

# Challenges in Participation and Implications on Human Development: Experiences from Health Information Systems Implementations in Tanzania and Malawi

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## ABSTRACT

In this paper, we present our empirical insights from Tanzania and Malawi by showing the challenges of participation and we provide implications which can be used to enhance human development in the health sector. Our empirical material is drawn from the Health Information Systems Project which is a global south-north network aiming at improving the use and management of health data in developing countries. Our focus is on the interaction between software implementers, end users and global open source software developers. Our study indicates participatory challenges which are related to the difficulties in identifying users, limited health domain knowledge among some of the expected end-users and software implementers; and limited participation arising due to local-global differences. We argue that for human development to occur through the use of open source software, participation skills in the design, development and use of open source software need to be enhanced through capacity development of end-users and software implementers.

## Author Keywords

Distributed Participatory Design; Implementation Mediators; HISP; Health information Systems, Developing Country, Open Source Software.

## ACM Classification Keywords

D.2.10: Design, methodologies, human factors, H.5.m: Participatory design.

## INTRODUCTION

The term ICT4D (Information and Communication Technologies for Development) refers to the opportunities for using Information and Communication Technologies as an agent of development (Heeks, 2008). For example, ICT4D practitioners use technology to help alleviate problems arising from climate change, poverty, disease and resource depletion in developing countries. Human development is a process which is participative and empowering; and in order for people to use IT, they need to be empowered through ICT and participation skills (Hamel, 2010). One way of empowering people so that ICT can be

used effectively is by using participatory design approaches.

Participatory Design (PD) represents an approach towards computer-based systems development whereby future users of the system play a critical role in designing it (Schuler and Namioka 1993, Bjercknes and Bratteteig 1995). User involvement in the design have potential benefits of improving the knowledge upon which objectives and procedures are built; and increasing workplace democracy by giving end user the right to participate in the decisions that will affect their work practices (Gregory, 2003). There are diverse participatory design methods and techniques to foster user involvement including, design by doing, mock up envisioning, future workshops, organizational games, cooperative prototyping, ethnographic field research and democratic dialogue (Gregory, 2003).

In this paper we present our empirical insights, from Tanzania and Malawi, on the challenges of participation, and we provide implications which can be used to enhance human development in the health sector. Our empirical material is drawn from the Health Information Systems Project (HISP) which is a global south-north network aiming at improving the use and management of health data in developing countries. HISP have developed free and open source software, known as District Health Information Software (DHIS), which can be used to manage health data at different levels of the health care system. It is widely acknowledged that open source software offers the possibility of acquiring new software in a cheap and quick way. This is viable solution for developing countries which are faced with the problem of resource scarcity. To be a tool for development, open source software needs to be customized and end-users trained on how to use it.

We present a case which examines the interaction between health workers, local software implementers and global OSS developers in order to provide implications for human development. The local implementers act as mediators who link developers at global level and local users in the health sector, such as health workers (Titlestad et al., 2009). Mediators are crucial stakeholders in facilitating PD in the global software development activities. Both Puri et al. (2009) and Titlestad et al. (2009) assert that, in distributed participatory design approaches, implementation mediators'

roles are crucial to enable participation at local levels and to make interventions at global level. The implementation mediators' role in PD projects is reinforced by Braa and Sahay (2012, p. 247) who emphasize that whether the design is considered to be participatory or not 'will depend on how implementers mediate requirements between users and core developers'.

## RESEARCH APPROACH

HISP is the setting of the study with its development of the DHIS2. HISP is focused on designing, implementing, and sustaining health information systems following a participatory approach to support local management of health care delivery (HISP 2013). The development of the DHIS 2 platform is coordinated by HISP at the University of Oslo. DHIS Tracker is a module within the DHIS 2 platform that is focused on managing patients' data for health programs. The development of DHIS Tracker is a result of the efforts of both global and local developers/designers. DHIS Tracker's core functionality is developed by programmers at University of Oslo and others who are distributed in various countries. In individual countries, local designers/developers customize the software to create different health programs and define information attributes to be recorded at each encounter.

We use the case of DHIS Tracker implementation in maternal and child health care in the two countries. In Tanzania, the study was conducted between August 2011 and December 2013 and DHIS Tracker system was implemented for maternal and child health in two health facilities in a rural district. An ethnographic approach was employed to understand the work practice with an aim to inform the design of the DHIS Tracker Module. 33 and 17 participant observation sessions, respectively, were conducted together with focus group discussions with health workers after the implementation of the system. Training was conducted to both facility and community health workers. There were also interactions with software developers and coordinators working for HISP at the University of Oslo where informal interviews were conducted. We used PD approaches like reflection and prototyping to influence the DHIS Tracker design. We have also participated in mailing list, group discussion and workshops which also have influenced our understanding and change of DHIS tracker.

In Malawi, the customization effort began in July 2010 following a situation analysis that was conducted to identify information requirements for maternal health. This analysis involved interviewing health workers in 19 health facilities and managers at district and national level in order to gain an understanding of maternal and child health work practices and data requirements. Based on the findings, we began customization of the DHIS Tracker to fit the local maternal health work practices. One rural health center was selected for implementation of the system. During the customization process, additional visits to the planned

implementation site were conducted to verifying the requirements. This was done through additional interviews on the existing work practices, reflective discussions on the planned implementation and observations of service provision. Later on, the customized software was demonstrated and tested by expected users at the planned implementation site, mainly to evaluate the interface designs. After further customization, training of the expected users was conducted over a period of 5 days at the health center. The training consisted of 'theoretical' sessions where a general introduction to computers, Electronic Medical Records and the DHIS was provided. The other sessions were practical whereby the health workers were guided on how to use the system. Customization and software installations continued after the training and the system was deployed for use at the health center in November 2012. This was then followed by support visits that allowed initial evaluation of the system in use. An evaluation of the use of the system was conducted in July 2013 by interviewing the health workers and observing service provision.

## EMPIRICAL INSIGHTS

The ultimate goal of PD is for users and designers to work as full partners in design processes whereby users take part in all types of decisions (Bratteteig and Wagner, 2012; Robertson and Simonsen, 2012). However, a number of challenges were encountered in our cases.

The settings of developing countries in Africa poses challenges due to lack of resources which can be used to improve participation of people. For instance, lack of computers and skills among health workers pose challenges for participation (Kimaro and Titlestad 2008); however, implementation mediators need to determine how maximum participation can still happen on the ground. Therefore, the question arises how can maximum participation occur regardless of lack of computers or skills and other resources which will enhance participation? Karasti (2001) illustrates how mutual understanding between designers and users was acquired through the use of video collages in the participatory design activities during the development of a teleradiology system. However, in the context of Tanzania, the use of video collage could have cost implications and may be time consuming, which is not feasible with health service provision. Mediators needed to focus on how they had to make users participate and influence the design of the new system. For example, in Tanzania, users were made to reflect on DHIS Tracker practices based on their understanding of their own practices where simulation of their daily practices was done; by comparing users' actual practices and digital practices in order to facilitate dialogue during focus group discussions.

Another challenge encountered was difficulty in identifying which users should participate. For example, in Malawi, some of the expected end-users were health workers that

were not involved in provision of maternal health services in the existing work practices. These health workers were brought in at a later stage, in planning for the training. Thus, the health workers participated in the training; however, they were unable to effectively participate in other areas such as defining the data requirements. A similar challenge in identifying users was faced in Tanzania whereby the need to involve additional people was realized later after the mediators' knowledge of practices increased, and we noted that there were other people who participated in maternal and child health care work practice. The boundaries were expanded to connect other people by seeking views about the design of child-based system from the community members. More interviews with community leaders and also demonstration of the system were done to them. Thus, in both cases, the user groups co-evolved with the progress of the project and more people had to be involved.

There is also a challenge of rapid development of new versions of software which could be incompatible with local capacity of end-users. For instance, in Tanzania the challenge was related to decisions to upgrade the system or not. DHIS Tracker new versions are released every three months. The new versions usually have more advanced features and functionalities; however, it implies that users need more training. Initially, we installed version 2.10 and in December 2013, we moved to version 2.13 and retrained the health workers. One reason for not installing the latest releases was the gradual rate of learning by health workers, which we found to be incompatible with a rapid release of new versions; we feared that users needed time to get accustomed to the features of the installed system which they have mastered. The process of training was slow due to the fact that some end-users like community health workers have basic education. The process of learning was also experienced to be slow among some health workers in Malawi, even for the same version (2.9). For instance, eight months after deploying the system, some health workers felt they still had not mastered the system and requested for 'refresher' training. Recently, the system was upgraded to version 2.13 and the health workers had to be retrained.

There were also challenges encountered in participation of mediators, when conveying local requirements to the global software developers. In the case of Malawi, challenges were faced during the early customization process due to poor communication links between mediators and the main DHIS Tracker developers (who were based in India at the time). Hence, it was challenging to get more information/help about the software due to unclear software documentation; and to communicate (and follow-up on) local requirements. Nevertheless, as the use of DHIS Tracker expanded to more countries, coordination of the development of the DHIS Tracker was then done by University of Oslo, making it easier to communicate requirements. However, challenges were still faced in getting the local requirements to be incorporated in the

global software. For example in Tanzania, health workers requested that SMS message need to flow not only to clients and facility health workers but also to community leaders and health workers who participated in following up on the clients. The requirement was forwarded to Oslo team in February 2013; however, it was not incorporated up to the end of the study in December 2013. Likewise in Malawi, a key requirement was generation of a cohort-based report to monitor ANC service delivery and this was not possible to configure with the existing functionality in the software. The requirement was presented to the developers and coordinators but the required functionality is yet to be incorporated in the global software. Thus, in both cases, there have been delays in incorporating context-specific requirements which further rendered the use of the software at the local levels.

### **IMPLICATIONS**

This study has identified challenges related to participatory design processes which are caused by limited capacity of users and software implementers on domain knowledge. Also, there are challenges in the software implementation part arising from the interaction between software implementers and OSS developers due to poor communication links and lack of incorporation of some context-specific requirements which limited further participation of end-users.

The use of participatory design in developing countries have been challenged by contextual issues such as lack of skills related to computer and how participation is contextualized (Elovaara et al, 2006; Nhamposha et al, 2004). Our findings portray similar issues related to skills and in addition, we have observed other challenges which are unique to the developing countries. More specifically, in addition to challenges with IT competence among users identified in other studies in developing countries (Elovaara et al., 2006; Kimaro and Titlestad, 2008), our study indicates other challenges on: the difficulties in identifying users because the user group co-evolves with the design process, limited knowledge (on the health domain) among some of the expected end-users; and challenges arising due to local-global interactions.

Heeks (2008) argues that ICT4D participation is complicated and it creates multiple divides, e.g., between designers and users and often between western versus non-western mindsets. The findings have shown the divides between users, mediators and global developers. Open source software are vital for improving human development through cheap and quick acquisition of ICT tools. However, we argue that for human development to occur, participation skills in the design and development of OSS need to be enhanced through capacity development. The empowerment needs to be done to end-users and implementation mediators.

End users can be empowered so that they can participate through training. This requires that the training should not only focus on the ICT aspect but also ensure it incorporates adequate discussions on the health domain area, in order to accommodate health workers who are new to the domain area. Thus health domain experts need to be involved in facilitating such trainings. In addition, both cases showed how implementation mediators did not upgrade the system to new version because they feared the incompatibility between users' skills and rapid software development. Therefore we argue that training should aim for developing capacity for continued self-learning of the users, considering the rapid development of open-source software. This implies considerable time investments during the training of the health workers and providing the required resources, e.g., setting up local installations for practice only with dummy data, and developing online training courses for health workers. Thus creation of online learning materials can be geared towards the goal that users can be trained or train themselves at cheaper cost.

The findings also show challenges faced by implementation mediators themselves which are related to communication, conveying requirements and coping with contextual challenges. We suggest that informatics people need to be equipped with participatory design skills through training. For instance, skills for the mediators can be enhanced through courses at the universities. Previously Heeks (2008) have argued for need to combine development and information systems perspectives as one strategy when we are introducing computer systems in developing countries context. Now many countries are offering informatics education. Our experience both at undergraduate course and now in our university work place there is nothing like participatory courses. We suggest that we need to look into African education system and assess on how informatics educational systems of developing countries can create a work force which knows participatory design approaches. The courses also need to equip students with skills so that they can figure out how maximum participation will occur since the model for Europe does not work always for Africa due to lack of resources.

We also need to consider the role of global OSS developers in enhancing participation in local contexts. The case of Malawi showed how implementers were challenged in obtaining comprehensive documentation on the software. Therefore we suggest that global developers need to provide more detailed documentation on the software which could facilitate capacity development of implementation mediators in different places all over the world. Furthermore, both cases showed delays in incorporating context-specific requirements which further rendered the use of the software at the local levels. We suggest that global software developer should improve their processes of getting the local requirements incorporated into the global software in order to facilitate human development at specific settings.

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