

Working papers in Information Systems



ICTS AND HEALTH IN DEVELOPING COUNTRIES: UNDERSTANDING THE ROLE OF IDENTITY

Esther Namatovu and Sundeep Sahay

WP 4/2017

Copyright © with the author(s). The content of this material is to be considered preliminary.

Edited by Petter Nielsen
Information Systems Group
Department of Informatics
University of Oslo
Gaustadalléen 23b
P.O.Box 1080 Blindern
N-0316 Oslo
Norway

<http://www.mn.uio.no/ifi/english/research/groups/is/>

ICTs and Health in Developing Countries: Understanding the role of Identity

Esther Namatovu and Sundeep Sahay

Dept. of informatics

University of Oslo

Norway

estherna@ifi.uio.no and sundeeps@ifi.uio.no

Abstract:

This paper explores the everyday work of Community Health Workers (CHWs) in the context of developing countries and seeks to understand interactions between mHealth systems use, work and identity. The paper argues that understanding identity in a deep manner is a significant input in developing a more human-centered approach to health information systems design and implementation. Identity is important because it helps shape behavior, attitudes and also user's relation to technology. Studying identity is thus important to understand how health workers view and use technology for conducting their everyday work. The empirical data draws on qualitative methods based on ongoing interpretive case studies in Malawi and Uganda. It examines the dynamics between mHealth implementation and the work identity of CHWs. Data is collected using interviews, Focus group discussions and observations. The empirical data was analyzed using Giddens concepts of modernity including- time-space distancing, disembedding of social relations and reflexive ordering and reordering of the self to understand the relations between work, identity and technology use. Findings indicate that the work identity of CHWs is built around their work context (activities and networks) and the use of mHealth systems enhances CHW's work identity through the development of a professionalism based on improved efficiency, work competence and enabling a higher level social status. However, we also see constraints to the actualization of this identity through increased workload and infrastructural challenges.

Suggested bibliographic references: Namatovu, E. and Sahay, S. (2017). ICTs and Health in Developing Countries: Understanding the role of Identity. Edited by Petter Nielsen. Working Paper 1/2018. Retrieved from University of Oslo, Information Systems Working Papers website:

<http://www.mn.uio.no/ifi/english/research/groups/is/publications/working-papers-in-information-systems>

“I am a health assistant but I am also a village doctor to the community...We can’t afford to have enough doctors at health facilities in rural areas so the Ministry of Health trained us as health assistants in our communities. I treat simple illnesses like fever, cough and diarrhoea for instance in the villages and everyone comes to me first. They don’t even know the health center in-charge. They refer to me as ‘dokitari’ (doctor) because I treat them.”

Interview with Health Surveillance Assistant in Malawi

1. Introduction; foregrounding identity

Developing countries globally are engaged in reforming their health systems and the introduction of ICTs is a crucial component in these efforts. The key brunt of these ICT efforts are typically faced by field level health workers- often referred to as community health workers (CHWs), who are at the cutting edge of providing care to the population and also in using new ICTs. Despite their crucial role in health services delivery, ICT initiatives tend to not focus enough on understanding their practices, aspirations, capacity strengthening needs and their relation to technology. In other words, we do not seek to adequately and intimately understand the world of their work. Contributing to this neglect, is that ICT led reform efforts in health systems are largely supply driven, in providing the technology, infrastructure and some surface level skill-based training while neglecting largely the human aspects of those who are expected to use them. This paper tries to address this neglect, through focusing on “health worker identity” which arguably provides a strong entry point to understand their world of work, and more importantly, helps to strengthen a human-centered focus to ICT design and use.

The notion of identity, this paper argues helps to develop insightful depictions of health workers’ work practices, their interactions with technology (Stein et al, 2013) and the changes which are inherent. This is in line with arguments made by sociologists like Giddens (1991) and Castells (1994) that identity will be a central driving force for social transformations in the 20th century. Identity potentially helps to illuminate a range of social and organizational phenomena such as processes of technology adaptation (Ibarra, 1999) and organizational and social behavior (Sen, 1998) amongst others. It therefore is pivotal to understanding individual actions (Tripsas 2009; Thompson and McHugh, 1995) and their underlying reasons. We explore the relation between work and identity, in the context of ICT projects in the health sector of developing countries.

Researchers have examined identity from different perspectives and disciplinary backgrounds. Identity broadly refers to the lens which people use to make sense of the world (Weick, 1995). It provides people’s primary source of meaning (Castells, 1997) reflecting what they believe themselves to be and also how they respond to social experiences and be regarded by others (Lutgen-Sandvik, 2008). Identity has been categorized broadly as personal and social (Fearon, 1999; Thompson and McHugh, 1995). These two forms are subjectively understood through interpretive processes by researchers. Other researchers (e.g. Walsham, 1998; Lamb and Davidson, 2005) have explored professional identity, which refers to how groups and individuals within particular professional groups see and describe themselves in relation to their work and the work of others. Carter and Grover (2015) depict IT related identity as the extent to

which an individual views the use of an IT as integral to his or her sense of self. Brown et al (2007, p. 13) defines work identity as “any kind of identity formation that develops through the interaction between the individual and the work context...” Schultze (2014) also argues that identities dwell in people’s social contexts and the artefacts they interact with.

We embrace Brown’s (2007) definition of work identity as it offers us an arena to understand the work practices of CHWs, and the kind of role which ICTs play in mediating their world of work. Specifically, we examine the introduction of mobile technologies (referred to as mHealth) in the work of CHWs, and the nature of their implications. We examine the following research question:

- i) *How does the mediation of ICTs, influence the interaction between identity and work of CHWs in developing country contexts?*

We explore this question through an empirical examination of the introduction of mHealth systems in the work-world of CHWs called Voluntary Health Teams (VHTs) in Uganda and Health Surveillance Assistants (HSAs) in Malawi. In both sites, we study how mHealth systems are introduced to support maternal and child health programs. This analysis, we argue provides a unique contribution to ICT4D research, and for supporting the design of more human centered approaches for mHealth systems. Theoretically, we draw upon Giddens theory of Modernity (1991) to understand the above relationship, particularly his concepts of ‘time-space distanciation’, ‘disembedding of social relations’ and ‘reflexive ordering and reordering of social relations’. These concepts help to assess various alterations in the work of CHWs and their implications on work identity.

The rest of the paper is organized as follows. In the next section, we describe broadly an understanding of the CHW work practices. Following that, in sections 3 and 4, a theoretical approach to understanding identity is presented. Section 5 elucidates the research context and methods followed by the case study presentation and discussion in section 6 where we analyze the relationship between CHWs’ identity and mHealth systems underscoring alterations and transformations in their work. Section 7 includes conclusions.

2. Understanding the Work of Community Health Workers

The term “Community Health Worker” (CHW) captures a variety of health aides who are selected, trained and are responsible for providing different health outreach services to community members, of which they typically are members of. There is no internationally generalized profile for CHWs but they can be men, women, young or old, literate or illiterate. They reflect local societal, cultural norms and customs to ensure community acceptance and ownership (WHO, 2007; Lehmann and Sanders, 2007). CHW programs sprung in the aftermath of the Alma Ata declaration (Sanders and Lehmann, 2007), and were defined as, “*any health worker carrying out functions related to health care delivery, trained in some way in the context of the intervention and having no formal professional or paraprofessional certified or degreed tertiary education.*”

In many developing countries, CHWs provide an alternate option to delivering care, especially in hard to access areas with low skilled health personnel (Lehmann and Sanders, 2007; Ludwick, 2013), working in the local language to reach rural populations (Love et al, 1997). Typically, they support various programs like maternal and child

health, HIV/AIDS care, health education etc., each with their own protocols of care. Noteworthy, the various health programs and activities are performed in many different combinations with varying degrees of blends of administrative, care provision and informational tasks over a geographical span (WHO, 2007). A key part of CHW's work, relevant to this paper, is to record data on the services they provide, and report them to levels above in prescribed formats and periodicities. To help perform this informational service more effectively, various ICTs are being introduced like mobile phones, and understanding how these influence or not their world of work and selves, becomes the primary analytical lens of this paper.

ICTs are slowly becoming an integral part of CHW's work, for example, various mHealth initiatives are being applied to support different health programs such as; mother and child health, and malaria among others implemented by both government and non-government organizations (Busiku, 2014; Mwangale and Kakaire, 2010). Since CHWs play an important role in data collection and reporting activities from the lowest levels in communities, they thus clearly need to have the capacity to use these technologies effectively. In the next section, we discuss the relation between ICTs, work and identity.

3. Theoretically Understanding ICTs and Identity in the context of CHW's everyday work

3.1 Overall Perspective on Identity

The concept of identity cuts across multiple disciplines including development studies, psychology, post modernism, sociology amongst others (Lamb and Davidson, 2005) helping us to understand from different perspectives how people make sense of and present themselves. Identity can be conceptualized as personal or collective/social (Fearon, 1999; Stryker and Burke, 2000). Fearon (1999, p.2) defines personal identity as "some distinguishing characteristic (or characteristics) that a person takes pride in or views as socially consequential but more-or-less unchangeable. Social identity on the other hand is "a set of persons marked by a label and distinguished by rules deciding membership and alleged characteristic features or attributes" (ibid). These social categories can be based on nationality, gender, occupational or professional groups (Hogg and Terry, 2000) that provide points of reference and comparisons to understand how we can define ourselves (Thompson and McHugh, 1995). Identity becomes crucial for studying individual, group, intergroup and firm level processes and relations (D'Mello, 2006). For CHWs, these characteristics for defining oneself may include; belonging to a group of first level community health aides with activities defined and shaped around health promotion in communities. In the context of ICT-based reforms, technology may also serve as an important characteristic in shaping identity.

Identities are not singular or static, but are multiple and evolving based on the roles played by individuals and their multiple social relationships (Stryker and Burke, 2000). Individuals often effectively engage in securing for themselves identities which provide both a sense of personal stability and a basis for directing activities (Thompson and McHugh, 1995). People may have a repertoire of discrete category memberships with varying influences on the self-concept, however usually organized in a salience hierarchy (Stein et al, 2013). A CHW's social relations could span across their work, family, church etc. each ascribing him/her various positions, roles and identities.

Social identity helps group members to share an understanding about situationally appropriate ways of acting and feeling (Turner et al, 1994). For example, Ashforth and Mael (1989) note that stereotyping and labelling are used to ascribe values and roles to others as well as to one self. They add that this definition of self is firmly located in intergroup relations (Tajfel and Turner, 1985) with one's own group being the 'in-group' which is constantly compared to various other 'out-groups' (Tajfel, 1981). While people can be categorized into several different groups simultaneously, some memberships dominate, shaped by distinctiveness of the group's features, values and practices compared to out-groups (Oakes and Turner, 1986), their prestige (Chatman, Bell and Staw, 1986) and awareness of other out-groups (Turner, 1985).

From the perspective of this paper, we also view the identity of an individual health worker to be shaped by their membership to the group of CHWs, with defined purposes and activities for their work. However, we do not rule out their membership in other social networks that influence definitions of the self and a weighing of salient characteristics, such as associated with ICTs.

3.2 Work and Identity

Whyte's (1956) description of the organization man indicates the workplace as strongly influencing identities and self-representations of people including the kind of work they do and organizations they work with. du Gay (1996) notes that no work situation, no matter how autonomous or restrictive, can be understood without reference to the action and beliefs of those involved in it. Individuals attach a sense of identification with particular contents and practices in their work as Alvarez (2008) also notes. According to Brown et al (2007), work identity develops through the interaction between the individual and the work context, and helps distinguish members of one occupational community from another. Work identity is adopted here as a part of social identity- based on its collective nature (Kirpal, 2004). Work identity is seen as distinctive from professional identity for instance because it encompasses professional and occupational identities. Since CHWs are difficult to group based on professions due to absence of academic accreditations and union memberships, we use the term work rather than professional identity.

IS research studies have primarily focused on professional identity (see; Mishra, 2016; Stein et al, 2013) to discuss a particular vocation and its relation to identity (Collin, 2009). However, professional identity can be contested as it emerges in unexpected occupational domains, or in relation to ambiguous terms such as specialized knowledge, conditions of autonomy and other social memberships (Fournier 1999). Interestingly, the articulation of competencies, certain kinds of conduct and work ethics can be a means to building professionalism (ibid). A group that articulates competence for instance, without necessarily having previous formal training and professional membership might identify with a professional based work conduct (ibid). There is thus a broader scope of work relations to explore as technology becomes a part of every aspect of the world of work. Studying CHW's work identity offers a nuanced area to understand the types of identity at play in their world of work and the role of ICTs.

3.3 Technology and Identity

Various IS researchers have emphasized the growing relationship between technology and identity of users (see for example; Lamb and Davidson, 2005; Nach, 2009; Tripsas,

2009; Carter and Grover, 2015). Carter and Grover (2015) reviewed eight top IS journals¹ between 1997- 2014 and concluded that studies have largely viewed ICTs in relation to identity as; a ‘medium’, a ‘determinant’ and a ‘consequence’ of identity. They posit that as a determinant, ICTs influence individual’s identities in the social positions they occupy. As a consequence, they provide individuals with perceptions of self-continuity. And as a consequence, ICTs support social relations in which identities are constructed. Lamb and Kling (2003), drawing upon Goffman’s (1959) notions of labelling and self-presentation emphasize ICTs as a medium for people to present who they are in relation to others. Walsham (1998) and Alvarez (2008) have emphasized ICTs’ role in changing work practices although they focus on the negative impacts of these shifts. Lamb and Davidson (2005) also acknowledge the enhancing abilities emphasizing aspects of culture. Lee et al (2006) examine social identity’s influence on technology acceptance, which they argue will be higher when it provides less conflict with what individuals already believe about themselves in work. IS research offers different views on ICTs and identity and we reflect on this relationship drawing on the implications of the interactions between mobile systems in the work of CHWs and their work identity.

3.4 Work –Technology- Identity relation

Our review so far highlights descriptions indicating how identities emerge with social groups, defining appropriate actions for group members. In work settings, elements and features in work can create a basis for individual and group work identity definitions. Some researchers have highlighted that the dynamics in work influence interpretations for users’ identity (Walsham, 1998; Lamb and Davidson, 2005). Work activities are conceived in terms of jobs and roles performed by members of occupations and professions with careers and trajectories that provide a basis for workers’ sense of meaning and identity (Casey, 1995 in D’Mello, 2006). Work and work contexts therefore afford individuals with cultural and social elements they use to construct their work identities and revise their sense of self. For CHWs, the way they experience and understand their work context forms an essential contribution to the construction of identity in their work. Hochschild (1997) asserts that our work roles and occupational memberships do indeed shape our lives, regulating and giving notions of order and structured activity which shape social identities. Beaudry and Pinsonneault (2005 in Nach and Lejeune, 2009) have shown that any alterations in aspects of work instigate individuals to deal with threatening situations to their identity. Yet again, the intensity of work identities and their revisions for individuals varies (Kirpal, 2004).

Carter and Grover (2015) write that in today’s world, technological advances have lifted social relations out of localized contexts– creating new expectations of how, when and where people perform various work roles and maintain their social networks. These expectations in turn shape an individual’s conceptions of themselves and guide their behaviors. X (2007) emphasize mobility to characterize everyday work, and analyze how

¹ European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of the Association for Information Systems, Journal of Information Technology, Journal of Management Information Systems, Journal of Strategic Information Systems, and MIS Quarterly, Information and Organization, Information Technology & People, and The Information Society.

technology is implicated in increasing mobility² and with it the yearning for identity. This resonates with Urry's (2007) argument that the use of modern technologies tends to collapse distance and time and impact on mobility. X (2007), in the context of global outsourcing work, analyze three instances of mobility intertwined with identity definition: geographical, existential, and social. While they quote (Gergen, 1991) noting that technologies free selves and relationships from geographical and spatial confines, they provide possibilities for alterations, and people are always 'to and froing' and somewhere in between. They assert that people hence use their social relations to reflect on their identity, and the evolving changes (x, 2003). As work undergoes changes with ICTs, so does the self, reflexively, which we try to understand in the context of CHWs doing health care work.

In summary, IS research has highlighted an important link between individuals' identities and the social positions they occupy and the ICT related mediation. This analytical lens helps to understand how identity definitions unfold in the presence of ICTs, and with work alterations the self undergoes reflexive redefinitions shaped by context and experiences of individuals and groups. We draw upon these ideas to develop our theoretical framework based on Giddens' ideas of modernity.

4. Theoretical Framework

We draw upon Giddens' theory of Modernity (1991) which has identity at its core, drawing upon three defining concepts; 'time-space distanciation', 'disembedding of social relations' and 'reflexive ordering'. Giddens' key argument is that as the forces of modernity impose themselves, an obsessive preoccupation with identity occurs (Giddens, 1991), a condition he describes as "high modernity."

'Time-space distanciation'- denotes a separation of time and space that in traditional societies are linked through everyday social life occurring in co-location. For instance the interaction between a CHW and her supervisor was historically carried out in co-located setting of the health facility, but now the CHW may send a monthly report from a distance and at any time using the mobile phone. This may alter how the CHW views herself (e.g. the hierarchy) in relation to her supervisor. The *'disembedding of social relations'* from local contexts of interactions to others distant, represents a 'lifting-out' of social activity from localized contexts and their reorganization across other time-space contexts. For instance, home visits of CHWs to expectant mothers often done through timely home visits could now be possible through the use of protocols communicated through the phone, a practice which is then extended to different villages within the purview of the health system. These standardized protocols become the object of disembedding and re-embedding in other contexts. A third relevant feature is the chronic *'reflexive ordering and reordering of social relations'* in light of new knowledge. For instance an increased demand for reports through mobiles might require CHWs to focus more on learning the technology, and less on care provision, possibly prompting feelings of being mere data collectors and not real care givers.

² Mobility is commonly understood as the movement of a body between locations in primarily geographical space. Urry (2007: 7) notes that various technologies in the contemporary world have set in motion new ways of people being temporarily mobile- something that moves or is capable of moving.

For Giddens, knowledge (scientific or social) in the modern world is temporary and alterable contrary to traditional societies where tradition, authority, religion and custom offered relative certainty. However, with the fundamental bases of knowledge constantly changing, individuals monitor these shifts, often creating anxiety, and use it as grounds for changed action, relations and self-identity. He notes that self-identity is not a distinctive set of traits possessed by an individual but the self reflexively understood by the person in regards to their biography. Rapid changes raise questions of identity among individuals and they therefore have to work out personal roles as, what to do?, how to act?, and who to be? which are answered either discursively or through day to day social behavior (Giddens, 1991). These three features, taken together provide a framework for our analysis of CHW identity.

4. Research Design and Methods

We adopt a comparative case analysis of mHealth projects in two countries; Uganda and Malawi. We first describe the respective contexts of research followed by the methods adopted in the study.

5.1 Research Context

5.1.1 Uganda

Uganda is a Sub-Saharan African country experiencing severe health worker shortages. In a bid to extend primary healthcare to inaccessible areas, the Ministry of Health in 2001-2010 rolled out the Voluntary Health Team (VHT) strategy (UN et al, 2015) based on notions of community consensus and volunteerism. According to Turinawe et al (2015), about 77% of all districts in Uganda had trained VHTs by 2009, responsible for providing newborn care, distribution of health commodities, simple community case management, and community information management among others. However since its implementation, the VHT roll out program has faced several challenges including low retention, and poor sustainability (UN et al, 2015; Ludwick et al, 2013).

VHTs are the foundation of health systems providing care at the village level and are attached to the lowest level of health centers (Busiku, 2014) responsible for providing care to communities. See figure 1 below of the health system hierarchy and the supporting information flows.

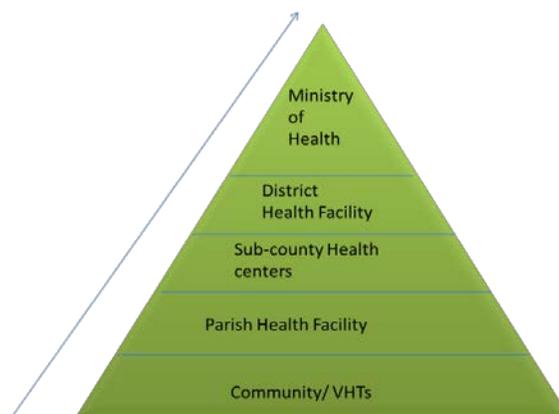


Figure 1: Structure and flow of information in Uganda

Often, VHTs are required to be able to read and write, and come from the same village in which they are deployed, supporting both government and non-government institutions. Many of these institutions have spearheaded the introduction of mobile technologies into health systems in order to strengthen linkages between community health services with formal health systems (Busiku, 2014). This has led to a proliferation of mHealth programs in the country (McCann, 2012) under the Ministry of Health's coordination. These initiatives have also been introduced to VHT programs with broader ambitions to empower, retain and motivate VHTs, while supporting them in their everyday work of data collection and community disease management (Källander et al, 2013). However, the implementation of these mHealth systems has proved challenging with a 2013 study by Malaria Consortium indicating only 40% of 5,506 trained VHTs reporting data.

5.1.2 Malawi

Malawi faces a high disease burden (WHO, 2014) and a critical shortage of professional health personnel. In 2005, an emergency Human Resource Program (EHRP) was started to build the size and capacity of the health workforce (Kok and Muula, 2013) to meet the country's pressing health needs. By 2009, Malawi had over 10,507 HSAs making up the country's largest health workforce. They evolved from temporary staff called "smallpox vaccinators" in the 1960s and "cholera assistants" in the 1970s to officially becoming part of Malawi's Health System in 1995 (ibid). They now constitute the community based health structure and are formally employed by the Ministry of Health with paid monthly salaries.

In the community, HSAs work in designated catchment areas providing primary, promotive and some curative health services at the primary level (MoH Malawi and ICF International, 2014). At the village level, they work with Village Health Committees (VHC) consisting of volunteers, and with other government and non-government institutions. MHealth systems in Malawi are being positioned at the forefront of facilitating community based health initiatives including quick disease diagnosis and administrative functions relating to data reporting and HIS (Joos et al, 2016) and for programs on maternal and child health, malnutrition and malaria (Källander et al, 2013).

5.2 *Research Design*

The study investigates two cases of mHealth system use in Uganda and Malawi. We investigate and compare both cases to understand mHealth systems use in the everyday work of CHWs and their identity.

5.2.1 Uganda

The Elimination of Mother to Child HIV Transmissions (EMTCT) program is implemented as collaboration between the Ministry of Health and other Implementing partners (IPs), to help reduce maternal and infant mortality. In light of this, over 4000 VHTs were engaged in preventive health activities for their respective communities. The program runs in over 10 districts in the country and for two months (March and April 2015) the first author selected and then visited two districts (Kibaale and Kyenjojo) which represented high and low usage rates of the mHealth programs.

In a bid to improve data reporting on maternal and infant mortality from the communities, weekly SMS reporting was introduced jointly by the Ministry of Health and its implementing partners. Upon its introduction, VHTs were given training on

understanding the importance of collecting weekly data and how to make the weekly reports and send them using the mobile phone.

A VHT said:

“They told us that we were going to start sending weekly data about infants and women who die due to pregnancy related causes in our villages. They trained us how to send data to a toll free number and gave us phones although not all VHTs got phones”

Eighteen VHTs engaged in weekly SMS reporting for at least the last 12 months were invited to participate in the study. Besides SMS reporting, the VHTs were engaged in various other activities like educating communities on the importance of women obtaining care from health centers while pregnant, following up on expectant mothers in communities that are not turning up for Antenatal care services, referring pregnant women to health centers, arranging motorcycle taxis in case of emergencies and follow up of women after delivery to ensure that they received appropriate postnatal care.

5.2.2 Malawi

Organization mHealth (a pseudonym) in 2014 developed a mobile decision support App system to aid decision-making by HSAs during assessment of expectant mothers and infants. The system is based on existing paper protocols that are incorporated into mobile phones to support HSAs in accurately assessing, diagnosing and treating mothers and infants. The system uses decision trees to guide HSAs through a step by step analysis and treatment plan for health conditions like malaria, pneumonia, and malnutrition amongst others. For example if a HSA is assessing the health of an infant, he/she has to go through a step by step inquiry and based on the answers entered into the system, a diagnosis or a recommendation for action such as a referral to a health facility is generated. An example of such a printout is depicted below.

Date	Child's Full name:	Age Years Months	Sex B G	Caregiver Name	Relationship M F Other	Physical Address	Village							
Identify Problem: Ask?	<input type="checkbox"/> Cough _____ Days?	<input type="checkbox"/> Diarrhoea _____ Days? <input type="checkbox"/> Blood in Stool?	<input type="checkbox"/> Fever _____ Days?	<input type="checkbox"/> Convulsions?	<input type="checkbox"/> Difficulty drinking or feeding? <input type="checkbox"/> Unable to drink or feed anything?	<input type="checkbox"/> Vomiting?	<input type="checkbox"/> Vomiting e							
Identify Problem: Look?	<input type="checkbox"/> Chest indrawing?	If cough breaths in 1 minute _____ ? < 12 months: 50bpm or more > 12 months: 40bpm or more	<input type="checkbox"/> Very sleepy or unconscious?	<input type="checkbox"/> Palmar pallor?	<input type="checkbox"/> For child 6 months to 5 years, MUAC colour: Red?	<input type="checkbox"/> Swelling of	<input type="checkbox"/> Swelling of							
Danger sign (Ask?)	Danger sign (Ask?)	Danger sign (Look)	Sick but no danger sign	Decide: refer or treat child (tick decision)	Prepare for referral (child who can drink)	Diarrhoea	Treat at home							
<input type="checkbox"/> Cough-21 days or more <input type="checkbox"/> Diarrhoea-14 days or more <input type="checkbox"/> Blood in stool <input type="checkbox"/> Fever - last 7 days <input type="checkbox"/> Convulsions	<input type="checkbox"/> Unable to eat or drink anything <input type="checkbox"/> Vomits everything <input type="checkbox"/> Red eye with visual problem <input type="checkbox"/> Red eye for 4 days or more	<input type="checkbox"/> Chest indrawing <input type="checkbox"/> Very sleepy or unconscious <input type="checkbox"/> Palmar Pallor <input type="checkbox"/> Red on MUAC tape <input type="checkbox"/> Swelling of both feet <input type="checkbox"/> Other problem to refer	<input type="checkbox"/> Diarrhoea (less than 14 days and no blood in stool) <input type="checkbox"/> Fever (less than 7 days) <input type="checkbox"/> Red eye (less than 4 days) <input type="checkbox"/> Fast breathing	<input type="checkbox"/> IF ANY danger Sign refer <input type="checkbox"/> IF NO danger sign treat at home and advise caregiver	<input type="checkbox"/> ORS given <input type="checkbox"/> LA 5 months up to 3 yrs (1 tab) <input type="checkbox"/> LA 3 yrs up to 5 yrs (2 tabs) Chest Indrawing or Fast breathing <input type="checkbox"/> Cotrimoxazole 2 months up to 12 months (1/2 tab) <input type="checkbox"/> Cotrimoxazole 12 months up to 5 yrs (1 tab) Red Eye <input type="checkbox"/> Antibiotic eye ointment	<input type="checkbox"/> ORS 2 plds <input type="checkbox"/> Zinc 2 months up to 6 <input type="checkbox"/> Zinc 6 months up to 5 Fever <input type="checkbox"/> Paracetamol 2 mon <input type="checkbox"/> Paracetamol 3 yrs 4 <input type="checkbox"/> LA 6 months up to 3y <input type="checkbox"/> LA 3 yrs up to 5 yrs (1	<input type="checkbox"/> Vomiting <input type="checkbox"/> Vomiting e							
Date	Child's Full name:	Age Years Months	Sex B G	Caregiver Name	Relationship M F Other	Physical Address	Village							
Identify Problem: Ask?	<input type="checkbox"/> Cough _____ Days?	<input type="checkbox"/> Diarrhoea _____ Days? <input type="checkbox"/> Blood in Stool?	<input type="checkbox"/> Fever _____ Days?	<input type="checkbox"/> Convulsions?	<input type="checkbox"/> Difficulty drinking or feeding? <input type="checkbox"/> Unable to drink or feed anything?	<input type="checkbox"/> Vomiting?	<input type="checkbox"/> Vomiting e							
Identify Problem: Look?	<input type="checkbox"/> Chest indrawing?	If cough breaths in 1 minute _____ ? < 12 months: 50bpm or more > 12 months: 40bpm or more	<input type="checkbox"/> Very sleepy or unconscious?	<input type="checkbox"/> Palmar pallor?	<input type="checkbox"/> For child 6 months to 5 years, MUAC colour: Red?	<input type="checkbox"/> Swelling of	<input type="checkbox"/> Swelling of							
Danger sign (Ask?)	Danger sign (Ask?)	Danger sign (Look)	Sick but no danger sign	Decide: refer or treat child (tick decision)	Prepare for referral (child who can drink)	Diarrhoea	Treat at home							
<input type="checkbox"/> Cough-21 days or more <input type="checkbox"/> Diarrhoea-14 days or more <input type="checkbox"/> Blood in stool <input type="checkbox"/> Fever - last 7 days <input type="checkbox"/> Convulsions	<input type="checkbox"/> Unable to eat or drink anything <input type="checkbox"/> Vomits everything <input type="checkbox"/> Red eye with visual problem <input type="checkbox"/> Red eye for 4 days or more	<input type="checkbox"/> Chest indrawing <input type="checkbox"/> Very sleepy or unconscious <input type="checkbox"/> Palmar Pallor <input type="checkbox"/> Red on MUAC tape <input type="checkbox"/> Swelling of both feet <input type="checkbox"/> Other problem to refer	<input type="checkbox"/> Diarrhoea (less than 14 days and no blood in stool) <input type="checkbox"/> Fever (less than 7 days) <input type="checkbox"/> Red eye (less than 4 days) <input type="checkbox"/> Fast breathing	<input type="checkbox"/> IF ANY danger Sign refer <input type="checkbox"/> IF NO danger sign treat at home and advise caregiver	<input type="checkbox"/> ORS given <input type="checkbox"/> LA 5 months up to 3 yrs (1 tab) <input type="checkbox"/> LA 3 yrs up to 5 yrs (2 tabs) Chest Indrawing or Fast breathing <input type="checkbox"/> Cotrimoxazole 2 months up to 12 months (1/2 tab) <input type="checkbox"/> Cotrimoxazole 12 months up to 5 yrs (1 tab) Red Eye <input type="checkbox"/> Antibiotic eye ointment	<input type="checkbox"/> ORS 2 plds <input type="checkbox"/> Zinc 2 months up to 6 <input type="checkbox"/> Zinc 6 months up to 5 Fever <input type="checkbox"/> Paracetamol 2 mon <input type="checkbox"/> Paracetamol 3 yrs 4 <input type="checkbox"/> LA 6 months up to 3y <input type="checkbox"/> LA 3 yrs up to 5 yrs (1	<input type="checkbox"/> Vomiting <input type="checkbox"/> Vomiting e							
Age	Fever	Diarrhoea	Fast breathing	Red eye	Red on MUAC	Swollen both feet	Palmar pallor	Other	Referrals	Death	New cases by gender		Total used	LA 6x1 (tablets)
2-11 months											Male			
12-59 months											Female			
Total											Total			

Figure 2: Paper forms previously used by HSAs which are now integrated in the mobile system

The study was conducted in two districts; Zomba and Dowa for two months (September and October 2015) and 12 HSAs participated. Upon its introduction, HSAs received; training from the District Health Office, monthly phone allowances, smart phones and App.

The comparative case analysis helped us to analyze identity in contexts with both similarities and differences. While the CHWs in both cases hold similar work responsibilities and activities- treating, referring, educating, data reporting – there are some differences such as; the VHTs in Uganda being volunteers and HSAs in Malawi are salaried employees. The HSAs received smart phones with more advanced features and functionalities while VHTs in Uganda received regular mobiles. In Malawi, the application content was more sophisticated including care protocols, while in Uganda it was simpler involving the reporting of two new data indicators- maternal mortality and infant mortality. Differences in work structure (salaried versus volunteers), types of phones (smart phones versus regular), and in the content of the application, arguably are important determinants of identity. This was the rationale for our adoption of a comparative case study design.

5.3 Data Collection Methods

The case studies were carried out over a period of four months (March-April 2015 and September-October 2015), and empirical data was drawn from interviews, observations and Focus Group Discussions (FGDs) which were conducted in two phases. Phase one between March and April 2015 was done in Uganda and phase two during September and October 2015 in the rural villages in Malawi. The case study in Uganda was conducted in the two districts of Kibaale and Kyenjojo, with four villages chosen in each district (8 in total). Access to VHTs was gained through their coordinators, and then their consent to participate in the research was sought and obtained. 18 semi-structured interviews with VHTs, 2 with VHT coordinators and 3 with community members were conducted, and field notes developed. Data collection also included regular observations of VHTs in health centers and communities combined together with informal discussions. Observations were made of VHTs interacting with community members and how they worked on activities such as; distribution of drugs to patients, weighing and treating children, aggregating data into monthly reports, and weekly SMS reporting. A group of 7 VHTs were engaged in a FGD, where they took turns individually and also as a group to share their experiences of using mobile phones, including the challenges experienced. Audio recordings were also made during the FGD and were later transcribed to facilitate the analysis process.

In Malawi, two districts- Zomba and Dowa were studied, during the period September and October 2015. In these districts, 3 villages were visited, 12 semi-structured interviews with HSAs, 1 with a HSA coordinator and 4 with community members were conducted. A group of 6 HSAs was also interviewed so as to understand and interpret their sense of working in a group. Notably, study participants were asked questions relating to their everyday work, the roles they play, the networks they were involved in, and their experiences with the mhealth system. Data collection also included informal discussions and observation of HSAs work in communities and at health centers. The first author was invited to join field visits and also to observe work at health facilities by HSAs that had earlier been interviewed. Observations were made of how they worked

and interacted with community members, for example related to child growth monitoring exercises and drug distribution. The combination of interviews and observations enabled useful insights on “What people are doing as well as what they say they are doing” (Myers, 1999, p. 2 in Walsham and Ellway, 2015, p.140), and how these dynamics may reshape work, skills and identity.

The table below summarizes the details of the interviews conducted.

Table 1: Number of interviewees

Source/method	Participant	Number		Duration
		Uganda	Malawi	
Interviews	CHW	18	11	40 minutes to one hour
	CHW coordinator	2	1	30 minutes- 1 hour
	Community members	3	4	30-40 minutes
Observation	Health official	1	3	37 minutes
	Home visits	4	2	38-40 minutes
	Health center visits	3	3	One hour
1 FGD	CHW	7	6	1 hour and 12 minutes

5.4 Data Analysis

Raw data was transcribed and organized from field notes and audio recordings to facilitate the analysis process. We then moved through a stage by stage analysis starting with compilation of raw data, to developing first order themes, a second order analysis and then overall theoretical inferences. The inter-case comparisons helped to sharpen our understanding of the identity related dynamics.

In the first order analysis, we relied on reading and discussing the primary data to identify emergent themes relevant to the research question posed in the study. We moved back and forth between the transcribed data and emergent themes and categories to continuously make sense of the data and modify or abandon categories. Key themes identified included; the nature of everyday work of CHWs, the roles CHWs play, the kind of work they do both in the formal health facility and in the community, the kinds of networks they are involved in, and their experiences in using technology. Following this thematic grouping, we then moved to the second order of analysis where we related the themes with the three theoretical concepts drawn from Giddens’ theory of modernity. These comparisons informed the analysis allowing us to enrich our inferences around the identity related dynamics.

In the table below, we summarize this inductive process of analysis.

Table 2: Example of how the analysis was done

Theme	Example	Theoretical Influence
Nature of work	e.g. “...I will call another VHT or the medical personnel at the	Time-space distanciation. Some aspects work like consultations

	<i>health center to consult on what to do. We do not have to necessarily make the trip to the health facility or another VHT member's home in case I am not certain about what I should do..."</i>	done across time and space.
Networking and relating to others	<i>"Some parents sometimes simply call us to make consultations if they have questions. Of course it is important that we examine the patient or child in most cases but some call us to ask questions about what they should do..."</i>	Disembedding of social relations between patient and CHW in situations described as simple illnesses do not necessary have to occur in the same place.
Experience with technology: Changes in work	E.G. On making both paper and phone reports simultaneously. <i>"...Then I have to send the weekly SMS. That means I have to go to particular households to confirm that I am reporting the right data. It is more work."</i>	Modern reflexivity. Redefining terms of work. Individual level reflexivity.
Experience with technology: Changes in work	<i>"The phone is fast and recommends solutions when checking for danger signs with a pregnant woman for instance. It even suggests what course of action to take hence making us more competent and 'professional' in our work..."</i>	Modern reflexivity. Redefining skills. Change in view of oneself

6. Case Studies and Discussion

This section describes and discusses the two case studies conducted in the research. We illustrate previously held notions of work and highlight emerging work shifts in light of the introduction and use of mHealth systems. We draw on important work shifts identified by earlier research as relevant (Walsham, 1998; X, 2003) and interpret them in light of Giddens' theory of modernity. We take as sub-sections, the three key concepts identified by Giddens (time-space distanciation, disembedding of social relations, and reflexivity of the self) and within each provide snippets and examples from both the cases. This is followed by an intra and inter case analysis. In this way, we have intertwined the case study and its analysis, which we hope provides a richer illustration of how we arrive at our analytical inferences.

6.1 Time Space Distanciation

6.1.1 In Uganda

Giddens (1991) describes this concept as the breaking or separation of social interactions over time-space. In Uganda, work interactions, the work context and associated identity are defined and seeded from the initial process of becoming a VHT member. Supervisors, VHTs and community members narrated that VHTs are voted by members of their communities including local leaders, public health representatives and other partners. The

community meets and deliberates on potential candidates and votes members to the VHT position. Elected VHTs are allocated a catchment area, often a village where the VHT physically serves and is attached to a health facility for supervision, training and facilitation. A community member noted,

“...we were called to a village meeting by the local council leaders. We debated amongst ourselves and selected individuals that we considered to have potential...For example someone that is exemplary in terms of good health practices, can read and write, approachable, dependable, reliable, has experience, a good reputation in the village and most importantly we should be able to trust that person to come into our homes”. (Community member 3)

This selection process helps create a trust relationship between the VHT and the community which shapes self-representations (Whyte 1956) of VHTs that plays out over different activities across time and space. Some of these are discussed.

Reporting: All VHTs noted that reporting is a central component in their work, which previously only involved updating daily activity registers and aggregating them to monthly and quarterly reports physically delivered to the supervising health facility. Since SMS reporting was introduced, two new reporting formats were added to the continuing practice of the earlier manual reporting systems. Weekly SMS reports directly sent to the national database at the Ministry of Health separated both space (as contrasted to earlier physical delivery) and time (instant transfer of data). This separation, arguably had implications on identity.

While majority of VHTs did not think it increased their workload considering the very little time spent on sending weekly SMS on only two indicators, some others expressed agitation and anxiety.

“It has increased work. I have to make reports every month and that means I have to walk throughout the entire village to collect this data, register it and report it. Then I have to send the weekly SMS. That means I have to go to particular households to confirm that I am reporting the right data. It is more work.” (VHT 1)

“We now send weekly SMS reports, submit monthly paper reports and quarterly paper reports. It is increasing our work. We need to be paid for the new formats of reporting” (VHT8)

“The mobile phone is complementing our work although we never reported on maternal and infant mortality before. It is not a lot of work to report on the two indicators. Except, when you hear of a death and have to go there to confirm it before sending the data. Also it is not like they are dying all the time as we try hard to get expectant mothers to go to health facilities. We should report on the two indicators because then we become efficient when we know the situation we are dealing with in our villages...” (VHT 15)

SMS reporting, since it added on to existing work and created a parallel work flow (see figure below) was seen to magnify the workload, and some VHTs (example #8) believed they deserved extra payment. However some others (example VHT 15) were enthused by the perceived enhanced increased efficiency and competence as it allowed them to report on two indicators (maternal and infant mortality) previously not reported. This example illustrates the varying implications on shifts in identity the same technology may have.

Furthermore, identities are shaped in context, as illustrated by the continued practice of paper based reporting, despite the introduction of SMS reporting. Work practices are historically and institutionally embedded, and thus difficult to dislodge. The same technology, in different contexts, may have very different implications, as the forces and motivations to dislodge existing institutions would vary.

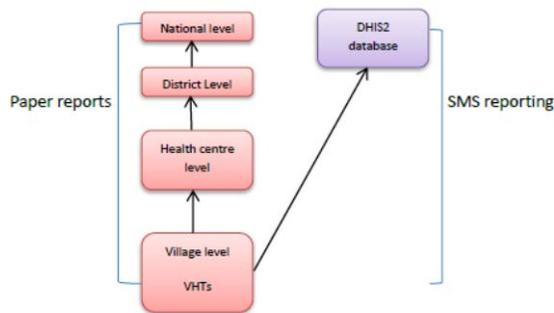


Fig. 4: information flow from the community and into the Uganda health system and DHIS2 database as described by VHTs



Fig 5: A VHT member shows me how SMS reporting is done

VHTs described that the SMS reporting of two new indicators - maternal and child mortality – had prompted various actions such as feedback giving over the phone and implementing partners planning new interventions. However, issues of poor network, phone credit, electricity, poor quality phones were cited as limiting mobile phone usage, a constraint often addressed by VHTs through borrowing phones from neighbors or relatives and paying to charge phone batteries.

Social interactions: VHTs engaged in different forms of social interactions in their everyday work such as mobilizing colleagues, making village visits and providing consultations. We found time-space distancing to be relevant in these interactions, and some examples are provided.

Prior to SMS reporting, VHTs occasionally used personal phones to coordinate and mobilize communities to attend community meetings without necessarily having to travel outstation. At the same time, the word of mouth was also used. Now with the phones, coordinators noted that even those previously without phones could afford to communicate without physical travel enabling fast and efficient conduct of activities.

A mandatory aspect of VHT work is to make home visits in villages so as to assess health conditions of communities and also follow up on patients. Some VHTs noted that they now sometimes made phone calls before a village visit to ascertain that members of a household were present, which previously would be done only through the physical visit. This event is now sometimes stretched through time and space with a phone call to follow up mothers. One VHT stated that presently follow up of some patients was occasionally made on the phone to ascertain that a referred patient, for instance an expectant mother, had made it to a health facility and received the necessary treatment. Another VHT recounted,

“...with some people you might have to call first otherwise you might make a trip and not find them at their homes. If they are not there, then you do not have to go and it may mean that you might actually just put them off the list to be visited in the present month and move them to the next. Although we are required to make monthly visits to each home,

we cannot because it is too much work and there are so many households” (VHT member 16)

Follow up over the phone with no physical visits increased mobility in a certain sense (X, 2007; Urry 2007), as they could provide services, albeit of a different nature than before, to community members more spread over time and space, and from anywhere. There were also reports of mobiles prompting simple health inquiries by community members to occur in a physically separated setting.

All VHTs acknowledged that the phone enabled them to make consultations with colleagues, supervisors, health personnel, and community members. A VHT narrated:

“For example if a parent comes to me worried that their child might be sick, I check them. If I am not sure about something, I will call another VHT or the medical personnel at the health center to consult on what to do. We do not have to necessarily make the trip to the health facility or another VHT member’s home in case I am not certain about what I should do... If it’s simple and I need to treat it, I simply just call”. (VHT member 9)

The case in Uganda depicts mainly how most VHT activities were gradually subjected to change, with respect to separating time and space. Changes implied the replacement of physical visits with mobile consultations and enabling VHTs to conduct work from anywhere and anytime. These shifts have implications on identity which we discuss later.

6.1.1 In Malawi

The work context, interactions and activities of HSAs in Malawi also take root from their initiation into the role of a HSA. HSAs are employed by the Ministry of Health with salaried positions. All HSAs reported that upon getting their position after responding to a vacancy announcement, they were allocated catchment areas in which they physically conduct their designated duties. The community chief introduced HSAs to community members, and this provided them with a sense of status and also helped shape the community and their own expectations of their work responsibilities. A HSA narrated;

“I become a HSA in 2007. I responded to a vacancy position advertised by the Ministry of Health in the newspaper. I must at least have completed secondary education to qualify. After being hired, I was integrated into the community by the chief and other local leaders. The community selected a Village Health Committee that would assist me. The community also built a village clinic where I would work.” (HSA 9)

The picture below shows a Village clinic constructed by the community.



Figure 3: A HSA stands in front of a Village Clinic structure that was constructed by the community

Besides, working in the community, HSAs are also attached to a health facility where they get supervision and facilitation. All HSAs reported taking turns to work physically at the health facilities and in their catchment areas. Like in Uganda, work activities included reporting, mobilizing others and providing consultations. These are briefly described.

Reporting: HSAs stated that reporting activities from the community to higher levels of the health system is central to their work. They previously recorded activities in daily registers, aggregated them and physically submitted monthly reports to the HSA coordinator who in turn submitted them to the health facility in charge and further to the District Health Office. With the mobile system, new reporting formats emerged supporting reporting over time and space with daily data directly going into the ministry's central database. All HSAs reported substituting paper data capturing with mobile data because the new system supported faster and better decisions while seeing patients. An example of HSAs being prepped for using the mobile system:



Figure 4: HSAs during training with the mobile decision-support app

HSAs had not experienced direct feedback from higher ups before. Through mobile reports, the superiors were made aware of the amount of work performed by HSAs in the field, which previously tended to remain hidden.

Social interactions: These included mobilizing activities, consultations and making home visits and we found time-space distancing germane as we describe.

HSAs conducted extensive mobilizing activities with colleagues, VHCs and local leaders. For example, with the community HSAs had infant immunization exercises communicated at the Village clinic based on physical co-presence. Now gradually these events were organized over the phone enabling more rapid and efficient mobilization.

“Now that we received phones, it is easier to mobilize the community and each other. We have a WhatsApp group as HSAs where we not only share experiences and queries but can mobilize each other. For example, if a HSA needs assistance in the field with an activity such as growth monitoring, then s/he can either call or simply coordinate this on WhatsApp”. (HSA 7)

Home visits, also crucial to HSAs work previously involved physical visits to community members such as expectant mothers, patients referred to health facilities and new-born infants amongst others. With the use of phones, HSAs believed their tasks could be done more efficiently, for example, they could now reach out to more and geographically dispersed households. While VHCs could identify expectant mothers and infants in villages, HSAs often would call first before going on visits. In the mobile app, it was also

possible for the HSA to store a patient's telephone number and schedule a follow-up appointment. A HSA narrated;

"...especially during the planting season people are in their gardens and if you need to follow-up an expectant mother, you may need to call first. It is often possible not to find them at home hence making the trip for nothing yet our catchment areas are big." (HSA8)

Consultations are made by HSAs with colleagues, supervisors, and health officials. All HSAs had a designated day in the week on which they met to discuss important events, made consultations and received facilitation. Currently with the mobile system, they consulted fellow HSAs and health personnel on what actions to take, reminders for important dates and events. They also received rapid feedback. A HSA narrated this;

"Now we do not have to wait for Monday and Fridays when we meet to make consultations, air out frustrations or comment on something. We can do this with a phone call if you have credit but that is more costly. In our WhatsApp group, we consult with each other in issues we are not sure about. It is fast and efficient to reach someone. Of course now the phone recommends a course of action when you are dealing with a child or expectant mother." (HSA FGD)

For community members, consultations happened at the VC, when the HSA was on a home visit or during community education in a co-located context. Community members often first consulted the HSA prior to visiting the health center. One community member noted the HSA's phone number is written on the wall of the village clinic and anyone could access HSAs anytime. The community developed trust in this 'abstract system' of the phone to access care and get responses to their queries. For the community, this was also an acknowledgement of the roles and position of the HSA as the "village doctor"/"dokitari" that would offer medical assistance to them anytime.

This case also unfolds activities and interactions now subjected to time-space separation that have implications on identity. Like Uganda, home visits, consultations and mobilization activities are afforded across time and space. We also see in both cases that new forms of reporting coexist parallel to old institutionally lodged reporting protocols. However, unlike Uganda, we see more than calls in Malawi where it is possible on their smartphones for HSAs to congregate in a virtual world on WhatsApp to consult and mobilize each other in work.

6.2 Disembedding of Social Relations

6.2.1 In Uganda

This concept relates to taking social relations out of a local context of interaction and restructuring them across other time-space contexts (Giddens, 1991; Carter and Grover, 2015). We discuss such disembedding mechanisms in the context of VHT work.

VHTs explained that their core duty is to prevent disease outbreaks and champion health programs in their communities. This role serves as a point of reference (Thompson and McHugh, 1995) that VHTs collectively identify with (Fearon 1999) and share common values, goals and activities.

"We are all working towards health promotion and sometimes jointly engage in similar activities that cut across our villages. Although our program as CHWs is designed with the ministry of health, we are mostly working together with partner projects that are

promoting health in our communities. We meet together with our VHT coordinators and discuss and plan activities in the communities we are to engage in at a particular time, we meet to discuss how we have performed, and identify areas we can assist each other in conducting health activities..." (VHT coordinator 1)

Upon becoming a VHT, they receive basic training on disease prevention, detection and treatment to manage their everyday work. For the Elimination of Mother to Child Transmission (EMTCT) program for instance, they detect danger signs among infants and expectant mothers. They reported gaining skills from the training to deliver simple treatments and distribute medicines for malaria, diarrhea, pneumonia, and cough to community members. Other work roles include; conducting outreach activities for immunization and sanitation programs, infant monitoring, making home visits, referrals, community education, and counselling. They perform activities either jointly or individually depending on workload but big geographical spans and populations impose heavy workload challenges covering 100 plus households on an average. Overall, VHTs adopted an insider perspective (Lutgen-Sandvik 2008) in discussing their role with reference to the community, and the activities they performed (Alvarez 2008) in communities. They also jointly share knowledge and consult each other, their coordinators and health personnel going back and forth between the field and the catchment area, currently often using their phones to facilitate these interactions.

Community members gave the 'outgroups' perception with respect to VHTs' work and interactions with them (Lutgen-Sandvik 2008). They pointed out that, because of VHTs' training and presence in communities, they serve as the first point of reference for community members to investigate health problems, treat simple cases and also refer patients to health centers. With these roles, the community refers to the VHT as a 'village doctor', a name VHTs also collectively accepted. A community member emphasized;

"The VHT is the first health personnel/ 'doctor' most of us in the community go to when we have health challenges... For instance, when a child is sick, we go to the VHT and s/he will assist us. They will either treat that child or refer us to the health center if they cannot manage. If we have any questions we need to ask, we first go to the VHT because they are doctors that can help us explain so many health concerns in the community". (Community member 1)

On a home visit in Kibaale, Joan (not her real name), a VHT I'm accompanying carries her register and upon arrival to a home is enthusiastically welcomed by the head of the house. I know this because she quickly whispers this to me. 'Doctor' he calls out to her and they both gladly exchange greetings. Joan says, "Today we have company", referring to me and we exchange greetings. He greets us into the house, offering both of us seats and something to eat to which we decline. The VHT and the man talk about the weather and the animals until she tells him what she is here to do, saying: "It is our routine visit, and I want to ask you some questions as usual". She takes the next half hour asking questions referring to her register. After that, I ask if I can talk to our host. I ask why he calls Joan 'doctor' and he responds, "She visits me quite often to check on our health and she is also treating diseases and giving us medicine for cough and flu. A doctor treats people and that is what she does when it is necessary." He finishes his sentence while smiling at Joan.

The ‘village doctor’ work identity constructed by the community is associated with the care roles of VHTs and expectations to serve and educate community members. It is also a portrayal of a trust relationship between the VHT and the community. An example of a home visit by a VHT is depicted below.



Figure 5: A VHT fills out a routine register while on one of the home visits in the community.

This position of the village doctor ascribed to the VHT a sense of social status. A VHT said with a sense of pride:

“The community sees me differently because of this position and they expect much from me. They refer to me as “village doctor” and I try my best to help them with championing health services in my community. Those that are sick I sometimes can treat if it is simple illnesses but I will refer those that I cannot to the health centers. Especially with the EMTCT program, I refer a lot of women to the health center to get professional help but for those that need Antiretroviral Treatment (ART) services, sometimes I go with them to the health facility as a form of support to ensure that they get the drugs”. (VHT member 7)

Work beyond the community: It is 11: 16 am, in a room outside the main health facility building where two health officers are seated behind a desk attending to a man. Outside the door, a long and thick queue stretches with men and women as they wait their turn. In and out they go. 12: 08pm Mary (not her real name) emerges from the room to take a break. She greets me seeing that I have been waiting to have a chat with her. We sit under a tree shade nearby and she tells me today (Wednesday) she works as a volunteer at the health facility mostly weighing children and distributing medicine. She points at the direction of the room she came from, indicating the big numbers of people she serves.

This brief vignette indicates how VHTs’ work roles stretch beyond the community to include emerging programs from the Ministry of Health and of other implementing partners like NGOs. This added to VHT’s collective work identification (Fearon 1999) of ‘health aides’, sometimes with impromptu roles ascribed by superiors.

VHTs acknowledged that their work stems from the official public health structure with them being at the bottom in the community and the Ministry of Health being on top of the hierarchy. This shapes their order and helps structure VHT activities which contour social identity (Hochschild 1997) as health aides. They reported that, for example, in their work, they facilitate community data collection, physically submitted to the HSA coordinator and eventually to the ministry through the health system hierarchy. However, majority of them admitted to not feeling a strong attachment to the Ministry of Health as explained by one VHT below,

“We do not feel like we belong to the ministry of health because they rarely associate with us and do not facilitate us much. We rarely have communication from them but implementing partners visit us, give us training, some transport and motivation. It is not much but it is better than the public service.” (VHT member in FGD)

Other social relations: Besides the work based networks (community, fellow VHTs, Ministry of Health and Implementing Partners), VHTs reported having various extraneous social relations because they inhabit different social worlds and therefore juggle diverse roles and identity choices (Stryker and Burkner 2000). They are parents responsible for providing for their families and because being a VHT is a voluntary service, they also engaged in various other economic activities, such as trading, farming and also riding motorcycle taxis. The work identity of VHTs is held with salience and to stay relevant in their work, they develop work-plans to fit into the different schedules of their social roles in various social worlds.

The Mhealth systems enabled some of these above described interactions to be taken out of a particular local context, and transported into other time-space locales creating disembedded social relations. For example, in mobilizing communities and colleagues for activities like community education, it becomes possible for them to conduct these over the phone without physical interactions as previously done. However, majority of the VHTs reported that this cost them, and coordinators complained that VHTs without phones were not able to work as effectively as their colleagues with phones. However they all emphasized that due to lack of credit, poor electricity and network, physical travel from village to village to pass on information was often still done,

Home visits now involved a phone call to ascertain the presence of the person being visited. Thus these calls disembedded previously held social relations from particular local context into other time-space locales. The mobile system is thus currently relied upon to efficiently organize home visits rather than first making physical visits with uncertainty as previously done. VHT 16 recounted the need to call first before making home visits in order not to waste the trips considering the diverse catchment areas.

Also, consultations with colleagues, supervisors, communities and colleagues currently undertaken on the phone are taken out of a particular local context that was reliant on face to face interactions and transported into other time-space locales creating disembedded social relations. A VHT narrated,

“For example if a parent comes to me worried that their child might be sick, I check them. If I am not sure about something, I will call another VHT or the medical personnel at the health center to consult on what to do. We do not have to necessarily make the trip to the

health facility or another VHT member's home in case I am not certain about what I should do... If it's simple and I need to treat it, I simply just call" (VHT member 9)

The mobiles also prompted some simple health inquiries by communities, sometimes foregoing physical examination and interaction, encouraging the disembedding of social relations. It shows a trust that through the abstract system (mobile phone), simple cases, symptoms and inquiries would be solved from a distance. .

"Some parents sometimes simply call us to make consultations if they have questions. Of course it is important that we examine the patient or child in most cases but some call us to ask questions about what they should do..." (VHT member 5)

In Uganda we mainly see social relations being lifted out of activities like home visits and consultations processes previously defined and structured to occur in physical locales of social interactions. This case indicates a trust in the mobile system to ascertain and arrange home visits without prior physical arrangements and to solve health inquiries in a distanced world.

6.2.2 In Malawi

First we highlight how social relations in their work related networks (community, colleagues, and superiors) were previously conducted mainly in the same physical context, and how these were changing.

HSAs described their everyday work as centered on promoting health activities and preventing disease outbreaks in their communities. Their work activities included treating simple diseases, following-up of patients in communities, immunizing children, drug distribution, growth monitoring of children, referring patients in the communities to the health facility, offering counselling, health education, making reports amongst others. A HSA gave a short description of his work,

"All community members come to me first before they go to the health facility. We have days assigned to the village clinic and that is when the community brings their children for child growth monitoring and adults also come...They also ask questions. But if I cannot treat an illness, I refer them to the health center". (HSA 10)

Notably, local leaders played a key role in integrating HSAs in the context, as narrated by one;

"When I was made a HSA, the chief called a community meeting to inform them of the new HSA that was going to serve the community. During the meeting he told the community that, we have a new "dokitari"³ to help the community with their health concerns...So by the end of the meeting, the chief allocated some free land where the village clinic would be constructed and a hut for me near the village clinic so I wasn't living very far. There were some people that offered to provide materials for constructing the village clinic and others offered labor. It is at the village clinics where everybody comes for inquiries, simple treatments, child immunization among others" (HAS 12)

³ 'Dokitari' is a word used in Malawi to refer to a doctor. In this case, the HSA is also referred to as a doctor but at the village level especially based on his/her roles in treating simple illnesses or being the first point of health reference when one is in need of medical attention.

To the community, the HSA is referred to as ‘Dokitari’ to mean doctor and community members attributed this status to the HSA for the roles and responsibilities they had, such as serving as the first point of contact and treating sick people with simple illnesses, immunizing and giving advice related to health concerns in villages and sometimes at health centers (du Gay 1996).

In conducting their work, it was and is still done individually and sometimes with fellow HSAs and also with the assistance of VHCs. HSAs collectively reported to be identified as ‘Health assistants’ but accepted the doktari identity attributed to their care practices (Alvarez 2008). It helped define activities and ways of working together (Turner et al, 1994) and shaping of intergroup relations (Ashforth and Mael 1989). For example, while HSAs diagnosed, treated and referred patients in communities, VHCs only mobilized community members to come for health services at the VC. There were different roles attributed to different individuals and groups (Ashforth and Mael, 1989). A HSA narrated, *“We are 12 HSAs attached to this health facility. We are divided into 4 blocks. Each block has 3 members and one of them coordinates the block. On days with community activities like child-growth monitoring or immunization at the health facility, we mobilize ourselves with various blocks assisting each other in villages and at the health facility.”* (HSA coordinator 1)

Work beyond the community: All HSAs described being attached to a health facility in the community and recounted that although most of their activities were in the communities, they also had responsibilities that stretched beyond. One HSA described below.

“When you become a HSA, you are attached to a health facility that serves your catchment area. Although we have to spend most of the time in the communities, we also have to work at the health facility. There are numerous activities at the health facility in which we participate. For example, we assist the health personnel to give tetanus vaccinations to expectant mothers, distribution of TB drugs, weighing children when they are brought to the health facility and distribution of condoms among others”. (HSA 2)

All HSAs reported that they are the lowest health personnel employed by the Ministry of Health, and upon recruitment they are attached to health facilities where they get training and supervision. This position created notions of order and structured activities (Hochschild 1997) that shaped HSAs’ work identity. At health facilities, HSAs take on more health assistant roles to medical professionals which reinforce a health assistant identity. While in the communities, they take on more ‘doctor-like’ roles of care. An indication that the social worlds they occupy in their work shape the way they are perceived by out-groups and also the way they perceive of themselves (Brown 2007; Tajfel and Turner, 1985). HSAs at health facilities divide each other into groups referred to as blocks, each with a ‘block coordinator’ who mobilizes activities. As one block worked at the health facility, another was out in the field serving its catchment area. The different blocks alternated between working at the health facility and in their respective catchment areas. They also agreed on a day for all HSAs to meet to plan the week’s activities at the health facility and in the communities designating roles to individuals and period of work performance.

Other social relations: HSAs reported having other social roles other than their health positions in the community. Most of them were parents with family roles and responsibilities. All of them noted that they were reliant on their monthly salaries from the Ministry of Health and so do not have to engage in other extra economic activities. Although these networks indicated HSAs occupying various social worlds and therefore liable to having various roles and identity choices (Stryker and Burker 2000), HSAs indicated to organize their identities in accordance to the most important (Stein et al, 2013) and one that offers stability (Thompson and McHugh, 1995, Oakes and Turner, 1986) through work related financial security, employment, social status, and expectations of the community and work.. Even those that confessed to carrying out some small scale farming with their families for food security, being a HSA came first.

The mobile system lifted some aspects of the social relations and separated interactions from the particularities of locales. For example, monitoring activities previously dependent on monthly paper reports physically delivered to the HSAs coordinator now involved superior's constant surveillance of daily activity data captured in the organizations' database. This took social relations linked with monitoring from the local contexts of a physical monthly report and rearticulated them across unlimited tracts of time-space locales stretching from the community to the national ministry. Supervisors trusted the mobile system to access precise and immediate data accounting for work done in the field without any physical interactions or field visits and waiting for monthly reports as previously needed and structured.

For HSAs, decision-making and providing care to expectant mothers and infants was now entirely supported by the mobile system replacing previously existing paper protocols. HSAs not only trusted the system to aid quick and efficient decision-making but depended on it for developing precise courses of action outlining whether to treat or refer patients to health facilities. HSAs currently base their diagnosis on recommendations generated by the system replacing to some extent the use of tacit knowledge gained from prior experiences of providing care.

Also in their work, HSAs previously relied on VHCs to mobilize communities for health events in their large catchment areas. Sometimes HSAs do not entirely rely on physical meetings with VHCs on predefined days but mobilize and coordinate events with VHCs over the phone. Hence lifting these previously physically coordinated events into time-space locales where the mobile phone is considered as a fast and efficient tool in relaying information to mobilize events.

In addition, some consultations with colleagues, health personnel and the community are also currently taken out of their physical local contexts with the use of the mobile system. For instance, all HSAs reported belonging to a WhatsApp group in which they shared retrospectives and made inquiries with others in the user group. The WhatsApp group replaced to a large extent the weekly meetings previously held for the same purpose at health facilities. In this disembedded and distanced world of social relations, HSAs created a platform to share, invoke, and express concerns, experiences, inquiries etc. while in the field without waiting for the predetermined meeting day in the week. Weekly meetings still continue to be held for planning HSA activities but to a certain extent they are re-purposed as compared to earlier as they discuss issues already raised electronically.

For the community, members noted that, the HSA is often consulted first before going to the health center. A community member noted that the HSA's phone number is written on the wall of the village clinic and anyone could access them anytime. The community developed a trust in this 'abstract system' to get a fast response to their consultations with health personnel across time-space contexts and at any time.

This case also presents disembedded social relations from the particularities of locales. Monitoring, mobilizing and community consultations are lifted into time space locales. The mobile system replaced existing paper protocols while the WhatsApp group also took consultations amongst colleagues into different time-space contexts. The case in Uganda also presents some similar findings in organizing home visits and consultations although in Malawi, there appears to exist more disembedded relations. The mobile system in Malawi could afford HSAs to convene in a virtual world on WhatsApp to consult each other and also use the mobile system protocols while treating patients which was impossible with the non-smart phones in Uganda.

6.3 Reflexive ordering and reordering of social relations

6.3.1 In Uganda

Giddens (1991) uses this feature to link identity to other concepts in modernity. He notes that as individuals reflect on the changes they experience in their everyday life, they tend to reflexively revise and redefine the self. Examples of 'time-space distancing' and 'disembedding of social relations' noted provide the impetus for this process of reflexive reordering. Through time-space distancing, there are different feelings evoked as the mobile systems contribute to work shifts.

For instance, the stretching of consultations, mobilization and coordination activities over time and space evoked feelings of work competence and efficiency through the fast and efficient conduct of activities without being in the same physical context as previously done. For VHTs this presented convenience and efficiency in work. At the same time, groups of VHTs reflexively considered a growing sense of work efficiency at mobilizing activities dislodged from physical contexts into time-space locales. Still through time-space distancing, for some VHTs, SMS data reporting created agitation, anxiety due to increased work load prompting them (e.g. VHT8) to reflexively define their work terms and deemed themselves deserving of extra payment. Some VHTs (eg VHT 15) expressed enthusiasm through the perceived increased efficiency and competence related to reporting the two indicators. We give two more examples (feedback and interventions) that drove VHTs' enthusiasm;

VHTs reported receiving feedback on their phones enhanced through SMS reporting. Although feedback wasn't particularly on reported data, it included notifications confirming data receipt and reminders to send data. Most VHTs described this data exchange as a reflection of their work and position in communities being better acknowledged by their superiors and raising feelings of work affirmation and appreciation.

“When we send SMS data, we get a notification saying that data is received although they do not send us the information from the data we have reported...When you don't send data, there is a reminder. As for the paper forms, we send them but do not hear back anything ...” (VHT 12)

SMS reporting was also reported by all VHTs to spark off various actions to address maternal and child mortality. A more pronounced outcome from these reports see the VHT take center stage in developing plans together with implementing partners to develop interventions. As Alvarez (2008), Walsham (1998) and Nach (2009) have noted that work alterations result in work identity redefinitions so did this shift in work prompt groups of VHTs to reflexively redefine their work identity. They viewed themselves with a growing sense of medical competence and professionalism in light of the new knowledge base on which actions to address infant and maternal health were currently based. A VHT coordinator narrates;

“When we send data into the DHIS2 database indicating maternal or infant mortality cases, the implementing partners quickly come down to the community, work together with the VHTs to investigate the cause of an infant death for instance. Usually the family will be counselled but this does not only end in the family. The whole community is called together for a meeting so that they are educated on how to prevent particular complications and deaths among expectant women and infants”. (VHT coordinator 2)

It was reported that programs emerged to address challenges after SMS reporting. For instance; the provision of pregnancy kits to expectant mothers, community sensitizations to address common challenges such as delivering at home instead of getting professional assistance in health facilities, and the provision of motorcycle ambulances used in times of emergencies. VHTs reported these actions were an indication of their rising competence and their efficiency to tackle real issues and doing exactly what they are designated to do. Most expressed feelings of affirmation of their positions in the communities.

“... It is important that we do not just send data because we do not really understand where it goes but what is important is that we make use of it to prevent health challenges in our communities. Even the community now sees that we are doing our work and we are not idle” (VHT 18)

It can be claimed that the position of the VHT was strengthened and affirmed in the community as they took on more “doctor” based roles representing them as knowledgeable, skilled and competent. In this way, the mobile phones also become a ‘symbol’ of expression of work identity.

On the other hand, disembedded social relations increased VHTs’ accessibility for their communities’ and colleagues’ consultations and inquiries at all times creating feelings of efficiency in work. Similarly dislodged home visits and follow-up on simple cases in time-space locales created convenience. However, it also generated anxiety among some VHTs who saw it as an invasion into personal time as their work stretched to anytime and anywhere and a radical increase in workload.

Overall in Uganda, challenges of poor network, limited phone credit, lack of electricity, poor quality or lack of phones for some VHTs were cited as limiting mobile phone usage. This implied that VHTs went back and forth between the new and the old depending on circumstances. It also meant that phone enabled activities were interrupted hence slowing potential avenues for reflexivity. This constraint was often addressed by VHTs borrowing phones from neighbors or relatives and paying to charge phone batteries to continue benefiting from mobile phone use.

6.3.1 In Malawi

The examples cited in the case associated with time-space distancing and disembodied social relations did give rise to some reflections of HSAs work and work identities as we describe below.

In their work, HSAs noted that reporting over time and space emerged with the mobile system and paper data capturing while out in the field was substituted with mobile phone data capturing because the system supported faster and 'better' decisions while seeing infants and expectant mothers. HSAs reported feelings of greater competence and professionalism which were not possible before. On the flip side, HSAs raised concern for an increased workload on daily data entry in both the phone and paper forms (still institutionally used) reflexively revising their terms of work. A HSA described this below:

"The phone is fast and recommends solutions when checking for danger signs with a pregnant woman for instance. It even suggests what course of action to take hence making us more competent and 'professional' in our work. So we often use it when we go to the field. But then we come back and copy data from the phones into paper forms because we have to send paper reports to the health facility...it is a lot of work". (HSA 1)

Although they all noted the workload from mobile reporting as it now involved data entry, other work related use such as consultations were enabled. However, some HSAs complained that the airtime was still very low but interestingly they went ahead to incur personal costs in order to maintain communication and conduct data entry with their phones. Some HSAs complained about the small size screens of the phones and suggested the use of tablets with bigger screens. As we shall elaborate further, work shifts resulting in fast, competent and professional related work may help to understand the growing levels of commitment and efforts to use the mobile systems regardless of challenges.

Another work concerned the manner in which the phone enabled to an extent for social relations to be extended beyond monitoring activities as supervisors are on a daily basis updated on the amount of work done by HSAs in the field. Consequently, as HSAs reflected on this, it created anxiety and a conception of an ever watchful eye of the superiors and therefore making them to work more and also find ingenious ways to exhibit more visibility of their work as health assistants in the field. A HSA narrates below;

"Before some people could afford to be lazy but now all the data you enter immediately goes into the organization's database and then they can see if you are working or not. Now we actually work more because you know they are watching you with the daily data entry unlike with the monthly paper reports". (HSA 4)

The mobile phone data capturing replaced paper protocols as an abstract system during the provision of maternal and infant health care services. It also replaced tacit knowledge and knowledge drawn from experiences while at the same time offering precise courses of action. Notably in light of this, reflections from HSAs portrayed feelings of becoming more professional and more 'dokitari' like thus reinforcing the sense of self. This was mainly attributed to the precise assessment made by the phone based on entered data to generate a decision on whether to treat and how to treat, or to refer serious cases to a health facility. A HSA narrates,

“This system is improving the way we work. Before we had to go back and forth through paper forms to ask questions or make a decision and sometimes we forgot to ask some questions. That in one way or another affected our decisions. Now we are efficient to decide if we can make a treatment or refer an individual to a health facility.” (HSA FGD)

Also with the system replacing paper use while seeing patients, community members reported HSAs as knowledgeable about their work. The status of the HSA was strengthened in the community as they took on more “doctor” based roles representing them as more knowledgeable, skilled and competent.

“The ‘dokitari’ [‘village doctor’] knows what they are doing. They put our names in their computers [referring to the smart phone] and then they treat us. So the next time I come back, they will know me because the computer already knows me”. (Community member 1)

This is an identity that HSAs collectively accepted in the communities and its reinforcement with the mobile system use.

In addition, activities like home visits and mobilization of communities enabled time and space over the phone and social relations were disembedded and taken to time-space locales. For instance relying on the phone to pass on information about how and when VHCs should mobilize communities for various activities. HSAs described this as creating ease, speed, convenience, efficiency and competence in their work as health assistants and dokitari to the people in their large catchment areas.

Another event that has been stretched across time and space is consultations conducted over the phones. And as noted, also led to a disembedded and distanced world of social relations to occur in the WhatsApp group instead of HSAs having to wait for weekly meetings to articulate their concerns. In reflection of this HSAs cited becoming more efficient in their work and competent in addressing challenging situations while far from health facilities. Being accessible at all times to colleagues and community members for consultations created both feelings of convenience and the ability to do their work and help out in times of emergencies especially at night, some HSAs also recounted it as an inconvenience in their personal time. As one HSA reported;

“...when they call, you can solve it over the phone if it is a simple issue. Sometimes if it is for instance a sick child at night and you are called, you might recommend they do something for the fever to go down until you are able to see them in the morning”. (HSA 2)

For the community, reaching the village doctor become more convenient as the HSA is the first point of reference before going to the health facility. One community member said that the HSA’s phone number is written on the wall of the village clinic and anyone could access them anytime. The community built trust around this ‘abstract system’ due to the ability to reach health assistance anytime and anywhere acknowledging the ‘dokitari’ roles.

This analysis has highlighted important aspects in HSAs work that resulted in reflexive processes. Activities stretched over time and space and resulting disembedded relations all created mostly enthusiasm but also some agitation. The case was similar for Uganda although reflexivity was quite limited by infrastructural challenges.

6.4 Summary of Both Cases

In both case analyses, we discussed the work activities and various networks that CHWs previously and still are a part of. Like Whyte (1956), du Gay (1996) and later Brown (2007) note these contexts of work help build identities. In both cases we see the community and local leaders playing a crucial role of a 'village-doctor'. The formal system created an image of a health assistant to reach services in communities although, HSAs in Malawi were more attached to the Ministry of Health due to direct employment while this attachment dwindled in Uganda where VHTs were volunteers and had more limited contact with the Ministry of Health.

We also note the growth of work shifts with mHealth system use in the work of CHWs that Alvarez (2008), Walsham (1998) and Nach (2009) have all related to identity redefinitions. Work shifts associated with mobile phone use and aligned with the concepts of time-space distancing and disembedding of social relations have depicted reflexive tendencies as Giddens (1991) notes. As they occurred, there was a continuous 'to and froing' (X, 2007) across different domains and relationships which served as a constant source for the CHWs to reflexively monitor their identity and to transition based on emerging work formats. There were no major contradictions or constraints arising although we identified anxiety from the 'to and froing'. Our findings resonate with arguments made by Lamb and Davidson (2005) of the positive implications of technology on identity as CHWs perceived of mobile systems use to contribute to a growing sense of professionalism which was not experienced before. Phone diagnosis in Malawi gave a HSA a sense of a competent and efficient health worker giving professional health recommendations. The VHT in Uganda also developed a sense of a professional, competent and efficient health worker providing maternal and infant health services based on real data. Experience with mHealth systems show work relations and activities enabled through technology helped improve work practices of CHWs and enhanced feelings of being skilled, knowledgeable, and competent with a growing sense of professionalism (Fournier, 1999).

Notably although there were numerous phone enabled activities over time and space and with some social relations lifted out of local contexts, reflexivity was largely hampered by infrastructural challenges. Institutional reporting formats also remained. Work transformations were not complete and remained interrupted hence less dramatic. It was notably lower in Uganda where VHTs had simpler phones, lesser significant use and had fewer alternatives to electricity and financial challenges which also inhibited use.

Interestingly as we conducted our analysis, we noted that most IS studies have focused on the notion of professional identity in professional domains which may deemphasize the implications of technology in non-professional work contexts. Our focus is broader embedded in the context of work. Ostensibly, as the shifts in work appear, and expressions of professionalism grow, so does the commitment towards continued mobile phone use in work. The importance of the CHW position in the community has made them uphold their work and the positive role of MHealth systems.

7. Discussion: Implications for Theory and Practice

7.1 Theory

The study posed the research question of- How does the mediation of ICTs, influence the interaction between identity and work of CHWs in developing country contexts? In answering this question, we have drawn upon Giddens' theory of modernity, especially the three characteristics that have been elaborated. We start with summarizing in the table below the key aspects of identity that we interpret as being associated with the identity characteristics.

Table 3: A summary of the theoretical Findings

Element of Modernity	Implication on identity
Time-Space	<ul style="list-style-type: none"> -Competence- enhanced in Malawi not to the same extent in Uganda -Anxiety and agitation from double reporting with the demand of being “always accessible”, Seen more in Uganda than Malawi -Increased need to express work visibility due to increased surveillance in Malawi -Sense of work efficiency enhanced in Malawi and to a lesser extent in Uganda while consulting, coordinating and mobilizing activities
Disembedded Social relations	<ul style="list-style-type: none"> -Effectiveness and efficiency in mobilizing and coordinating activities enhanced in both Uganda and Malawi. A greater sense of collective action. -Enhancement of status as “dokitari” in the community both Malawi and Uganda - Anxiety arising from sense of virtual surveillance and work visibility in Malawi -Care protocols inscribed in phone and disembedded across time and space enhanced knowledgeability. -Growth in sense of collectiveness through the WhatsApp group in Malawi
Reflexive ordering	<ul style="list-style-type: none"> -In both cases, reflexive feelings of enhanced workload experienced -Feedback messages by supervisors, provided a sense of visibility of work, which previously tended to be hidden -Anxiety and agitation from being accessible all the time and everywhere in both cases -In Uganda, VHTs see themselves as deserving of additional pay because of extra mobile related work -Expressions of Knowledge in Malawi during patient interactions and in Uganda during data based action planning Over all growing sense of work competence and professionalism in ‘doctor-like roles’ more in Malawi than Uganda

As the table demonstrates, the introduction of Mhealth systems into the world of CHW work has significant implications on identity. These implications are in the form of

enhanced sense of status of competence, the reinforced perceptions of the community of the CHWs as “dokitari”, a greater sense of collectivity enabled through WhatsApp and increased visibility of work, which was seen positively by some, and negatively by others. However, there are also negative implications with feelings of anxiety, overload of work, frustration from being required to be accessible at all times also becoming rampant. We also see the implications are different in the two countries. While in Malawi, the HSAs are salaried by the Ministry and have been given smart phones, in Uganda that is not the case, as the CHWs are voluntary and also do not have smart phones. So, many things possible in Malawi (like WhatsApp based messaging) through the smart phones are not possible in Uganda, with varying implications on identity. In both cases, there are infrastructure bottlenecks like poor internet coverage, interrupted power supply and long distances have direct implications on how central the mobile can become in the everyday work of health workers. This also contributes to uneven implications on identity within and across countries.

The contexts of our cases are extremely dynamic (Giddens, 1991) challenging our understandings of modernity, Giddens asserts that in light of changes, individuals become reflexive. However in our cases, due to various technical and institutional challenges, this reflexivity is highly constrained and varied. This deters the unfolding of work shifts and reflexive processes with implications on identity. Even with the onset of work shifts, they are not consistent in both cases, and CHWs go back and forth between the new and the old. For example in Uganda where VHTs relied on their own credit top up, and had poor quality phones with severe electricity outages, they had to still use word of mouth and physical visits to mobilize activities. They spent little amount of time in using mobiles, with limited implications on work and identify shifts. On the other hand, in Malawi where active mobile usage was enabled, the phone adoption was seen to replace some reporting practices and there were arguably larger implications on work identity.

Studies that have explored the dynamics of technology with work-related identity of users (Walsham, 1998; Lamb and Davidson, 2005; Zuboff, 1998), have largely focused on Western contexts, where conditions to use ICTs were enhanced. However in the developing world, network connections, power supply and the quality of information systems implemented in work can be challenging hence limiting all-time use and implications on work and identity. As activities continue like previously, implications are necessarily constrained.

7.2 Practical Implication

The study holds managerial implications for both academic and work organizations in guiding management of technological change among CHWs. Despite enormous amounts of research on information systems and professional and work identity, less is known about the case of CHWs that are a key to the provision of primary health care in developing contexts. The aspects of change that are associated with the use of mHealth systems have drawn a link with their work identities as they mostly align well with their work. Perhaps one of the more interesting findings of this study is that while the mobile phone assisted faster coordination, collaboration, mobilization and decision-support for CHWs, the increased efficiency and competence created a growth of professionalism in work amongst CHWs and a commitment to use the systems. This articulated work identity shifts, but we also noted some agitation. The findings can be crucial for

addressing issues related to the management of CHWs in light of technology introduction, design and use relevant to their work practice.

8. Conclusion

Literature on identity is rich and varied and we draw on this richness and variety to extend theory on understanding how CHWs identify with their work practice and unfold work-identity that we link to shifts in work upon mHealth systems introduction. Our findings show that CHWs work-identity is intertwined in their work activities and in work related relations such as, the community and institutional structures. It is this context that has given them a basis for the description of their work identity based on inside and outside perceptions. As mHealth systems were introduced in their work, work alterations emerged such as in the way CHWs collaborated, coordinated and mobilized work activities. These prompted feelings of competence and efficiency associated with a growing sense of individual and group professionalism. It shows that technology use that supports and develops existing work practices, reinforces and builds work identities. However, increased reporting created concerns of workload and undermined work identity especially where some CHWs felt that their terms of work were no longer clearly understood. Our findings contribute to the extensive literature on identity in IS studies as we urge for an arena to exploring other forms of work identities besides professional identity for instance considering that technology continues to be immersed in several work practices.

8. References

- Ashforth, B. and Mael, F. (1989). Social identity theory and the organization. *Academy of Management Review*, 14(1), 20-39.
- Brown, A., Kirpal, S., Rauner, F. (2007). *Identities at Work*, The Netherlands, Springer.
- Busiku, S. R. (2014.) *Community Health Workers and mHealth: Health Systems Strengthening Approaches in Uganda*. Retrieved from <http://www.ict4dconference.org/wp-content/themes/cfl/ict4d-archive/files/2014/community-health-workers-and-mhealth-health-systems-strengthening-approaches.pdf>
- Carter, M. and Grover, V. (2015). Me, My Self and I(T): Conceptualizing Information Technology (IT) Identity and its Implications, *MIS Quarterly*, 39(4), 931-958 .
- Castells, M. (1997) *The Information Age, Economy, Society and Culture: The Power of Identity*, Malden, USA: Blackwell Publishers.
- Collin, K. (2009) *Work-related Identity in Individual and Social Learning at Work*, *Journal of Workplace Learning*, 21(1), 23-35.
- D'Mello, M. (2006) *Understanding Selves and Identities of Information Technology Professionals: A Case Study from India, Oslo, Norway: University of Oslo*.
- X
- du Gay, P. (1996) *Consumption and Identity at Work*, New Delhi, India, Sage Publications.
- Ellway, W.P.B. and Walsham, G. (2015). A Doxa-Informed Practice Analysis: Reflexivity and representations, *Technology and Action, Information Systems Journal*, 25 (133), 133-160.
- Fearon, D.J. (1999). *What is Identity (As we now Use the Word)?*, CA, USA: University of Stanford.
- Giddens, A. (1991). *Modernity and Self-Identity*, Stanford, CA: Stanford University Press.
- Hochschild, A. (1997). *The Time Bind: When Work Becomes Home and Home Becomes Work*. New York, Metropolitan Book (Henry Holt &Company).
- Ibarra, Herminia (1999). Provisional Selves: Experimenting with Image and Identity in Professional Adaptation, *Administrative Science Quarterly*, 44 (5), 764–91.

- Joos, O., Silva, R., Amousou, A., Moulton, H.L., Perin, J., Bryce, J. Mullany, C.L. (2016). Evaluation of a mHealth Data Quality Intervention to Improve Documentation of Pregnancy Outcomes by Health Surveillance Assistants in Malawi: A Cluster Randomized Trial. *PLoS One*, 11(1): e0145238. doi: 10.1371/journal.pone.0145238
- Källander, K., Tibenderana, K.J., Akpogheneta, J.O., Strachan, L. Hill, Z., Asbroek, A.H.A., Conteh, L., Kirkwood, R.B. and Meek, R.S (2013). Mobile Health (mHealth) Approaches and Lessons for Increased Performance and Retention of Community Health Workers in Low- and Middle-Income Countries: A Review, *Journal of Medical Internet Research*, 15(1) :e17. doi: 10.2196/jmir.2130
- Kirpal, S. (2004). Researching Work Identities in a European Context, *Career Development International*, 9(3),199-221.
- Klein, K. H. and Myers, D. M. (1999). A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems, *MIS Quarterly*, 23(1), 67-94.
- Kok, C.M. and Muula, S.A. (2013). Motivation and Job Satisfaction of Health Surveillance Assistants in Mwanza, Malawi: An Explorative Study, *Malawi Medical Journal*, 25(1), 5-11
- Lamb, R. and Davidson, E. (2005). Information and Communication Technology Challenges to Scientific Professional Identity, *The Information Society: An International Journal*, 21(1), 1-25.
- Lamb, R. and Kling, R. (2003). Reconceptualizing Users as Social Actors in Information Systems Research, *MIS Quarterly*, 27(2), 197-235.
- Lee, Y., Lee, J. and Lee, Z. (2006). Social Influence on Technology Acceptance Behavior: Self-Identity Theory Perspective, *The DATA BASE for Advances in Information Systems* 37(2-3), 60-75.
- Ludwick, T., Brenner, L.J., Kyomuhangi, T., Wotton, A.K., and Kabakyenga, K.J. (2013). Poor Retention does not have to be the rule: Retention of Volunteer Community Health Workers in Uganda, *Health Policy and Planning*, PubMed, 29(3), 388–395. doi: 10.1093/heapol/czt025.
- Lutgen-Sandvik, P. (2008). Intensive Remedial Identity Work: Responses to Workplace Bullying Trauma and Stigmatization, *Organization*, 15(1), 97-119.
- Malaria consortium (2013). Increasing Access to Antimalarial drugs in Uganda, *Second Annual Review*, 2013.
- Margolis, L.S. and Hansen, D. C. (2002). A Model for Organizational Identity: Exploring the Path to Sustainability during Change, *Human Resource Development Review*, 1(3), 277-303.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis*. Beverly Hills, CA: Sage.
- Ministry of Health Malawi and ICF International (2014). *Malawi Service Provision Assessment (MSPA) 2013-14*. Lilongwe, Malawi, and Rockville, Maryland, USA: MoH and ICF International. Retrieved from [https://dhsprogram.com/pubs/pdf/SPA20/SPA20\[Oct-7-2015\].pdf](https://dhsprogram.com/pubs/pdf/SPA20/SPA20[Oct-7-2015].pdf)
- Mishra, K.S.T.G. (2016). Professional Identity Construction among Software Engineering Students: A Study in India, *Information Technology and People*, 29(1), 1-41.
- Mwagale, S. and Kakaire, F. (2010). *Mobile Health Projects in Uganda- Narrative Report*, Malaria Consortium. Retrieved from <http://www.malariaconsortium.org/inscale/local/downloads/1206-mhealth-projects-in-uganda.pdf>
- Nach, H. and Lejeune, A. (2009). A Model of Individual Coping with Information Technology Challenges to Identity, *Americas Conference on Information Systems (AMCIS) 2009 Proceedings*, Paper 174. Retrieved from <http://aisel.aisnet.org/amcis2009/174>
- Nach, H. (2011). Who do you think I am? An Analysis of the IT Professional Self-Identity. In Earing, M., (Ed), *Social Identity* (pp. 109-127). Nova Science Publishers

Orlikowski, J. W. and Gash, C. D. (1994). Technological Frames: Making Sens of Information Technology in Organizations, *ACM Transactions on Information Systems*, 12(12), 174-207.

Orlikowski, J. W. (2000). Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations, *Organization Science*, 11(4), 404-428

X

Schultze, U. (2014). Performing Embodied Identity in Virtual Worlds, *European Journal of Information Systems*, 23(1), 84-95.

Sen, A. (1998). Reason before Identity: The Romanes Lecture for 1998, Oxford University Press.

Stein, M., Galliers, D.R. and Markus, L.M. (2013). Towards an Understanding of Identity and Technology in the Workplace, *Journal of Information Systems*, 28(3), 167-182.

Stryker, S. and Burke, J. P. (2000). The Past, Present and Future of an Identity Theory, *Social Psychology Quarterly*, 63(4), 284-297.

Tajfel, H. (1981). *Human Groups and Social Categories*, Cambridge, UK, Cambridge University Press.

Thompson, P. and McHugh, D. (1995). *Work Organizations: A Critical Introduction*, London, UK, MacMillan Press.

Tripsas, M. (2009). Technology, Identity and Inertia Through the Lens of “The Digital Photography Company”, *Organization Science*, 20(2):441-460

Turinawe, B. E., Rwemisisi, T.J., Musinguzi, K.L., de Groot, M., Muhangi, D., de Vries, H.D., Mafigir, K.D. and Pool, R. (2015). Selection and Performance of Village Health Teams (VHTs) in Uganda: Lesson from the Natural Helper Model of Health Promotion, *Human Resource for Health*, 13(73)1-11, DOI 10.1186/s12960-015-0074-7.

United Nations, Ideal Development Consults Ltd, PathFinder International and Ministry of Health Uganda (2015). National Village Health Teams (VHT) Assessment in Uganda, Kampala, Uganda, Ministry of Health Uganda. Retrieved from <http://www.pathfinder.org/publications-tools/pdfs/VHT-Report-with-District-Analyses-1.pdf>

Urry, J. (2007). *Mobilities*, Cambridge, UK, Polity Press.

Weick, K.E.(1995) *Sensemaking in Organizations*, Thousand Oaks. CA: Sage

Walsham, G. (1998). IT and Changing Professional Identity: Micro-Studies and Macro-Theory, *Journal of American Society for Information Science*, 49(12), 1081-1089

World Health Organization (WHO) (2007) *Community Health Workers: What do we know about them? The State of the Evidence on Programs, Activities, Costs and Impact on Health Outcomes of Using Community Health Workers, Evidence and Information for Policy*, Geneva, Switzerland, Department of Human Resources for Health.

World Health Organization (2014) *Malawi: Country Cooperation Strategy at a Glance*. Retrieved from http://www.who.int/countryfocus/cooperation_strategy/ccsbrief_mwi_en.pdf