an Ugandan infrastructure. As part of a stronger emphasis on mobile phone users in various regions in Uganda a knowledge sharing platform between the entrepreneurs at technology hubs and non-governmental organizations is needed – a platform, that are more experienced with working large-scale with mobile applications in rural areas.

Affirmative actions for social change

The actors and the infrastructure of the technology hubs are examples of co-development. The innovations occurring as ideas and real life prototypes, are being made by and for people in Uganda. The developers are able to take into consideration their own situatedness, not merely physical, in the development of innovative mobile technologies. They are learning through others and by themselves how to build mobile applications, work with a business and survive in a national market.

The technology hubs encourage further collaboration with other actors in the mobile technologies arena through mentor programs, courses and partnerships suggesting a longevity and visibility in the tech arena. The affirmative actions for social change are the ideas generated by the developers and the entrepreneurs. A social change where co-development and knowledge from within is taking place.

Further research: designing for whom?

The visible infrastructuring of an unstable and corrupt economy and a negative perception of agriculture and the national self are factors that affect how and for what the entrepreneurs choose to develop their applications. One workshop participant mentioned that as a developer he or she made certain assumptions about who the user will be. Instead of participating and asking potential users what their needs are this

¹⁹ See for instance <http://www.bbc.co.uk/news/business-19702011>. Accessed September 27, 2013.

participant's reflection is consistent with another participant's comment *we want to do something and then you run for funding*.

This is how the idea for the Bodapay application originated. The idea for the application came from one person who was frustrated with how rate system worked among Boda Bodas. Through a personal need the developer could find a common need for many Boda passengers. The infrastructuring of poor road maintenance and a fierce escalation of Boda drivers in the city together with a GPS network made Bodapay possible. Instead of hoping that the government would ensure a secured payment system of Boda customers, the developer together with a team created a system of their own. Further research on the design process is needed to understand the relation between the designers, developers and the users and encourage a closer relation through co-evolving design. Both those design processes that originate from hackathons and those that do not, to determine when and how the future users are incorporated in the development process and to what extent the developers incorporate user feedback in their applications. The synthesis that Jonathan Donner (2010) drew from the two phenomena user choice (the phone) and embedded directionality (the computer) in the field of mobiles for development is not apparent in the discussions surrounding innovation among the entrepreneurs and it would be of interest to introduce and test the synthesis model in the design process.

This study focused on topics relevant for developers located in Kampala. Further questions of relevance from a national perspective is which topics are of interest for the potential developers and users living outside of Kampala and how can the current mobile applications development be extended outside of the capital? The issues of digital literacy becomes quite apparent when several of the entrepreneurs are working with applications that require a good knowledge of a smartphone interface and a good knowledge of English, something that excludes many users with low-end mobile phones. How is digital literacy being (self)-taught in communities outside of Kampala and can these self-learning methods be of use for application development in a wider, national context?

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Girl geeks, mobile technologies and figurations

Abstract

In Uganda the mobile phone users are in high majority compared to users of land line phones. The mobile phone has become an everyday communication device used for various purposes - business, service access, entertainment and communication. It is changing the socio-technical relations of gender, technology and development. This chapter examines the relation of gender and mobile technologies from interviews, chats and online media. A specific emphasis is placed on the two initiatives Girl Geek Kampala and Women in Technology Uganda (WITU) which was formed with the purpose of empowering women in a male-dominated ICT environment. Using diffraction, intersectionality and figuration as cartographic nodes for discussion, I examine how the initiatives Girl Geek Kampala and Women in Technology Uganda renegotiate and reconstitute the understandings of gender and technology.

Introduction

At the turn of the century many development organizations believed that Information and communication technologies (ICTs) would provide a promising direction for women's empowerment. In 2002 the United Nations Division for the Advancement of Women declared: "ICTs can provide diverse avenues for women's social, political and economic empowerment." The Groupe Speciale Mobile Association report *Women & Mobile: a global opportunity* (2008) mentions that mobile phone ownership can advance social and economic goals for women considering that women direct up to 90% of their income to their families and communities. Gurumurthy & Chami (2014) suggest that "access to ICTs and their benefits is a pre-condition for women's empowerment" (p. 8). They base their claim on the Information telecommunication union forecasts showing a global gender gap of 200 million people without access to internet. Referring to policy discussion Gurumurthy & Chami consider expanding women's access to mobile phones to be the best strategy for closing the Internet gender gap. Mobile phone use is changing women's social connections and increasing their participation in private and public spheres.

In 1999 Uganda became the first African country — as one of the few in the world — where the number of mobile users surpassed that of fixed-line subscribers. Uganda's telecommunication needs continue to be in majority serviced by mobile networks. Statistics from Uganda Communications Commission (2012) show that by the end of 2014 mobile subscriptions were more than 20 millions while the fixed subscriptions were slightly more than 300.000. The increasing level of mobile penetration provided an arena for innovation where mobile services such as M-Pesa, a money transfer service via the mobile phone, were created in the East African region.

Socio-cultural and economic factors are reflected in mobile phone use. Mobile technology usage in developing countries often gather, store and deliver information in a different way than in countries where the internet connectivity, electricity and computer

hardware is reliable, cheap and stable (Wicander, 2010). In Wamala's study (2010) on understanding access and use of media and information technologies among Ugandan farmers brings forth technology as culturally embedded. The social environment affects how the farmers relate and value the technology. Wamala (2010) mentions that access to information is a crucial resource to the farmer, just as land and capital is.

Gender and ICT initiatives in Uganda

The underrepresentation of women in the IT industry has been consistent for several decades. Statistics from Inter-University Council for East Africa indicate that, among seven selected Higher education institutions in Uganda, the female proportion of total students is 51%. However, the female proportion among Science and Technology Students is 18%. Despite an increasing encouragement for women to pursue STEM-education women remain highly under-represented in political parties, governments and employment (Masanja, 2010).

The Women of Uganda Network (WOUGNET) was formed in 2000 by several women's groups in the country. The aim of the network was to use ICTs to disseminate information more efficiently among member groups and is today a major network consisting of over 90 women organizations (Wamala, 2010). WOUGNET initiated a programme in 2005 with twelve rural women farmer's groups in the Apac district that uses mobile phones and radio to increase the effectiveness of communication channels. This project gave women access to mobile phones and taught them how to sms. In 2012 the initiatives Women in Technology Uganda (WITU) and Girl Geek Series – Uganda were formed with the purpose of empowering women through technology, or more specifically to empower women through code. While WITU offers various technology-related activities for different age groups, the Girl Geek Series focus on programming courses and hackathon attendance. Both organizations provide courses where young women are taught different programming languages enabling them to create their own mobile applications, attend hackathons¹ and enter or remain in the ICT sector.

A diffractive method

It is very difficult, almost impossible at times, to write and think outside the language of humanism, our mother tongue that constructs and perpetuates with such transparent ease binaries, hierarchies, dialectics, and others structures that are not just linguistic but that have very material effects on people. (St Pierre, 1997, p. 406)

This chapter is written diffractively with the purpose of narrating the phenomenon Girl Geek as a heterogeneous story. The empirical material consists of conversations with the co-founders of the initiatives, online chats, news articles and websites. When I met with the co-founders of the organizations I initially wanted to talk to them about

¹ A hackathon is an event where computer programmers and other professionals collaborate on software projects during a limited amount of time, usually a day or longer. The events are often competitive where a panel of judges select the winning teams and prizes are given, sometimes in the form of substantial money.

their work with ICTs in their work life. During my interviews we started talking about their initiatives for women and ICT and I became curious to why they had chosen to create these gender-separatist arenas. I use the term Girl Geek as a reference point for members of both organizations. However, the members of WITU do not describe themselves as girl geeks and have a different focus than the girl geek initiative in terms of how they advocate activities also involving career and leadership, internship program, tech kids program for boys and girls. Both initiatives were created within and alongside two technology hubs, Hive Colab and Outbox. These hubs provide office space for entrepreneurs, especially mobile application developers, and organize programming courses, mentorship programs and hackathons.

St. Pierre expresses my diffractive writing strategy with “as I write, I think, I learn, and I change my mind about what I think” (St. Pierre, 1994, p. 408). While reflexivity is a method to reveal how scientific knowledge is socially constructed diffraction takes a different turn. “Diffraction patterns record the history of interaction, interference, reinforcement, difference. Diffraction is about heterogeneous history ... Diffraction is a narrative, graphic, psychological, spiritual, and political technology for making consequential meanings” (Haraway 1997, p. 273). Haraway sees reflexivity as problematic because of its over-emphasis on semiotics and suggests that joining the term semiotics with the material is a “way to intervene in the networks of actants to produce both new actants (which she also refers to as ‘inappropriate/d others’) and new networks” (Bell, 2007, p. 126). Lykke (2010), drawing on the works of Haraway and Barad, proposes diffraction as a better thinking technology for critically viewing the world and changing it at the same time. I use diffraction to narrate the phenomena girl geek with stories from the co-founders of the organizations Girl Geek Kampala and Women in Technology Uganda, stories on the conceptualization of the Girl Geek, the relation gender and technology, and figuration.

A negotiation process

Kimberle Crenshaw is often considered to be the one who introduced the concept intersectionality. Crenshaw (1991) exemplified intersectionality with the experiences of women of color where intersecting issues of sex and race influenced each other. Lykke (2010) suggests that intersectionality can be defined as a theoretical and methodological tool to understand and analyze power differentials and normativities where intersectional gender/sex becomes a nodal point in feminist discussions. However, gender tends to dominate the intersectional analyses where social markers as age, class and ethnicity become subordinate. Wamala (2010) highlights the problematic nature of categories due to their tendency to fix an actor in time and space thereby disregarding the transformative aspect of categorization in itself. Wamala further mentions that intersectionality has been criticized for taking categories for granted and using categories for adding to character significations that are interpreted as more privileged or more oppressed. In order to address this critique intersectionality is working more towards the processes of transformation and theorizing “sociocultural categorizations as ‘doings’, that is, as effects of processes of interpersonal communication rather than as fixed identities that individuals ‘have’ or ‘are’.” (Lykke, 2010, p. 51).

In this chapter an intersectional perspective forms a cartography of the multi-dimensional aspects of the imaginations and realities of socio-technical relations in relation to fluid categorizations such as gender, technology and development. Intersectionality is considered a negotiation process where different categorizations, standards and positions are in tension with each other and identities are fragmented. In the startup phase of the initiatives Girl Geek Kampala and Women in Technology (WITU) intersecting and conflicting influences were discussed on why these initiatives are needed and how they can change the understandings of gender and technology.

At the time of the interviews with the co-founders the initiatives were fairly new and had been active for a few months. One of the co-founders of Girl Geek Kampala [GG1] was initially involved with the WITU organization but the objectives gradually changed and she explains why she no longer wanted to be involved in the everyday activities.

[GG1] - Initially I was. I was a very active founding member because we were four who started the whole idea but then I think the whole objective changed. Because initially it was supposed to be apps for girls, bring girls from universities who are really interested in tech and sit down, they compete with guys, you know, develop applications, go present, market them. But after some time, it just became very confusing for some reason. [...] I said I can advise but I can't actively be... because I worked with Wougnet and that's what Wougnet used to do. So I just didn't really wanted to repeat myself and go back to that. I wanted an advanced because while it's good to bring people back to basics of technology, it won't easily help bridge that gap because when you go to Universities you find that percentage or the ratio of boys and girls in tech faculties, it's horrible. And you see while these girls they may be at Universities doing the tech courses but when they come out they opt for something else. Never do anything tech-related for several reasons. There are so many reasons. It happens over and over again. So that's why maybe we should advice by Thought-works, I went for one of their meetings. I met one of their team members and she told me, why don't you have this Girl Geek Kampala chapter? So I asked, what's Girl Geek all about? So she explained you get girls who build apps, they compete. And that's what I really wanted. So I said, why not?

[GG1] does no longer want to work with basic training of ICTs as she perceived that the other co-founders of WITU wants. Her interest and focus lies elsewhere and is coherent with a negotiation process of the reconstruction of the understandings of gender and technology. [GG1] doesn't want to repeat the work that other groups such as Wougnet are already working with. Her personal experiences as a University student highlights a gap. She doesn't identify this gap more than it has to do with who gains technical skills at a technical faculty. Her privileged position as a University-educated person, with a MSc. in information systems and an extensive work experience in social media and mobile technologies, creates a distance between herself and those who have no experiences with technology. Her focus of interest is how women with a graduation in ICT-related disciplines, similar to herself, can gain access to the privileged

urban ICT community. When Girl Geek Kampala organized a two-day workshop in 2013 on Ruby on Rails, a code for a web framework, one of the prerequisites was a laptop. You must own or have access to a laptop to participate in the workshop. This prerequisite excludes people who may be interested in the activity but due to economic inequalities cannot attend.

WITU on the other hand wants to engage with women who are new to the tech industry. WITU provides training in STEM, entrepreneurship, leadership and life skills for women in underserved communities. While Girl Geek and WITU may differ in objectives and practices the cause for creating the initiatives are similar. [GG1] explains how women studying technical-related courses choose to do something not related their courses after graduation for various reasons. The founder of WITU [WITU] tells a similar story:

[WITU] It's not about how much education you have but how you sell yourself. Because we have so many women in ICT or girls that have studied ICT. They need a job right now to pay their bills, they will maybe go and apply for an ICT job and then during the interview the employer says she may not be able to handle this but I have a secretarial position available and she's offered that and, she's like, it's going to pay the bills, she will take it up but she's like when I get the one I want that's in ICT I can take it up, but before she knows it, maybe the administration manager is leaving and they need someone to replace her and maybe they need a slightly higher education than that, maybe human resource [competence], she'll be like, ok if I study human resource I'll be able to become admin manager and that's more money. She's losing the vision of ICT. [...] So how to get those women before they actually divert to make sure they stay on this path?

The founders of the initiative are working against a cultural perception of technology as masculine. In the story of the WITU co-founder there is an assumption of gender in relation to certain job descriptions. The administration manager is female and the woman who has studied ICT will be inclined to choose a job as an administration manager as this is more accepted due to her gender. Participants in Ochwa-Echel's study (2011) confirm the norms of a masculine science. One male student explains that: "When you are at the primary and secondary levels, you just know from people that the boys are cut out for sciences. You know it is like that because most of the engineers you know are men, the electricians are also men. So as a boy you think that if I have to do something that is recognizable, then I have to go to sciences. Maybe that is why we have more boys than girls here doing computer science". One of the other co-founders of Girl Geek Kampala [GG2] expresses this inclination in a news article that "[t]here's this vibe, this thing that happens where girls are pushed towards the arts and boys are pushed towards the sciences"²

2 <http://www.thedailybeast.com/articles/2014/01/05/geeking-out-uganda-s-women-are-creating-the-next-generation-of-girl-geeks.html>

Worlds are created from fiction and imagination. Values, images and social norms pervade our practices in how we go about our everyday lives. The transformation within these initiatives is a reaction to the historically, culturally and materially embedded practices that have created a society where discourses such as science and technology is masculine. When [GG2] describes a vibe where the art disciplines belong to girls and sciences belong to boys she is in the borderland of fiction and reality. The story she tells is not new. It is a story that has been reconstituted for centuries and is now being questioned with an alternative story. The alternative story is changing the perception of technology as gender-neutral where women will have equal access to technology. For Girl Geek Kampala it means gaining access to male-dominated arenas such as hackathons and technology hubs.

[GG1] Because sometimes I go for those hackathons. You enter the room, and you look around and in a group of fifty there are three girls and they are always the same girls. Because when we go for tech events you will find Evelyn, myself, you will find Christine. You will find, yeah just the common faces. So that's a very huge challenge. There are very many girls out there who are so good but you know the confidence, the issues of being bullied. You can't blame them because it starts from home.

[GG2] provides another example of exclusion and gender discrimination in the news article: 'a teacher once told her that she shouldn't apply to a certain technical school because, as she remembered it, "you're a girl—you'll never get in."' Examples of being bullied, gender discrimination and lack of self-confidence create a negative precondition for the women working against the stereotype of masculine technology. In Ochwa-Echel's (2011) study on women in computer science education in Uganda factors discouraging women from entering a STEM education are extensive; a discouragement of society, lack of support by spouses, lack of support by peers, urban/rural differences, lack of career guidance and counseling, lack of mentors and role models, lack of coordination among women's advocacy groups, lack of official policy addressing women's participation in sciences, lack of scholarships and computer science anxiety. Access, gender, cultural perception are issues that converge and create tension in the transformation of the understandings of technology.

Another key issue to the initiative's objectives and that has already changed the global ICT landscape and especially in Uganda is access to mobile technology. Computers are expensive. They require a lot of electricity and are often exclusive to post-paid internet plans. For the younger generation in Uganda computers are mostly accessible at schools and internet cafés. Access to a mobile phone is something quite different. As mentioned above Uganda was one of the first countries in the world that had more mobile phone subscribers than fixed landlines by 1999. The technology hubs Outbox and Hive CoLab, where the initiatives reside, were created in a time when mobile services innovations such as MPesa and Village Phones had gain ground, when hackathons became increasingly popular and organizations (Text To Change, Unicef, Grameen Foundation) started using mobile services for purposes of monitoring and evaluation, healthcare systems and agricultural communication. The technology hubs were look-

ing to the neighboring countries Kenya and Rwanda and saw similar initiatives that had already been put in place and created a physical space for local innovation.

Post-colonial boundaries and local innovations

Embracing the identity politics of girl geek in Kampala it is easy to assume that the actions of their aims will resemble the actions of Girl Geek in another part of the world. This assumption disregards the intersectional aspects of being a Girl Geek in Kampala. While race is not apparent in a national context, it is so globally. Using ICTs is to think and act globally. The design, material, artifacts, people, environments of ICTs all partake in the shaping of gender and technology.

When examining the intersectional trajectories of access, gender and technology, we also need to face the boundaries of development and post-colonialism. Initiatives that focus on gender and programming are gaining ground all over the world. Black Girls Code in USA, Akirachix in Kenya, Geek Girl Meetup in Sweden all share objectives where they want to empower girls and women through science and technology. At a first glance, it may seem as if the practices are homogenous and the objectives identical. Examining the objectives from a semiotic perspective this may be rightly so but considering the cultural, political and material embeddedness behind the objectives the differences appear. The teaching process at a programming course may be similar to that of Ruby on Rails³ in Finland but the learning outcomes will differ. The people learning the code, their interpretation of ICTs and how they will utilize their knowledges will differ from others in other contexts. The initiatives were created by a privileged group in an urban context but it was formed from the margins of the urban ICT community, and in the margins of a global context. Mohanty (1995) addresses the implications unifying the category women in the context of analysis. Firstly, there is the assumption of women as a homogenous group with identical interests regardless of politics of location or situated knowledges. Secondly, there is a risk of using methodologies that provide a 'truth' of universalism and cements the gender category. This chapter criticizes this god-trick⁴ worldview and have chosen methodologies emphasizing subjectivity, difference and transformation. Thirdly, Mohanty mentions a political principle where 'a homogenous notion of the oppression of women as a group is assumed' (Mohanty, p. 261). The homogenous notion of the oppression of women is particularly important to underscore in the difference between gender and ICT movements internationally. I have chosen an intersectional and posthuman approach addressing the transformative processes of categorization.

Although the members of the initiatives are not in minority in terms of ethnicity in a national context, they are so internationally. The conceptualizations of tech hubs, hackathons and gender and ICT movements are international and carry with them

³ Ruby on Rails is a web application framework

⁴ Donna Haraway (1991) explains the term god-trick as a scientific belief where the researcher, the knower, is detached from the object of study. Feminist technoscience theorists (Haraway, 1991, Trojer, 2002) consider the god-trick to be an illusion and argue for situated knowledges where knowledge is partial and subjective.

a socio-historical background of a Western, male-dominated technology differential (Ahmed, 2010; Harding 2006, 2011). For the tech hubs in Uganda the funding often comes from an international company, the objectives converge with other start-up organizations and programming languages such as Ruby and Python were created by men. Alongside these influences a focus on developing from within, for the local community, is emphasized among the members of Girl Geek Kampala and WITU and the wider community of technology hubs.

[GG1] There are those startup weekends - where you get young people, university students, put them in one room for three days and tell them to come up with an application, and the whole idea is to have, the application has to add value, to someone's life, or it has to creative positive social change, I mean you don't just come up with any application, that doesn't help anyone just because you think you like it or what. So they grade them based on their relevance and their applicability in real life.

Christine [GG2] mentions in the article at Daily Beast how she experience developers to be passionate about building locally relevant products. One of her first mobile applications was Mafutago that crowd-sources petrol prices and was very used during a petrol shortage in Kampala.⁵ Barbara Birungi [WITU1] describes a mobile application created as a result from one of their women-only hackathons:

One notable application is a maternal and infant health application called Nakazade. Nakazade offers information for mothers and Traditional Birth Attendants (TBAs) on SIM cards that are embedded with information on basic pregnancy health care, infant health care, contraceptive use and immunization schedules. Due to poverty, lack of information and limited access to health centers, mothers resort to TBAs or homeopathic ways during pregnancy and infant care. With Nakazade, the women always have access to the best care advice, even if they don't have access to a mobile network. Nakazade is built on the Abayima platform that turns basic features phones into e-readers and also works with SMS and smart phones. It's still in its early stages, we will get back to you on impact after the pilot.⁶

The self-identification of the category woman in relation to ICTs is an entanglement of the category woman, what kind of intersectional trajectories the category woman cross, and how the socio-technical relations are performed when building infrastructures (ie. Girl Geek Kampala) involving human and non-human actors (mobile applications, code, business plans, language and so on). The Nakazade example suggests an increased visibility for women's needs and is coherent to a renegotiation of how technology perform in socio-technical relations.

Figurations and power

Figurations are not graceful metaphors that produce coherence out of disorder but rather cartographic weapons that tear through the orderliness of humanist language;

⁵ <http://www.thedailybeast.com/articles/2014/01/05/geeking-out-uganda-s-women-are-creating-the-next-generation-of-girl-geeks.html> Retrieved: 2015-10-01

⁶ Source: <http://afkinsider.com/24772/qa-barbara-birungi-paves-new-roads-ugandas-women-tech/>

they scatter sureties; they prod and poke at positivities and foundations; and they perform curious transitions between disjunctive proximities. (St Pierre, p. 407)

Braidotti (1994) has introduced the nomad, or nomadic subjectivity, as a figuration “of a situated, postmodern, culturally differentiated understanding of the subject in general and the feminist subject in particular.” The nomad stands at the loci of differentials such as gender, class, race, ethnicity, age and so on. Braidotti uses the nomadic subject to move across these categories, boundaries and experiences with the purpose of resisting fixating locations and instead remain in a critical consciousness. Haraway’s cyborg is another figuration stressing the implosion of boundaries between subject, bodies and realities. The cyborg figuration is an ambivalent creature that on the one hand performs a cybernetic organism that enforces the power of biotechnologies in control and communication (Haraway, 1991; Mörtberg, 2003). On the other hand, the cyborg is a fusion of organic bodies and technological artefacts questioning the hierarchical dualities of the modernistic, anthropocentric worldview (Åsberg, Hultman & Lee, 2012)

Figurations from alternative feminist subjectivities – such as the lesbian, the cyborg, the inappropriate Other and so on – differ from classical metaphors as they take responsibility for our belongings. They are materially embedded and embodied stories of power relations. (Åsberg, Hultman & Lee, 2012, p.113-114) The cyborg figuration yields conversations about epistemology and how we can redefine ourselves when we surpass binary thinking. It is effective when examining the socio-technical relation of gender and ICTs because of its ambiguous plurality. The movements Girl Geek Kampala and WITU are a reactive force to the social construction of ICTs and development. In their practices they question the borders of biological sex and sociocultural gender where the category woman should no longer be excluded from the technological spaces. Whereas the perception of the biological sex is not questioned per se the dominant story of a masculine technology is put into question.

A common notion among policy makers is the representation of women. By increasing the number of women in ICT the workplace will become more equal. Another view suggests that women’s experiences, competences and knowledges are useful for improving the quality of work activities. The risk with this view is that it can create a gender essentialist perception suggesting that women’s experiences differ from men’s based on their (static) gender (Gulbrandsen et al, 2007). Yet another view used in many instances for many different reasons is the formation of women-separatist activities and networks. Gulbrandsen et al reflects these issues in their text on process of cooperation in innovation systems, “In the Swedish gender-equality tradition, it is more apt to interpret the various special arenas for women as training grounds where women can prepare to move into more masculine and male-dominated domains.” (Gulbrandsen et al, 2007, p. 25)

Girl Geek Kampala and WITU are women-centered formations created for the purpose of providing a safe haven for girls and women interested in ICTs. While some gender-separatist networks are physically and communicatively separate from their male counterparts this is not the case with the Kampala initiatives. WITU was created

in collaboration with Hive CoLab, a technology hub, and work together with men in the development of activities. Similarly, Girl Geek Kampala was co-founded by men and in collaboration with another technology hub, Outbox. Their networks are less about creating geo-politically separate arenas for women and more about providing a place within the larger male-dominated networks. Still, the inclusion practices taking place risk reinforcing gender differences where certain activities are women-only. Another difficulty is the gender essentialist positioning were Girl Geek Kampala and WITU will, perhaps unintentionally, create an environment where women are prone to create mobile applications for women, as was the case with the application Nakazande.

The Girl Geek trope

Donna Haraway explains a trope as: “tropes are what make us want to look and need to listen for surprises that get us out of inherited boxes” (Haraway, 2003 a, 32). Giger (2010) suggests that while a literary trope is the use of figurative language, a Harawayian trope concerns the deconstruction of a conception. To go beyond economic growth, to go beyond a binary thinking in development, to move and be moved by transition and difference is to think about how the trope negotiates a site of difference.

The conceptualization of the girl geek as a trope is ambiguous. The prefix girl suggests a young age group and tend to be exclusive for women over a certain age. The use of the prefix is a reaction to the male-dominated geek scene that has dominated computer programming for the past few decades. After the Second World War computing became a male space and computer scientists have since then been considered both “masters of the machine” encapsulating a hegemonic masculinity as well as nerds and geeks that can be read as a failed masculinity (Bury, 2010). Johnston is critical of using the term geek because of how the dichotomy between the traditional gender roles is being used similar to how the prefix women’s is used as modifier for magazine. In her opinion “[i]t fluffs the achievements that women can make, and diminishes the achievements of women like Ada Byron and Grace Hopper” (Johnston, 2001). For others the geek label can provide a positive connotation for agency and empowerment. Currie et al (2007) studied peer culture among 12-15 year-old girls in Canada and found several of the girls embracing the label geek in order to position themselves against other, more feminized, labels.

For Girl Geek Kampala the concept Girl Geek is used to fight the stereotype of women’s agency in relation to ICTs. Christine Ampaire, co-founder of Girl Geek Kampala, explains that “parents and teachers often think math and science are too difficult for girls. I won’t say they think girls are stupid, they just think that the hard stuff is for boys because they are stronger. They generally assume because she’s weaker physically, maybe mentally she will not cope with the hard stuff.”⁷ To improve the situation of the gender and ICT equilibrium there is a need to locate and front female role models in ICTs for the younger generation. The founders of the movements have an interest

7 <http://www.voanews.com/content/ugandan-women-show-tech-isnt-just-for-boys/1905950.html>

in investing in young women's career choices and changing the cultural stereotypes of how girls are perceived in relation to technology.

We look forward to a time when WITU [Women in Technology Uganda] will not be needed by women in Uganda anymore, When they will be empowered as Business Leaders, Tech professionals, Community Leaders, Confident sisters, mothers and wives whose importance and contribution to a family is recognized and doesn't have to be demanded. When the men in our lives will support us as we support them. When we stop seeing ourselves as victims and rather take challenges by the horns and overcome them. That we will lead everywhere we go and create a generation of Intelligent, Inspired, powerful young women who will influence generations to come.

We do not believe that we have to empower women forever, for women catch up fast, Men need to support their women, daughter and sisters as we support them.

Arise Women and girls in Uganda and Africa, Arise women and girls in the world, Its our time to create a generation of Women Leaders in everything.

The above text was published on the wall in the Facebook group Women in Technology Uganda (WITU) December 9, 2014. In the text WITU acknowledges their platform as temporary. When their objectives of equality and empowerment have been reached their movement can dissolve. The text mentions the female role as already supportive of the men in their professions. It is now the men's turn to be equally supportive. For the understandings of gender and ICTs to change as proposed in WITU's Facebook text men need to acknowledge their position in the patriarchy of socio-technical relations. Multiple identities of women are listed in the text where the change needed is not only from supportive men but also in how women perceive themselves. The story involve a categorization of linear development were women will catch up to men. If the aim is transformation it is important to highlight the boundaries of technology and understand who are creating these fixations on technology, whether it be feminine, masculine or gender-neutral (Mörtberg, 2003).

Conclusions

This exploration has found a loci of different negotiation processes among the movements created for the purpose of empowering women through technology. In the initial phase of starting the movements the founders presented different needs and expectations of how technology should transform gender differences. Girl Geek Kampala works with girls and women already interested in technology having basic competence in ICTs. WITU works with a large age group, both boys and girls, and especially young women, who are new to technology. The initiatives have located heterogeneous aspects of oppressed groups and have resolved these by creating two separate groups with slightly different objectives. Their activities complement each other as they are both working for a transformation in gender and technology but they express a plurality in activities.

The cultural perception of men being prone to technology has driven the initiatives to defend and prove their rights in a male-dominated community. They want access to ICT arenas, such as technology hubs, hackathons and ICT companies. To gain access to these arenas they have created communities within the larger technology hubs as a

safe place without prejudice for their members. The initiatives differentiate from other gender-separatist groups as they work with men both strategically and operatively.

Information and communication technologies, such as mobile telephony, are structuring people's everyday lives through formalized and standardized technologies and by these technologies and services enabling the creation of better living conditions as well as other understandings than those at our disposal (Mörtberg, 2003). The stories of mobile technologies as something revolutionary in low-income countries, as something widely accessible and thereby more democratic, as something more gender-neutral are potentially subverting the socio-historical stories of technology as masculine. The cyborg is a hybrid that transcends a binary thinking of technology and man. When experimenting with the Girl Geek as a trope I suggested that the interpretation and translation of the Girl Geek character can be quite ambiguous. I see a similar ambiguity from the members of the Girl Geek and WITU initiatives. They are creating mobile applications not for themselves but for the local community. At the same time they have individual and collective visions of being equal to the socio-cultural gender category man in relation to technology. They are both reconstituting gender roles through their women-only activities and reconfiguring what is included in these gender roles in relation to technology.

Girl Geek Kampala and WITU as collective groups are pushing the boundaries for actors. Members of the initiatives have been given a safe haven for learning and testing programming languages without feeling excluded or questioned. When working against a stereotype of masculine technology the initiatives risk replacing one stereotype with another were technology becomes more feminine instead of gender-neutral. Efforts of access and agency may be hindered or pushed aside for the sake of providing a women's group within a larger community only providing partial access instead of transversing the relation gender and technology altogether.

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The situatedness of mobile infrastructuring in Uganda

Abstract

The inhabitation of mobile technologies has been rapid throughout the world. This paper is an empiric study of how the mobile phone is creating and changing the infrastructuring in Uganda. People, politics and technologies are entwined in the stories told by representatives from a telecom company, the Ministry of ICT, a knowledge sharing network, a social enterprise and two non-governmental organizations. The stories range from communicating differently depending on region, the mobile phone as a potential obstruction in everyday health work, to an increased need for policies and law frameworks that secure and support Ugandans inhabitants.

International organizations such as the International Telecommunication Union and East Africa Communications Organisation (EACO) lead the direction of standardization and classification of the mobile phone infrastructure in the world. One of their policies involved the mandatory registration of sim cards in 2012 in Uganda. This mandate has created a concern of privacy as the registrations will be done by private companies and the corruption level in Uganda is high. Can I trust that my personal information will not be leaked?

I address the situatedness of the mobile infrastructuring by departing in the generic properties of an infrastructure as suggested by Star and Ruhleder (1996). I argue that the use of these properties as cartographic nodes are affective for illustrating the relational aspects of an infrastructure. The mobile phone is being used for entertainment purposes, developmental goals and marketing strategies and cannot be singled as a device for a uniform vision of the Information society. The examination of situatedness suggests that the strength of understanding infrastructure lies in the ambiguity of sustaining and transforming relations simultaneously.

Introduction

Connectivity is a central enabling agent in building the Information Society. Universal, ubiquitous, equitable and affordable access to ICT infrastructure and services, constitutes one of the challenges of the Information Society and should be an objective of all stakeholders involved in building it. (World Summit of Information Society, 2003, Geneva Declaration of principles, §19)

Infrastructures are pertinent in the linguistics of development. In the Millennium Development Goals (MDGs) infrastructures for water and sanitation and communications are mentioned. (Scott & Seth, 2012) A report from the Overseas Development Institute (Scott & Seth, 2012) mentions that the lack of infrastructure is the main limitation to economic growth in low-income countries. Alongside energy, transport, water & sanitation ICT has held a key role in the Millennium Development Goals and there is a broad agreement that ICTs can accelerate security, productivity and empowerment. Several examples demonstrate links between ICTs and the MDGs related to health, education, gender equality, poverty alleviation and environmental sustainability (Scott, Seth, 2012). Ranganathan and Foster (2012) suggest that infrastructure

matters because adequate infrastructure is key for economic growth and competitiveness in Uganda.

The World Bank, United Nations, ITU and other international key players such as World Summit on Information Society have set the stage for how the ICT infrastructure should look like for low-income countries. ITU is prominent in the area of universal connectivity, in terms of extending mobile subscribers, Internet users and fixed phone lines, and as one of the leading regulators for standardization. Bridging the standardization gap (BSG) programme was created as a mission of ITU concerning the digital divide and divergences in development. The overall goal of the BSG is to “facilitate increased participation of developing countries in standardization, to ensure that developing countries experience the economic benefits of associated technological development, and to better reflect the requirements and interests of developing countries in the standards-development process” as expressed on their website.¹

Standardization is one of the essential building blocks of the Information Society. There should be particular emphasis on the development and adoption of international standards. The development and use of open, interoperable, non-discriminatory and demand-driven standards that take into account needs of users and consumers is a basic element for the development and greater diffusion of ICTs and more affordable access to them, particularly in developing countries. International standards aim to create an environment where consumers can access services worldwide regardless of underlying technology. (World Summit on the Information Society, Geneva Declaration of principles, §44)

The mobile phone is a nod in the global information network. The mobile phone is used in discourses of employment, moving information, money and people, ultimately changing the economic development (Katz, 2008). The mobile phone is an integral part of how we communicate. How it is interpreted differs. In Burrell’s study (2008) rural villagers in Uganda viewed the phone as an alternative to transportation technologies. Rather than taking a bus to Kampala you can give the person you want to meet a call instead. Susan Leigh Star (1999) suggests that infrastructuring is both relational and ecological. Infrastructure means different things depending on who you ask and is an inseparable part of the actions, objects and environment surrounding us. The complexity and vastness of an infrastructuring suggest that not a single person can be in charge. Smith (2009) explains, through the works of Haraway and Foucault, that new methods of domination are occurring in class society where the control and management of information are crucial for social institutions such as governments, hospitals, armies, schools and so on. Haraway share her views on components in an infrastructure, “[n]o objects, spaces, or bodies are sacred in themselves; any component can be interfaced with any other if the proper standard, the proper code, can be constructed for processing signals in a common language” (Haraway, 1991, p. 212).

This chapter focuses on stories from various actors in the mobile telecom industry, academia and NGOs in Uganda that emphasize how the mobile phone is changing their work environment. The stories range from communicating differently depending on region, the mobile phone as a potential obstruction in everyday health work

1 <http://www.itu.int/en/ITU-T/gap/Pages/default.aspx>

to an increased need for policies and law frameworks that secure and aid Ugandans inhabitants. In my methodological approach I address the concept situatedness as a resource for telling the story of an ongoing infrastructuring in Uganda. Infrastructure is a construct of multiplicity, responsibility and controversy. The mobile infrastructure is akin to the internet infrastructure. In the internet infrastructure we have already located democratic and legal risks of who gets access to what. Who regulates and manages the mobile phone infrastructure and what kind of norms are we building into the technology? Infrastructures are a tricky, messy layering that, if we value its performativity, can be better understood for its performative, entangled characteristics.

The ethnography of a mobile infrastructure

Trying to develop a large-scale information infrastructure in this climate is metaphorically like building the boat you're on while designing the navigation system and being in a highly competitive boat race with a constantly shifting finish line.
(Star, Ruhleder, 1996, p. 112)

An infrastructure is filled with tension and paradoxes. A standard used in one context can become chaos in another context. With the increase of decentralized technologies in the globalized world a need for common standards and an infrastructure is needed. At the very least, for the purpose of bringing together different communities of practices who are using the same kind of technologies. An infrastructure is a relational concept. The image of an infrastructure becomes 'visible' in relation to various practices.

The ethnographic fieldwork consists of interviews and observations that took place during a two-month period in fall 2012. Some of the observations are logged on on the blog tumblr.thehybridself.com during the time period. I interviewed people open-ended with themes of design, gender and development, and received answers that ranged from the history of mobile telecom companies in the country to outbursts of how the government shut down mobile networks when the president held a public speech during the 2011 elections. In my analysis I connect examples and thoughts presented by various actors who influence and are influenced by the mobile technologies integral in Ugandan society. Instead of clustering the stories around traditional, binary categories such as producer/user, urban/rural I make use of the properties that Star & Ruhleder (1996) ascribe for an infrastructure.

The properties are as follows:

- Embeddedness.
- Transparency.
- Reach or scope.
- Learned as part of membership.
- Links with conventions of practice.
- Embodiment of standards.
- Built on an installed base.
- Becomes visible upon breakdown.

In the analytic section the properties are further explained and developed through the stories from actors in the mobile infrastructuring of Uganda. Similar to the Hanseths (2002) description of an infrastructure, the properties include human values and social arrangements and are positively inclined to storytelling. I have stressed the notions of story and storytelling because “understanding the world is about living inside stories. “There is no place to be in the world outside the stories. And these stories are literalized in these objects. Or better, objects are frozen stories...” (Haraway, 2000, p. 207).

When analyzing an infrastructure Bowker & Star (1999) has presented a methodological term called infrastructural inversion that focuses on change in technical networks, standards and knowledge production and politics. The inversion foregrounds the conventions and constraints of an infrastructure enabling us to see both classification systems and the standardizations formed in areas and unclassified spaces in between categories. Bowker & Star calls this the ubiquity of classifying and standardizing and can be seen in ICTs for instance when one person is trying to get in touch with another through sms and it isn't working because of network failure. Another departure point for inversion is materiality and texture. When studying the mobile infrastructuring the list runs long if we are to consider the classifications enlisted for a mobile phone. Different types of hardware and software, operation systems, code categories, cellular network categories, sim card variations, keypad layout, channel frequency bandwidth, gateway providers, ISO standards and so on. Thinking of infrastructure as both material and symbolic propose a material-semiotic language where relationship is central (Bowker & Star, 1999, p. 40).

With an increasing demand of standardization in sim card registration and a higher visibility among mobile phone users, trust becomes an issue. Can I trust that my personal information will remain personal? The ambiguity of tools and infrastructures used for different reasons in different groups risk becoming sidetracked, when the standardization process is outlined by powerful, leading, international leaders and organizations. The strategy of avoiding binary categories is an epistemological one. My research discipline is feminist technoscience and is a critique of how we categorize the world. The stories told for this chapter are based on their non-linearity and their becoming-an-infrastructure.

“Technoscience provokes an interest in zones of implosion, more than in boundaries, crossed or not. The most interesting question is, what forms of life survive and flourish in these dense, imploded zones?” (Haraway, 1994, p. 16). Situated knowledges is an onto-epistemological inclination for taking responsibility for the subjectivity and partiality of knowledge production. A story does not provide a universal answer for all things concerned. Bearing in mind my partiality and situatedness of knowledge production my methodological proposition seek answers in a plural sense. Just as the stories map an open and evolving infrastructure so do my investigation.

My field of interest goes far beyond one (physical) site. The majority of interviews took place in urban Kampala and as such the stories told reflect their politics of loca-

tion (Braidotti, 1994). But just as I am partial and fragmented to how the mobile infrastructuring occurs so are my interviewees. They have their different agendas and visions and I have mine. Sometimes they converge and sometimes they differ. Star & Ruhleder (1996, p 114) write "[a]n infrastructure occurs when the tension between local and global is resolved. That is, an infrastructure occurs when local practices are afforded by a larger-scale technology, which can then be used in a natural, ready-to-hand fashion." My aim is not to look only for synergies, where there is no more tension. On the contrary, I ask for difference and controversy. I ask for hints that uncover values and ethics that form a global information ecosystem.

The situatedness of mobile infrastructuring

This section is built upon the properties of an infrastructure as suggested by Star and Ruhleder (1996). Each chapter begins with an explanation of the property and continues with stories unfolding the complex nature of the mobile phone.

Embeddedness

Infrastructure is sunk into and inside of other structures, social arrangements, and technologies.
(Star & Ruhleder, 1996, p. 113)

Hanseth (2002) describes an infrastructure as shared, evolving, open, standardized and heterogeneous with an installed base. Telecommunication infrastructures evolve with more mobile phones, more applications, more owners and more access areas. An infrastructure lacks borders. There are no limits to who can participate or what one can contribute with to the further development of an infrastructure. Standards are crucial part of an infrastructure. For it to be open, it also needs standards in the sense that standardizations provide for a maintenance that is manageable. Standards provide easier communication between people and technologies. One of the objectives for the East African Communications Organization (EACO, 2015) is to harmonize ICT policy and regulatory frameworks in the East African Region. In Uganda the Uganda Communication Commission (UCC) is in charge of regulating several of these policies. Uganda did not build its mobile infrastructure upon an existing land line structure or pre-defined policies that showed the way for how Wi-Fi antenna masts or fibre cable should be laid out. Uganda got its first internet connection in 1995 and a few years' later mobile phones were introduced (Mulira, Kyeyune and Ndiwalana, 2010). The number of phones have steadily increased since then and the formation of Ministry of ICT in 2006, together with its agencies, are managing this emerging infrastructure through the establishment of several policies and strategies. These policies are affecting the mobile phone infrastructure involving sim card registration, combating use and import of counterfeit phones, e-waste management system, numbering and short codes.

The mobile phone is sunk into the social arrangements of the Ugandan society in that millions are using it as an every-day communication device. Uganda's population is more than 32 million people, the poverty rate (% of population below \$1 a day) is 35% and the urban population is 15%. Mobile services such as money transfer and

bill payments are more and more common. Mobile solutions such as SMS broadcasts and SMS application for voter registration status were deployed in the general elections in Uganda 2011 (Hellström, 2012). Still, ongoing standardization processes by Ministry of ICT and a multitude of different organizations, that are introducing the mobile phone in their monitoring and evaluation systems, makes the mobile phone a less embedded object. The cost of using a mobile phone remains high for the majority of Ugandans and the day-to-day logistics involve managing how one can afford a pay-as-you-go card, locating where one can recharge the phone and figuring out when the network is reliable.

Transparency

Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or reassembled for each task, but invisibly supports these tasks. (Star & Ruhleder, 1996, p. 113)

mTrac is an initiative coordinated by the Uganda's Ministry of Health, Unicef, WHO and UKaid, to digitize the transfer of Health Management Information System (HMIS) data via mobile phones.

Dr. Davis, UNICEF, explains the accessibility of using the mTrac system.

The mTrac project provides a computer to every district and also provides them with internet access of one 1GB every month to help them manage these online dashboards. So they are quite equipped. Of course in several districts they still have a challenge with electricity, maybe they are running on a generator, maybe they're running on solar, maybe the national grid power is not as reliable sometimes, but nonetheless, you can still use your laptop to be able to access the dashboard so it's very mobile, very efficient and convenient for them to access it anywhere. Even if I'm in Kampala and I'm in Kampala for a workshop and I'm coming from the Western part of Uganda I can still be able to approve reports and to do my work just about anywhere.

[...]

Anybody that goes ahead to produce any technologies, and innovations, that involve healthcare workers it really needs to understand the workflow at the health facility and make sure that is as, that is not in any way intrusive to their normal workflow. Cause the moment that it is then it becomes an extra piece of work and I think that's something that we have really incorporated into mTrac. To make sure that they have a seamless transition from what they used to do on paper to what they are doing on the mobile phone.

They still fill in the paper, it's just that the keep it at the district level to make sure that you still have a paper trail, so this is not replacing what we were doing before. No, we are just creating an easier system for them to send this information through.

The mTrac system is considered successful when introducing transparency and accountability in a national ICT project. The workflow for the health care workers continue to work well and the multiple reporting mechanisms strengthen the quality of information. The multiple reporting for mTrac is conducted by cross-checking the SMS data the health facilities send to the national coordinator with the information

that anonymous SMS hotline receive and independent reports on a community level (Cummins, 2012). Here transparency can be read twofold. The mTrac system is making the health care system more transparent in that the information is more accessible and visible for more people involved in the national healthcare system and the system itself has become more transparent in that it invisibly supports the task of the people reporting via mobile phones. There is a risk that the personal information transmitted in the mTrac system can be accessed by unauthorized people, but the advantages for the people involved is considered by the project managers to outweigh the disadvantages involved.

Reach or scope

Spatial or temporal – infrastructure has reach beyond a single event or one-site practice. (Star & Rubleder, 1996, p. 113)

Uganda Communications Commission (UCC) was established as an agency operating under Ministry of ICT to implement ‘the provisions of The Communications Act Cap 106 Laws of Uganda with a principal goal of developing a modern communications sub-sector and Infrastructure in Uganda, in conformity with the operationalization of the Telecommunications Policy’ (NITA-U, 2010). The representative I met with at UCC mentioned that they are working with the mandatory sim card registration together with the telecom companies as part of the enactment of the Communications Act. Opponents of the registration believe that it would allow the government access to personal information imposing on the rights of Ugandans (Internet Freedom in Uganda, 2014)). The response given by UCC to why registration is necessary is to increase national security, track criminals, fraud and improve customer quality for service providers.⁴

An investigation on the state of Internet freedoms in Uganda 2014 conducted by The Collaboration on International ICT Policy in East and Southern Africa (CIPESA) has expressed concern on the Ugandan Communications Act (2014) because it is “unclear as to how data collected from citizens would be used and how citizens’ privacy would be protected” (CIPESA, 2014, p. 4). The establishment of this law conflicts with conventions of national security and personal integrity. We don’t know yet whether this law will have an effect on how and when people choose to use their mobile phone.

As part of the infrastructural inversion Bowker & Star (1999) introduced a methodological theme, alongside ubiquity and materiality and texture, which they named the indeterminacy of the past: multiple times, multiple voices. This theme explains how we revise our stories over time and in doing so change our classification systems. This theme also overlaps with language as we in different communities of practice retell stories depending on suitable terminology. Situated knowledges is apparent in this indeterminacy in how we can never be universal or unison in our storytelling. The spatial and temporal infrastructure change and so do our knowledge production.

⁴ <http://www.ucc.co.ug/data/smenu/23/SIM-Card-Registration.html> Retrieved: October 1, 2015

A representative from Ministry of ICT (MoICT) explains the challenge of creating an ICT infrastructure with few other infrastructures to plug into.

No, they [E-government] are not copy-paste because first of all they [South Korea] are already too far for us. So I cannot copy America or Sweden. They've have been doing data things for 300 years. There's no way I can get to that level. The other time we were looking at land management in Sweden. They are managing their land since the 16th century. So every square inch of Sweden is documented. There is a general plan for Sweden that flows over the centuries.

That this area will be abandoned, this will be industrial, the road will pass here, the water will be here. You know, that kind of thing.

Computers just came in to help but there was already a system organized for doing things.

The representative from MoICT tells a story of inadequacy and comparison. Uganda's ICT infrastructure cannot copy a system from another country because of how much they differ. There are multiple times and voices present in this story. One story tells of Uganda's past and lack of classification systems that have existed over a long period of time. Another story suggests that a lack of existing ICT infrastructure, i.e. computers, suggests that it is difficult for Uganda to catch up to a standardized ICT model as constructed by leading people and organizations in countries such as Sweden or USA. These stories highlight the questions of who is changing and who is being changed?

Learned as part of membership

The taken-for-grantedness of artifacts and organizational arrangements is a sine qua non of membership in a community of practice. [...] Strangers and outsiders encounter infrastructure as a target object to be learned about. New participants acquire a naturalized familiarity with its objects as they become members. (Star & Ruhleder, 1996, p. 113)

Text to Change is a social enterprise and a Certified B Corporation since 2014.

Eunice Gray, Text to Change, gives an example of the dilemma of introducing smart phone technologies to Village Health Teams (VHTs).

I think health workers have been given all these nice smartphones and two days ago I was in Jinja [town in Eastern Uganda] where I was trying to train these VHTs. A VHT is a person who not all of them have gone school you know and I'm trying to force them to use this smartphone which has also taken me a long time to learn. The VHTs fears to touch a button, what if I mess up everything and I don't have this person [Eunice] to train me again tomorrow.

I like it, it's really good, it's going to help us, especially with data collection in the field but at the end of the day, is this technology going to be an inconvenience for the VHTs? Is this technology going to put VHTs off the original task that they are supposed to do? If I spend the whole day trying to navigate a phone, where I just answer five questions, instead of helping the health worker or the village, the patients, how do we make sure that technology is not derailing the health workers away from doing the work that they are supposed to do?

Leigh Star (1991) suggest that more effort should be put into the exclusion processes, where in the example above, is shown as a steep learning curve and a potential intrusion to everyday healthcare work. From the multiplicity of experiences with the introduction of the mobile phone as a monitoring and evaluation tool in a health care

project it is important to avoid creating a network hegemony where only indicators of efficiency and economy are mentioned. Instabilities are a part of the infrastructure and important to acknowledge when changing the infrastructure (Elovaara, p.62). In comparison with the mTrac system the experiences expressed by Eunice Gray indicates the mobile phone is not yet a member of the practices of the health community and as such still remains somewhat of a barrier.

The inversion of this infrastructuring is shown in how the collision of two worlds come together, the healthcare workers and a smartphone application. The tension of translating one system of practice to another involves maintaining or adapting to the new community of practice for the purpose of stabilizing the infrastructure. In the case of Text to Change, more training may be needed or the health care worker will get used to the application over time. The mobile phone, as part of the global ICT infrastructure, presents a forceful presence and a sense of robustness in the informatics of domination.

Links with conventions of practice

Infrastructure both shapes and is shaped by the conventions of a community of practice, e.g. the ways that cycles of day-night work are affected by and affect electrical power rates and needs. Generations of typists have learned the QWERTY keyboard; its limitations are inherited by the computer keyboard and thence by the design of today's computer furniture. (Star & Ruhleder, 1996, p. 113)

When I was in Kampala I got a business card from a taxi driver that had five different mobile phone numbers written on it. Instead of him asking, which operator I belonged to, the choice was to be mine, if I wanted to use his services again. If I had a Warid number, then it would be most cost-efficient for me, if I called his Warid number. The taxi driver's behavioral patterns of several sim cards are shaped by the conventions built by the telecom companies. Their competitiveness and variations in customer offers create an infrastructure where a multitude of sim cards are used.

Having five different sim cards is surely not the most time-efficient way of using your mobile phone but in this case money triumphs time. In a nation with high unemployment keeping your job is priority and providing a range of mobile numbers is beneficial for both customers and taxi drivers. When talking about multiple sim cards with a colleague at Makerere University, she explained that she always used her MTN number in her professional work. Her Warid phone number was mostly used for private matters and when contacting younger relatives. MTN has been around from late 1990s, while Warid entered the market in 2008 and actively targeted a younger audience for their services. The different uses of the mobile numbers illustrate a relation of materiality and texture. The selection process before calling someone creates a symbolic identification of depth in a phone number.

Embodiment of standards

Modified by scope and often by conflicting conventions, infrastructure takes on transparency by plugging into other infrastructures and tools in a standardized fashion. (Star & Ruhleder, 1996, p. 113)

An infrastructure is both standardized and heterogeneous. Hanseth (2002) explains that basic TCP/IP services are built upon other layers of telecom infrastructures such

as mobile phone services and satellite communications. Email and web structures are built upon the TCP/IP services and e-commerce is built upon email and web structures. Another example of the heterogeneity in an infrastructure is the presence of different version of a standard. This is visible in Uganda's national ICT policy where one of the strategies is to prepare for the transition of next generation global Internet delivery mechanisms (ICT Policy, 2012). There is also the circumstance of different standards in the same area with, for instance, different operating systems on mobile phones. The smartphone is becoming more and more popular but it is still a selected few who own one. The most common models used in Uganda are still quite powerful in terms of handling SMS and digital storage and address book. More advanced models have IP (Internet Protocol) enabled and function as an internet access point (Hellström, 2012).

A regulatory environment assessment conducted by Mulira, Kyeyune and Ndiwalana for Research ICT Africa (2010) sampled perceptions of stakeholders involved with the telecommunications sector in Uganda. The mobile sector was perceived more favorably (43.2 % of 41 responses) compared to fixed landline and broadband. The majority of stakeholders perceive access to resources and interconnection regime amongst telecom operators as ineffective. In the concluding remarks of the report the tension by the ICT community stands in contrast to the progress in the ICT sector in Uganda. The authors interpret these perceptions due to a change in the regulatory regime and that the established operators are charging new operators higher interconnection fees. The different perceptions and results presented in this report show a tension between those regulating, the translators (the authors of the report) and the stakeholders in the Ugandan telecommunications sector. Establishing policies and improving connectivity throughout Uganda is part of the embodiment of standards.

Built on an installed base

Infrastructure does not grow de novo; it wrestles with the inertia of the installed base and inherits strengths and limitations from that base. (Star & Ruhleder, 1996, p. 113)

The existing infrastructures limit and influence the evolution of new infrastructures. The newly installed base of the fibre-optic cables in Uganda called the National Backbone Infrastructure has faced problems where the contractor is using an inferior cable type.⁵ The project involves a 2,100-kilometre fibre optic cable network making Internet more accessible to Ugandans in 20 major towns. The latest status is the installation is heavily delayed and it is unclear whether they will change cable types.⁶ The telecom infrastructure first began with Celtel (now Zain) as Uganda's first mobile network in 1995, followed by MTN in 1998 (Hellström, 2010). The early ICT reform was effective in expanding mobile coverage and creating a competitive market for telecom operators. Some of the challenges Uganda face in the further development of the ICT infrastructure is optimizing industry tax burden and reducing costs of broadband services (Ranganathan & Foster, 2012).

5 <http://www.monitor.co.ug/News/National/-/688334/1385826/-/aw3qrvz/-/index.html>

6 <http://pctechmag.com/2015/01/ugandas-usd-100-million-fibre-optic-project-halted-by-president/>

Peter Muwanga, Warid Telecom, explains the consequences of a popular service called Pakalast. Pakalast initially provided the customer with a 24-hour slot for 1000 shilling but the offer has changed over time.

Basically in African market, and Uganda in particular, we have so many mobile products. So, so many.

- Which one is the most popular?

For us, our starting point was the Pakalast.

- That's the 24 hour...

Exactly. But of course, at the beginning it used to be 24 hours of talking at 1000 shillings. But it was purely an enticement, bring on the customers. The customers kept on coming in, the numbers grew, the access network started choking. You know, Ugandans like the conversations so much. Someone who talk on the phone but because I've put my 1000 shilling on my subscription, on Pakalast, 24 hours.

I will talk, especially let's look at housewives. She will talk with her friend, maybe another housewife, in another house they talk, they converse, she goes to cook, and she's going into bathroom. She says "I'm going to bed". She will leave the phone on, connected.

She goes to shower for like thirty minutes, finishes and then resumes the conversation, you understand.

- But can't she hang up and just call back?

At that time, when things were free, as I have explained, now it's started growing so we started getting what they call congestion when the numbers grow on the same limited resources you start getting congestion and the congestion grows in the network, access entry. For you to enter the network becomes a bit difficult. So when it gets to that level the moment you access the network and you get connected, you don't want to release the connection.

- So you leave your phone on for 30 minutes.

So we started getting such and once people got into that mentality they became so many so one channel exist for over ten hours. Because for me the phone is there, I begin to cook. I put the loudspeaker on as I'm cooking. [...] So what happened? Warid started cutting the number of hours for the same amount in the same 24 hours, you can utilize the means it went from 24 hours to 12-13 hours, and they cut the number of hours. Warid then realized it wasn't getting any better, still the congestion levels were shooting up so they cut down to 60 minutes, but you can utilize it in 24 hour division.

Subscribe now, you can use your 60 minutes until tomorrow sometime.

- So you can have several conversations, several calls.

So people are forced to release. You have one hour to use, you can't afford to keep the phone on with your friend. The demand kept on going up I think now its 45 minutes, at some point it will go to 30 minutes.

The example of the housewife who didn't hang up is a useful example of an installed base on a socio-cultural convention. Warid could not beforehand know that the Pakalast offering would create a culture where people didn't hang up. Network congestion and traditional communications patterns created a situation where housewives could be social and continue with their work at home. Because the network congestion continued to rise, Warid changed their offering. They decreased the time which meant that

people no longer could keep their phone for longer periods of time. Once again there was a shift in communication patterns and the phone calls became more time-efficient. The telecom operators are a part of how communication patterns change over time just as the communities of practice challenge the systems offered. The mobile phone is much more than a communicative tool. It plays a role in the process of individual expression.

Becomes visible upon breakdown

The normally invisible quality of working infrastructure becomes visible when it breaks: the server is down, the bridge washes out, there is a power blackout. (Star & Ruhleder, 1996, p. 131)

In the quarterly market report by Ugandan Communications Commission (UCC, 2015) examples of unsolicited messages, billing, sim registration and data related services are shown in their consumer affair section. According to data from World Bank the average power outage in firms are more than six per month in Uganda.⁷ Mwesigwa from UCC expressed some of the ICT standardization challenges in Uganda at the ITU Regional Standardization Forum for Africa (2014) - coordination between different standardization bodies, inadequate capacity (staff, tools, relevant, updated documents on standards etc) and unclear process of legalization of standards. These examples suggest that the mobile phone has not yet sunk into a social arrangement in Uganda.

Another aspect of mobile phones is where they go in their afterlife. This part of the mobile infrastructure is not yet visible and little is known where the mobile phones will end up eventually. A representative of I-network, an ICT4D organization working with knowledge sharing and advocacy, talks about one of their research projects on e-waste:

Another one that is ongoing right now, this is related to e-waste. There is quite a bit known about e-waste in relation to computers, there's a lot of studies, but not e-waste in respect to mobile phones. And I think in this country by volume if you take the number of computers by volume put them together with the number of mobile phones I think that the mobile phones are probably bigger. They are more difficult to deal with, they are everywhere. So, little is known, we don't know where people put them when they come to the end of their life, we don't know the habits of people buying and selling, what do they do with them? It's a bit of an unknown and yet we know that it could be a serious hazard in terms of waste, they have batteries, they have all sorts of stuff that can be toxic.

Ministry of ICT created an Electronic Waste Management Policy for Uganda in 2012 that adopted the internationally accepted Basel Convention's definition of E-Waste. "According to this Convention, E-waste encompasses all discarded and disposed of electrical and electronic assemblies, scrap, components and batteries; some of these wastes may contain hazardous materials such as cadmium, mercury, lead and polychlorinated biphenyl" (Ministry of ICT, 2012) Before this policy there has no strategy to handle e-waste and according to an assessment by United Nations Industrial Development Organization in 2008 electronic equipment is left on garbage heaps and landfills without consideration to the environment.

⁷ <http://data.worldbank.org/indicator/IC.ELC.OUTG>

*Is fixed in modular increments, not all at once or globally*⁸

Because infrastructure is big, layered, and complex and because it means different things locally, it is never changed from above. (Bowker & Star, 1999, p. 35)

Ednah Karamagi, representative of NGO Brosdi¹, gives an example of local adaptation from their farmers project:

When we first sent text messages to Butaleja (district in Southeast Uganda) we found it was a waste because there was no telecom network there. So the use of sms had to be confined to other districts. You have to study your population; age, academic situation, location. Do they have telecom companies there? Do they have electricity to charge the phone?

Let me give you an example:

Butaleja has just gotten electricity, they didn't have electricity before when we started the project. So when we send text messages we tell the farmers: Every Monday switch on your phones. Every Monday. The reason? The farmers have places where they can charge their phone but they don't leave it on. They switch it on and find the missed calls and the missed sms and reply.

But sometimes when we send sms it can take two or three days before the farmer charges his phone. Now, if we send you the message on Monday and you check your phone on Wednesday it has bounced back. So you miss it. So what we do is we tell them you can switch off your phone all other days but not Monday.

So all of them know, every Monday I must leave my phone on so that the message can come through. Or if he has to switch off his phone he knows that if he switches it on before midnight the message comes through, it doesn't bounce back. There is a 24 hour limit with our system. Then it bounces back.

And the other person will never ever know that you have sent a sms.

An infrastructural inversion becomes an approach of resistance to how artifacts and technologies can be challenged. Through trial and error the Brosdi project team found a way of using sms services in their communication with the farmers. The situatedness of this story is expressed in an understanding of the local context. The regions differ so much when it comes to language, age and network connection that each project needs to build its own infrastructure. Ten years from now, when the demographics between the regions converge more, the project infrastructures may look more similar to each other. The Brosdi story is an example of the here and now. In order to affirm mobile phone use with the farmers the project managers analyze their specific context. If it's best to sms within a certain time frame during a certain day then the project will adjust to this. The intricate relation of farmers, connectivity, battery life, text messages and network systems suggests that in order to achieve a sustainable infrastructure all actors (human and non-human) need to be considered.

Discussion

The stories presented alongside Star & Ruhleder's (1996) properties build a trajectory of multiplicity where people and things are in a relationship. The infrastructural inversion of the mobile infrastructuring in Uganda present an ubiquity of standardizations, or perhaps a lack of standards, where stakeholders from Ministry of ICT and Text to Change are working to decrease the tension between members and non-member of the ICT community.

⁸ This property is not presented in Star & Ruhleder (1996) but present in their list of properties in Bowker & Star Sorting things out (1999).

Materiality and texture is expressed in the story of the housewife who didn't hang up. The behavioral patterns with the housewife converged with the materiality of the mobile phone and the offering of the telecom operator providing a beneficial social pattern during a limited time. The taxi driver has created a system of having the most used sim cards active and switching the less common ones once in a while. This system was created as a response and a resistance to the high fees of the telecom operators. The use of multiple sim cards have created a substructure within a larger infrastructure that will most likely change over time as the cost of tariffs decreases and the mobile phones get cheaper.

The story of the mTrac system is presented as a success story. What counts as success is its transparency and accountability. Through training the health care workers can use the mobile phones seamlessly in their workflow. The content of the reports are cross-referenced through other means of information access points.

Previously mentioned methodological themes in the infrastructural inversion are ubiquity, materiality and texture and the indeterminacy of the past. The last theme as suggested by Bowker & Star is practical politics. The process involved in the practical politics reaching a conclusion on which categories and standards to use and what should be visible within the system (Bowker & Star, 1999, p. 44). The story from Ministry of ICT involved a position on a linear development where Uganda is behind other countries in terms of building an ICT infrastructure on an already installed base. The politics of leading agencies, multinational companies and ISO standards are a silent figure in this story. Another silent figure, filled with controversy and homogeneous thinking, is the material-semiotics of development. The infrastructuring of ICTs becomes in a Ugandan context entangled with figures of poverty and unemployment.

The examination of situatedness suggests that the strength of understanding the mobile infrastructure lies in the ambiguity of sustaining and transforming relations simultaneously, or better yet, a posthumanist performativity where human and non-human forms of agency are taken into account. Barad (2003) explains this agency with to the production of the matter of bodies and the subject. She states:

[A] specifically posthumanist notion of performativity—one that incorporates important material and discursive, social and scientific, human and nonhuman, and natural and cultural factors. A posthumanist account calls into question the givenness of the differential categories of “human” and “nonhuman,” examining the practices through which these differential boundaries are stabilized and destabilized. (Barad, 2003, p. 808)

How do mobile technologies work? How can we understand agency, as an enactment, of the mobile phone? (Barad, 1998) Implementing the mobile phone in organizations have impact on how work tasks are conducted. Marketing campaigns effect behavioral patterns in the private sphere. Network congestion inflict on human actors temporality and spatiality. Socio-historical stories of sustainable technology in one context effect visions and policy-making in another. Stabilizing and destabilizing boundaries in an infrastructural inversion is fruitful for how and why certain standardizations are

implemented. When situating the mobile infrastructuring in Uganda certain material (re)configurations were enacted and others not. A posthumanist performativity such as agential realism sensitizes reality as becoming rather than being.

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EPILOGUE

It matters what matters we use to think other matters with; it matters what stories we tell to tell other stories with; it matters what knots knot knots, what thoughts think thoughts, what ties tie ties. It matters what stories make worlds, what worlds make. (Haraway, 2013)

I use my first story *The visionary narrative of a feminist and postcolonial technoscientific researcher* as an umbrella text for the epilogue of this licentiate. I reconnect with my initial research objectives, relate them to the stories told and try to expand on a new story of 'where to go from here'.

One of the crucial points within technoscientific research is the role of the researcher as an active and re-generating participant within knowledge production. The researcher needs to acknowledge his/her own contextualized part in order for the research to be transparent and accountable (Gibbons et al, 1994; Novotny, 2006). I position myself as a woman who loves technology and wants to change rules of the game, the game in reference being society. I wrote this text before I travelled to Uganda. Before I met with the actors I mention in my other stories.

In my story I refer to myself as a narrator and less an ethnographer and this position has changed. I believe I wrote this to distance myself from a traditional ethnographer who is placed in a context for an extended time with the purpose of being a 'fly on the wall'. However, there are people and methodologies within ethnography where my position fit (Balsamo 1996; Mol, 2002; Strathern, 1991; Traweek, 1988). I use for instance Marilyn Stratherns example of the Haraway's cyborg to recognize the pos-

sibilities of making connections in ethnography, connections that surpass bodies and machines. The cyborg is a recurring figure in my texts and works well for explaining boundary implosions.

I created a research question for this text after the text was written. How do I, as a researcher, approach the technoscientific practices of the mobile artifact? The text was written in the early stages of my PhD, when I was trying to work out how on earth I should combine the disciplines feminist technoscience, ICT4D and design. I leaned toward the mobile phone as an embodied object and tested how it would work as an corporeal transformation. This transformation later became useful when I discuss gender and technology in the story *Girl Geeks, mobile technologies and figurations*. In this story I ask how the mobile phone is changing the socio-technical relations of gender, technology and development. I used intersectionality, diffraction and figurations to tackle the negotiation and translation processes of the initiatives Girl Geek Kampala and Women in Technology Uganda. I found it extremely difficult to discuss the socio-technical relation of gender and technology because of linguistic short-comings. I'm not talking about a meager vocabulary but of a language stuck in modernity. This text was a transitional work on my behalf. My ambitions encompassed being respectful towards the political relevance of women-oriented arenas in technology while including feminist technoscientific visions of the science question in feminism (Harding, 1986). The initiatives are creating access points for women in networks formerly exclusive for men. They are pushing physical and mental boundaries in women's agency and members of the initiatives are gaining knowledge they aren't given anywhere else. They are also at risk having their efforts of access and agency remained in the periphery based on how they situate themselves. I am concerned that technology and knowledge transfer, in the case of women initiatives and technology hubs, are replicating a historical situation enforcing a gender dichotomy where there is little room for transformation. Formulating this concern I return to the concepts of situated knowledges and responsibility. Where does the responsibility lie in discussing and evaluating the knowledge produced in science and technology? Gulbrandsen (1995) lifts a conference discussion on the impotence of Western science critique programmes. Western researchers have a tendency to place problems and challenges elsewhere, preferably in the South. Gulbrandsen quotes Vandana Shiva saying that it is "deeply entrenched in you" (Gulbrandsen, 1995, p. 5). In my research practice I strive in building a research-transforming competence that acknowledge these externalizations and vision science as an agent for change (Gulbrandsen, 1995, Fox Keller, 1992).

Returning to the umbrella story of the visionary narrative I wrote "I challenge Western and male dominated knowledge systems and their implications towards the invisible women in the periphery of mobile technology and development". This critique is based on a top-down perspective in knowledge and technology transfer. I critiqued the system for being negligent and discriminatory towards women in the periphery of technology and development. This discrimination should be elaborated and read as multiple. There are certainly women in certain contexts who are effected by a top-down development initiative, but in other contexts the knowledge transfer can look

quite different as in the case of the urban initiatives Girl Geeks Kampala and Women in Technology Uganda, which have found a practice where they are the ones who create and form their learning practices. I was negligent when I didn't mention the situatedness of individuals and how actors differentiate their oppressive experiences (Braidotti, 1994; Mohanty, 1995). Still, I remain firm in my opinion of the story of a socio-technical system as exclusive, neo-colonial and masculine continuing to dominate the information society. That being said, I want to emphasize that alongside this dominant story other stories exist. These stories tell a different story where Ugandan citizens, entrepreneurs, politicians and academics are working together to create infrastructures based on local contexts and international expectations. I elaborate on these entanglements of local innovations, standardizations and digital health care systems in the story *The situatedness of mobile infrastructuring in Uganda*.

My second challenge in the umbrella story concerns design processes and participatory design. In my eager to question the dichotomy between the categories designer and users to create a more inclusive design environment I failed to provide a historical context of the extensive discussions and changes going on in the field of participatory design. I made certain assumptions about the role of the designer, which I want to revise. I wrote that a common view among designers is to ignore social relations. This remark concerned the perception of “the omnipotent designer and the obsession with products, objects, and things” and a discussion within the design community about designers reconfiguring the design process to be more collaborative and socially inclusive (Björgvinsson, Ehn and Hillgren, 2012, p. 101). Björgvinsson, Ehn and Hillgren (2012) write “we argue that a fundamental challenge for designers and the design community is to move from designing “things” (objects) to designing Things (socio-material assemblies)” (p. 102). This is the challenge I wanted to address in my blunt sentence and I fell short on providing this important reference.

Bridging the discussion on design I move on to the story of *Design-games and future-making – a feminist technoscientific exploration among Ugandan technology hubs*. I asked how do actors in technology hubs relate to local innovations and design processes? To answer this question I presented a multitude of stories and perspectives from the Open Space workshop on the theme “The Mobile futures of Uganda: sharing visions and challenges for today and tomorrow”, a focus group discussion by the Bodapay team and interviews with the co-founders of the tech hubs Hive CoLab and Outbox. In my exploration I located stories of corruption and individual and collective responsibility in technology development entangled with user-design and conflicting power relations. The infrastructures of economy, ICT policies and a university curriculum are boundary-making practices that the entrepreneurs at the tech hubs have confronted by learning programming languages outside of the academia. The spaces provided by the tech hubs affirm innovative responses to existing practices and encourage rapid prototyping at hackathon events.

Returning to design as a socio-material assemblage I believe further discussions are necessary on how the design process can become more collaborative between different stakeholders working with mobile applications. One of the workshop participants

explained the lack of user involvement in development, “[o]ne thing about the way we build our platforms here is that we do not look at this thing, the end-user experience. When we build we assume that the guy who is going to use the application is an elite guy. For example the Farmer’s application that was built by Grameen, tell me how many farmers are using that application?” This example not only tells us that entrepreneurs think of the design after design perspective but also has certain prejudices of a large, international foundation working with mobile applications in the rural areas. Another workshop participant responded to this comment, “[t]he thing with Grameen, they go and interview the guys, I think I wouldn’t front Grameen because these guys know what they are doing. They have experience dealing with the poor, so at least they go down to the grassroots and find out how we do it, this is how we should do, and they train those guys.”

The conflicting perspectives between actors in the mobile industry are part of the boundary-making practices creating the future industry of Uganda. I am interested in how these boundaries can be destabilized for the purpose of increasing collaborations between different businesses, academic disciplines and non-governmental organizations. There are already collaborations taking place in some instances but they are often temporary and intended for the privileged ICT community. In the study on participatory action research and sanitation engineering in Sweden and South Africa Rydghagen (2002) writes “the question arises whether user participation is introduced to reduce costs and transfer responsibility or if it is recognized that involvement of the users and their knowledge, experiences and capacities will contribute to the quality of the technological system” (p.137). Rydghagen believes that user participation in technology development is a positive action and so do I. How can we create a design environment less inclined on problem-solving and more engaged in controversy and conflicting perspectives. Ehn (2008) expresses this challenge as follows,

[t]he really demanding challenge is to design where no such consensus seems to be within immediate reach, where no social community exists. In short, where a political community, a public characterized by heterogeneity and difference with no shared object of design, is in need of a platform or infrastructure. Not necessary to solve conflict, but to constructively deal with disagreements - public controversial things where heterogeneous design-games can unfold and actors engage in alignments of their conflicting objects of design. Participation in the making of such things stands out as the ultimate challenge for professional design. (Ehn, 2008, s. 9)

My third and final challenge in the umbrella story concerns the epistemological infrastructure of today. I refer to futures and corporeal transformations as a stepping stone for exploring the socio-material configurations in technology and development. To continue my thoughts here I would like to add a merging of ontology and epistemology. I believe this is necessary if we are to create more inclusive and reflexive futures where we are responsible for what we are doing. Barad presents this connection as agential realist ontology.

This account refuses the representationalist fixation on “words” and “things” and the problematic of their relationality, advocating instead a causal relationship between specific exclusionary practices embodied as specific material configurations of the world (i.e., discursive practices/(con)figurations rather than “words”) and specific material phenomena (i.e., relations rather than “things”). (Barad, 2003, p. 814)

Instead of viewing ontology as a description of concepts and objects and the presumption of agents with pre-existing relations and epistemology as a pre-defined belief system of what knowledge is Barad (2003) proposes phenomena as an ontoepistemological figure. Barad explains that “*phenomena do not merely mark the epistemological inseparability of “observer” and “observed”; rather, phenomena are the ontological inseparability of agentially intra-acting “components”*” (p. 815). This perspective becomes important for the diffractive method I’ve been using for several of my stories. Barad mentions apparatuses as open-ended practices to exemplify the dynamic reconfigurings of the world. If we consider the mobile phone as an apparatus as Barad defines it, then my research with the mobile phone is an agential practice where the mobile phone is “always in the process of intra-acting with other apparatuses” (Barad, 2003, p. 817).

The world is a dynamic process of intra-activity in the ongoing reconfiguring of locally determinate causal structures with determinate boundaries, properties, meanings, and patterns of marks on bodies. This ongoing flow of agency through which “part” of the world makes itself differentially intelligible to another “part” of the world and through which local causal structures, boundaries, and properties are stabilized and destabilized does not take place in space and time but in the making of spacetime itself. The world is an ongoing open process of mattering through which “mattering” itself acquires meaning and form in the realization of different agential possibilities. (Barad, 2003, p. 817)

In my endeavors of locating matter within the phenomena of the technoscientific practices of the mobile phone in Uganda I too am a part of stabilizing and destabilizing boundaries. My story as a visionary narrative is contradictory, political and affective. I am humble in that my partial, situated knowledges are in translation and that “[s]iting (sighting) boundaries is a risky practice” (Haraway, 1988, p. 595).

In the story *The situatedness of mobile infrastructuring in Uganda* I depart in the generic properties of an infrastructure by Star and Ruhleder (1996). People, politics and technologies are entwined in the stories told by representatives from a telecom company, the Ministry of ICT, a knowledge sharing network, a social enterprise and two non-governmental organizations. I use these properties because of how Star and Ruhleder position them in their text. They express infrastructure as a relational concept. In correlation to Barad’s intra-action the agential cut happens when organized practices becomes infrastructure. I suggest that the strength of understanding an infrastructure lies in its performative characteristics. I chose the generic properties because of how they function as agential cuts. Any act of observation creates a cut and these cuts are how we produce knowledge. In my pursuit to think and act differently for the purpose of seeing and acknowledging things ignored I selected stories from the empirical material that at a first glance might seem disparate but looking closer reveal the possibilities of reformulating agency as material-discursive. Why does this matter? It matters for the housewife who didn’t hang up, it matters for the healthcare workers who didn’t know how to use the mobile phone, and it matters for the futures of e-waste management in Uganda. How we choose to relate to the changing possibilities of the mobile phone matters because of who gets included and excluded in the agential cuts made by the politician, telecom operators and standardization agencies.

Agency is about the possibilities and accountability entailed in reconfiguring material-discursive apparatuses of bodily production, including the boundary articulations and exclusions that are marked by those practices in the enactment of a causal structure. Particular possibilities for acting exist at every moment, and these changing possibilities entail a responsibility to intervene in the world's becoming, to contest and rework what matters and what is excluded from mattering. (Barad, 2003, p.827).

The good thing with this licentiate is that it brings closure to what feels like a never-ending research practice. Working with technoscientific and posthumanist methodologies tend to leave me feeling embraced, lightheaded and distorted. I'm glad I have come this far and yet I feel I haven't moved at all. I see a line when I should be looking at dots. I look forward to expanding my thinking and doings spatially and temporally by remixing story-worlds in friction and affect. I will let Gulbrandsen summarize my journey ahead.

We no doubt need to build new narratives, new imageries, new motivating languages that will lead us to know how to stay committed to the struggle for change and transformation, even while admitting our complicity. (Gulbrandsen, 1995)

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