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# Challenges of user participation in the design of a computer based system: the possibility of participatory customisation in low income countries

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## Abstract

Participatory design is generally regarded as an effective approach in systems development to overcome challenges such as changing contexts, difficulties of capturing users' needs and problems of achieving systems' acceptance. However, user participation is associated with certain contextual assumptions or beliefs from its origin in the West that are not always applicable in the context of Low Income Countries (LICs). The initial technical capability of users, motivation and desire to participate, availability of resources and long-term support mechanisms are often taken for granted in the West, but in many cases not present in the context of LICs. In the Western setting, due to favourable socio-economic and political conditions and the presence of skilled users, an approach to design of systems from scratch with user participation tend to give quality systems. However, in a LIC setting where the intended users have limited computer skills, there is a need to put an extra effort into training and to find alternative approaches to achieve participation in system design. In such a setting, we argue that participatory customisation, a process where the users in collaboration with the developers adapt an already developed or partly developed system to meet the needs of their own workplace, can be a better approach. In this paper we approach participatory customisation in LICs by looking in detail at the customisation of the District Health Information Software (DHIS) in two pilot health districts in Tanzania. The Tanzanian project is part of a global research initiative (the HISP), and in order to put forward more general approaches for LICs, we compare our findings from Tanzania with similar customisation processes in Cuba, India, Mozambique and South Africa.

Keywords: participatory design, participatory customisation, HISP, LICs, Tanzania.

## 1. Introduction

In a western setting, participatory design (PD) has proved to be a relatively successful approach to system development; however a successful user participation process requires certain contextual properties, such as skilled users (Kyng, 1994, Emspak 1993) and a cultural and political setting that is supportive of user participation, also at the local level (Heeks 1999a). The lack of computer skills in Low Income Countries (LICs) is widely acknowledged (Walsham et al., 1988; Sahay 2001). LICs face lack of infrastructures and lack of quality ICT education. These constraints to participation demand a strong focus on training of intended users in computer basics in order to let these users contribute to the participatory process. Furthermore, when collaborating with users that do not possess the skills a developer would normally expect in a western setting, there is a challenge to find alternative ways of approaching user participation that do not demand the same technical understanding.

During the last 7-8 years, important elements of the Scandinavian collective systems approach has resurfaced as a strong political "design movement" in South Africa through the Health Information Systems Program (HISP) (Braa 1996, Braa and Hedberg 2002). Born out of the anti-apartheid movement and combined with Scandinavian systems design influence, a participatory systems design project established in three pilot districts gradually spread out to cover the entire country and is today the official health information system in South Africa. HISP's relative success in South Africa has led to the export of software and ideas on health management to countries like Mozambigue, India, Malawi, Mongolia, Cuba, Tanzania, Ethiopia and Vietnam. The HISP focuses on action research and user participation, especially local participation to customize the health information software with the aim to develop local knowledge and skills in computers, design, data handling and use (Braa et al. 2004, Williamson et al., 2001).

Ever since it was developed in 1997, the District Health Information Software (DHIS), as the software tool is called, has gone through many improvements that are applicable to all countries, but it has also been customised in every country to meet the needs of the local contexts (Braa *et al.* 2004).

The last two years the Tanzanian Ministry of Health (MoH) has implemented the DHIS in two pilot

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Kimaro, H. C., & Hodne, O. (2008). Challenges of user participation in the design of a computer based system: the possibility of participatory customisation in low income countries [Electronic Version]. *Journal of Health Informatics in Developing Countries, 2*, 1-9 from http://www.jhidc.org/ index.php/jhidc/issue/view/4. districts. A HISP-team of foreign and national researchers has run the process of customising the DHIS to the Tanzanian context. The adoption of HISP approaches to systems development led to a strong focus on user participation and locallevel involvement in this customisation process. One of the authors was part of this HISP-team and involved in implementation, customisation and training of the DHIS during several field studies. This paper presents a case study from this project, and to take advantage of the research in the global HISP network, we compare the Tanzanian case findings with other similar projects in Cuba (where the other author was engaged in a HISP project), South Africa, Mozambique and India.

In this paper we approach the following questions: What are the challenges of applying a participatory approach in LICs, and how can we address these challenges in a context so different from the Western conditions? The rest of the paper is organized as follows; section 2 gives a theoretical background to participation and customisation, section 3 outlines the research approach, and section 4 presents the Tanzanian case study. Section 5 covers the discussion, and finally in section 6 we summarize and outline some concluding remarks.

# 2. Theoretical perspectives: Participatory design and customisation

### 2.1 Participatory design

Participatory design grew out of Scandinavian trade union initiatives towards democratisation in the workplace over the last three decades (Ehn, 1993; Bjerknes and Bratteteig, 1986) and since then it has received a growing attention in the Western setting (Gould and Lewis, 1985; Grudin, 1991a & b; Kyng, 1991; Schuler and Namioka, 1993). Skilled users and developers mutually collaborate to create quality computer systems while enabling learning and reducing communication problems. However, several favourable cultural, socio-economical and political conditions in this setting help to promote a joint technical development endeavour (Ehn, 1993; Bjørn-Andersen and Hedberg, 1977).

Participation of skilled users is intended to mediate work practices and to enable smoother changes to system use in the context (Kyng, 1994). Intended users play a significant role in decisions about organisational aspects rather than technical (Cadle and Yeates, 2001; Walsham et al, 1988) whereby the lack of effective communication with intended users often lead to insufficient capturing of design needs and thus system failures (Curtis et al. 1998). Intended users and developers need to agree on what is being designed by sharing technological and contextual understandings and available design options (Kraut and Streeter, 1995). Thus, knowledge gaps (such as perception about technology, language, terminologies, jargons, etc) are resolved in joint collaboration (Oliver and Langford, 1987; Davis, 1982) building common understandings, motivation and effective participation (Kyng, 1994; Damodaran, 1996). However, effective participation is a result of

motivation, skills and knowledge of both intended users and developers in a suitable environment where intended users can feel fully empowered. Typically, users with lack of skills are ineffective in participation and have less influence in the design. As Emspak (1993) puts it:

If one is ignorant of what alternatives are possible then it will be impossible to win them. The central point of making ideas into reality is knowledge (p. 20).

For intended users to contribute to the design they must possess skills so that the focus of the design process can emphasize the users' abilities and needs rather than solely on quality and efficiency of the system (Grønbæk *et al.*, 1993). User participation needs to go beyond participation of skilled users in design, and also incorporate training and learning (Bødker *et al.*, 1987, Tollmer, 2001) to empower intended users with lack of skills to contribute in the design in the long run (Walsham, 2002). Moreover, training of intended users prior to their participation creates a democratic and empowered environment (Byrne and Sahay, 2003).

A system has different user groups with separate skill-requirements and interests. These differences can be addressed by creating usergroup representatives that participate in training and design, or by working with larger groups of participants with similar interests and requirements (Avgerou and Cornford 1993). Selecting skilled users is a crucial step (Bødker and Grønbæk, 1991; Heeks et al. 1999b) in a participatory process, but in the context of LICs such users are not necessarily available. Heeks (1999a) explores the effect of participation in LICs, and he points to several factors limiting the value of participation. One such example is cases where participation is not really participation, where the culture and politics in an organisation prevent participative outcome from apparently participative processes, by constraining who can say what and how within different groups (Biggs and Smith 1998).

### 2.2.Customisation

Customisation, adaptation and tailoring are terms often used interchangeably to describe changes to systems design by users. According to Gasser (1986) adaptation implies any of the following three scenarios; 1) changing work practices to accommodate for design misfit, 2) undertaking additional work to make up for design misfit, or 3) using the original design in ways it was not intended for. Tailoring can be understood as a process where the users or even organisations adapt the design to handle new circumstances that originally was not anticipated (Cook and Woods, 1996; Randell, 2003, Watson, et al, 2004; Stiemerling *et al.* 1997).

Customisation means that the intended users change the system design in order to reflect their work practices and needs (Randell, 2003; Page *et al.* 1996). The design of an already existing system is customised with user participation where intended users, not necessarily with high technological skills (Mackay, 1991), are initially trained to be able to participate. Thus, participatory customisation implies that the developers initially work closely with the intended users, thereby



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Journal of Health Informatics in Developing Countries

enabling them to gain better practical control of the design, and an understanding of how their work practices and needs can be reflected in the system. By initially being guided in design changes in collaboration with the developers in a learning-by-doing process, the users themselves are later able to make design changes. In contrast to a more traditional participatory approach, this interpretation of customisation helps intended users to influence design decisions by designing parts of the system themselves. This process may enable a design culture that empowers the users to tailor the system (MacLean *et al.* 1990) and make changes to the design when needed, even after the developers have left the scene.

# 3. Research setting and approach

This study is based in the LIC Tanzania, located in Eastern Africa. The country's literacy rate is 67.8% and the national language is Swahili, a language spoken by 90% of a population of 34.5 million. Swahili is the compulsory teaching language in primary schools, and a large part of the literate can only read and write in Swahili. English is used in the secondary and tertiary educational levels. The quality of education is affected by a low morale among the teachers, poor conditions for learning, and lack of educational resources (Juntunen, 2001).

Tanzania started the process of redesigning the Health Information System (HIS) in the early 1990s, through engagement in the development of an integrated, both paper-based and computerised HIS, with the assistance of multiple donor agencies (Rubona, 2001). However, due to the shortage of skilled manpower and resources, and dependence on external support, such efforts have not produced positive results. The health system is still centralised, making it difficult to implement the Primary Health Care (PHC) strategy (WHO 1978). The health system's organisational structure consists of four levels; health facility, district, regional and national, whereby the district level represents the hub for all information flows. At the regional and national level the HIS is computerised, but the software in use has been reported to have a number of pitfalls, such as lack of design flexibility and missing functionality (Lungo, 2003). At the district level there is a lack of software to support data processing and to make use of the information. Thus, implementing and customising the DHIS in this context was an important goal in the Tanzanian HISP project. The HISP-approach was introduced in two pilot districts, Bagamoyo and Kibaha health districts, both located in rural areas not far from the city of Dar es Salaam.

### 3.1 Action research as an approach

This study is part of an action research initiative within the global HISP project (Braa *et al.*, 2004). In general, HISP aims at strengthening design, development and implementation of sustainable HISs in LICs with a focus on building local capacity of health workers to effectively design their own systems, operate computers and use information for action. HISP applies action research to meet these targets in such a way that health workers and HISP researchers can work together, share knowledge and experiences and thereby become more aware of the options and possibilities for change in the local context, and then collaborate to make change. The key action research strategies are training and participatory customisation of the DHIS to facilitate learning. One of the authors was involved in the implementation, customisation, and training of the DHIS in two districts (Bagamoyo and Kibaha) for the period of two months, from June to August 2003. The research study was further extended for a period of 3 months from January to March 2004 to include user support and situation analysis in the pilot sites.

In each district the training participants were district information officers, vertical programme coordinators and data compilers. The training and customisation of the DHIS was conducted through first an intensive period of one week (4 hours in the morning and 4 hours in the afternoon), and then a follow-up period of 2 months. The mode of training was based on presentations of the DHIS userinterfaces and functionality followed by discussions with trainees on the particular features. The last training session was an evaluating the trainees' competence in computer use and the DHIS. Group discussions with the trainees during break times, separate unplanned interviews, planned meetings with health managers/health officials and participant observation provided more understanding of the existing work practices, health workers' capabilities and motivations, their interpretation of computers, and their roles and barriers in the design process.

## 4. The case study

### 4.1.The DHIS software

The District Health Information System Software (DHIS) is a free and open source database application for collecting, processing, and analyzing health information for health administration purposes.

The software is developed in South Africa using the technologies MS Office (Access) and Visual Basic, and it is the basis for the customisation process in Tanzania as well as in the other countries in the HISP network. The key advantages of the software as a customisation tool are its flexibility; it can be quickly changed and adapted to typical routine health information systems' needs, and its support for multiple languages; the user interfaces can be translated to any Unicode supported language and alphabet. The rationale for designing such a flexible system was to support decentralisation of health management and to empower the lower levels (especially the districts) of the health system, by giving them the possibility to customise an information system to fit their needs, as opposed to the more traditional centralised systems. This flexible application, though originally intended for the South African Health System only, has proved suitable for customisation in other countries and health systems as well.

When introducing the DHIS in a new context, in this case the Tanzanian Health System, the implementation can be seen as a continuous customisation process where most of the work is done out in the field with participation from the domain experts. The system is gradually being



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Journal of Health Informatics in Developing Countries

tailored to the local context and the developers' involvement changes from strong at start-up to almost non-existent when the users are trained and comfortable with the software.

# 4.2.Customisation of the DHIS in the Tanzanian context

The first step in customizing the DHIS (step 1 in Table 1 below) in the two pilot sites was to define the overall database structure, meaning how the organizational hierarchy, the health facilities, and the data collected by these facilities are represented in the computerised system. This process was done in collaboration between the developers, who knew the technical part well, and the domain experts, who had knowledge about the local structures and data flows.

Table 1Steps in customisationthe DHIS

Step	Task	Actors
1	Set up the overall structure of the database: Organisational hierarchy and the data sets to collect.	Developers and local health management.
2(a)	Customise system use to local context.	Developers and health workers.
2(b)	Customise system use to local context.	Health workers only.



Figure 1 Steps in customisation the DHIS

This first database prototype was then set up on each individual computer, and training in application use was organized. In parallel with the training, further customisation was conducted (as shown in step 2(a) of Table 1). Among the many features provided to the local users in order to customize the DHIS are: add or modify data elements to be collected (such as number of deliveries, number of inpatients etc.), define local indicators, design local validation rules, modify graphical user interface features (such as labels, text boxes, logos and images), edit the language, switch from one language to another (e.g. English to Swahili), and to define reports based on the needs of the local facility.

Given the lack of computer skills among the health workers, the first task was to train them in computer basics. The HISP developers emphasized hands-on training where each health worker had its own computer, as a strategy to build up their confidence in computer use, and thereby eliminating their computer-phobia and increasing their effectiveness in the customisation process. It was assumed that by providing the health workers with basic computer skills, the developers could help to empower them with the necessary design skills (e.g. sketching using mouse, using menus etc.) for the customisation process. The user empowerment and participatory customisation processes were conducted in three stages as shown in Figure 1 and Table 2.

**4.3.Evaluation of the customisation process** The evaluation conducted after the training and customisation process demonstrated that:

- Health workers obtained some hands-on experience in computer use and design through customisation based on the local DHIS developed in collaboration between health workers and the HISP team.
- Health workers could for their first time design graphs in Microsoft Excel presenting their health data in a more illustrative way.
- Health workers obtained some confidence in using computers and the DHIS, e.g. they managed to enter most of the reported health data from 2002 and 2003.
- Health workers realised the potential benefits of their participation in design as they gained more knowledge about the DHIS and computer use

### Table 2

Description of the stages shown in Figure 2

### Stage 1: Health workers learn computer basics, assisted by developers

- Computer hardware basics. E.g. keyboard, mouse, monitor, memory, hard disk, floppy disk, printer, etc.
- Operating System basics. E.g. using windows, menus, command buttons, mouse movement and clicks, etc.
- Microsoft Word. E.g. how to write a document, save, open, print etc.
- Microsoft Excel. E.g. simple manipulation operations and graphical representation of data
   Microsoft Access. E.g. how to define a field and set its properties, graphs tables and how to a
- Microsoft Access. E.g. how to define a field and set its properties, create tables and how to create a simple database.

### Stage 2: Health workers learn to use the DHIS on their own computer, assisted by a developer

- How to install the DHIS on their own computer.
- How to browse through the DHIS features e.g. command buttons and text boxes, and how to edit them.
- How to customize the DHIS, the organization hierarchy definition, local changes to the structure, unitspecific data elements (beds, human resources, etc), data element categories, routine health data elements (BCG, malaria-cases etc), semi-permanent data (population, targets etc.), indicators, and report generation.
- How to input, edit, and validate routine data and semi-permanent data and how to calculate indicators. Stage 3: Do it yourself-health workers and developers now work together

- Redefine DHIS user interface's features showing possible suggestions such as images, text labels, etc.
  Re-define local health data items and indicators.
- Enter quarterly routine data and generate reports using the DHIS.
- Define and make reports through the DHIS.
- Export data to the Excel environment and analyze data using pivot tables and graphs.
- Suggest features to the developers that can improve the DHIS.



www.jhidc.org

Journal of Health Informatics in Developing Countries

Vol.2 • No.1 • Jan 08 Page 4

in general. Some health workers managed to learn how to develop different graphical representations from the data, e.g. a graph on the immunization status of the district which was very fascinating to the person in charge of the district immunisation programme.

- Health workers' computer-phobia was to some extent eliminated as they learned how to use computers and how the computers work.
- Health workers were able to participate in the design process by e.g. suggesting improvements on how to better represent the paper forms in the computerized system.

# 4.3.1.Challenges and limitations of participatory customisation

Although the previous section has presented some positive results of customisation, there were several challenges that limited the outcome of the user participatory process.

### Lack of motivation

The lack of motivation by users was evident in the poor attendance during training sessions, excuses from managers pertaining attendance to the training, and practical utilization of skills acquired after the training. Moreover, we experienced a tendency of having users who had attended the training for financial gain only. An example from one of the pilot districts illustrates this. Early in the training process we organized two different sessions, one in the morning for normal endusers, and another in the afternoon for higher level users (doctors and managers). However, the afternoon session's participants did not show up for training and thus we extended the morning session. Asked about the absence of doctors and managers, the morning session's participants replied, "Some of our colleagues thought there were training incentives; that is why they dropped out". The health managers, the most important user group both considering design and use of the DHIS, were said to be too busy in dealing with direct health services, to have time to participate in the pilot project. Moreover, some users perceived participation as a way of getting more financial income, but HISP did not have the resources to motivate the participants by reimbursing them for their time spent in training.

Difficulties of selecting the right participants In some cases, the most suitable DHIS participants were not prioritised by the managers, and in stead more personal motives affected the selection process. One example is when a health manager chose his messenger (delivery boy) to attend the training session dedicated for future trainers that were going to the district level to teach health workers. This was clearly not a suitable person for this task, and when the manager was asked about this he replied that the messenger was his close friend, and therefore it was necessary to send him to that training session in order to get something (money).

Lack of basic computer skills The fact that some of the intended users had never touched a computer before meant that we had to provide close and long-term training to give them hands-on experiences with computers, in order to prepare them for the customisation of the DHIS. Users that were not skilled enough, lacking the fundamental understanding prior to the participatory design process, provided a limited contribution to the design. Furthermore, valuable training resources that could have been spent on improving system design had to be allocated to teach computer basics.

### 4.4.Political brokering at the national level

The initial implementation funding for the HISP project in Tanzania was provided by the Norwegian Government through University of Oslo's (Department of Informatics) research funds. Given the lack of an appropriate computerised system to support district health information combined with the relative success of the South African HISP project, the MoH took the decision to go for a customisation of the DHIS in two pilot districts. However, while at the same time demanding tangible results from these pilot districts in order to scale up, the MoH allocated no resources to help the implementation process.

The HISP-team started to work on to fronts; 1) at the local level where they customised the DHIS in the two selected districts focusing on local level user needs, and 2) at the national level, where they were engaged in a continuous political brokering process to get participation from national HIS personnel and management. Both processes were of course highly dependent on the other.

A typical excuse from national level personnel for not participating in training and customisation of the system, was lack of time due to their many other responsibilities and initiatives at an understaffed national unit. Although some national level personnel were part of the national HISP-team, their participation was only partial and unpredictable. The other HISP-team members were committed to seek participation from national personnel in most decisions about the project, but these efforts did not succeed. The replacement of the national head of HISs in the middle this brokering process made it even more complicated to get national-level support and participation.

As a result of a lack of national-level participation, district management showed some reluctance in using the information output of the pilot system (DHIS) in their daily work, as they were waiting for a sanction from the top level to formalise the project. However, at the national level they were waiting for tangible results from the districts in order to move forward; a typical deadlock situation.

# 5. Discussion

**5.1.User participation in a LIC context** In general, participatory design is regarded as an effective approach in systems development processes to overcome challenges such as changing contexts, difficulties of capturing users' needs and problems of achieving system acceptance. However, user participation is associated with certain contextual assumptions or beliefs from its origin in the West that are not



www.jhidc.org	Journal of Health Informatics in Developing Countries
	Vol.2 • No.1 • Jan 08   Page 5

always applicable in the context of LICs. The initial technical capability of users, motivation and desire to participate, availability of resources, and long-term support mechanisms tend to be taken for granted in the West, but are often not present in the context of LICs. Furthermore, participatory approaches, and especially the Scandinavian projects, are influenced and driven by socio-political targets such as work place democracy and local empowerment, and they are often backed by strong and well organized trade unions (Bjerknes and Bratteteig 1995). Such a democratic context for a participatory approach was not present in the setting of the Tanzanian health system, and is hard to find in many LICs.

To understand some of the differences of participatory contexts in the west and in LICs, it can be useful to look at how technology plays a role in these two broader settings, and especially on the way citizens get exposed to technology in their everyday life. The exposure to and experience with technology in the West is generally higher than in LICs. In the West, even if one does not have a computer at home or in the office, one would e.g. most likely have an electronic credit card and frequently interact with Automatic Teller Machines (ATMs) when withdrawing cash, or with terminals in the supermarket when buying food or goods. The mobile phones, or small multimedia computers as they are becoming these days, are another good example. One almost needs to have mobile access to communicate with friends, family or work colleagues, or to call the police or an ambulance. Furthermore, most organisations and businesses in the developed world have one or more computerised systems to support their work processes, such as a human resource database. When deciding to try out alternative software packages or to computerise other sections of their work, organizations would in most cases have a fair understanding of computerised systems.

In a LIC like Tanzania, technology is not exposed to the society in the same way. In some places a computer is looked at as something special ('it is like a superman'). When institutions get a computer through a donation or buy one themselves, the computers are highly protected and restricted to only limited use. In this setting we realized that it is hard for the lower-skilled users to understand the relationship between system design and a running application on the computer, and even more difficult to understand; how can they participate in this mysterious design process?

Given such a context, in order to go into collaborative processes with the users, the developer should find more context-sensitive approaches that do not demand the same kind of basic technological understanding that the developer would take for granted in a Western context.

# 5.2.Participatory customisation – a gateway to understand system design

Participatory design approaches in the West are dominated by design-from-scratch processes involving users from the very beginning of the development cycle. And given the rich human resource capacity and other favourable social and economic conditions in the West (Ehn, 1993), these approaches seem to function well. As we have argued above, these approaches meet difficulties in contexts where the users lack a basic technological understanding. Based on the experiences from the Tanzanian HISP project, we propose that a more effective way to achieve user participation in LICs is to present the users with a pre-developed and flexible system that can easily be customized in collaboration with the developers. Participatory customisation is a better term as we emphasise the importance of a collaborative process between users and developers to customize the system to the local context. Introducing the users to a running application that they can see and interact with, as in the Tanzanian HISP case, facilitated an easier communication with the users in the process of designing a localized system. A customizable system should have the ability to implement visible changes relatively easily and on the fly, so that the users understand that they are participating in the customisation process.

The participatory customisation process can also be understood as a learning-by-doing process where the users learn about basic computer use and application-specific features, while at the same time customizing the system. In the Tanzanian case, customisation and training were often done in parallel, at the workplace, in collaborative sessions with both users and developers.

### 5.3.The importance of learning

Training has been an important part of the DHIS customisation process. Given that most users had no previous experience with computers, training in basic computer use was a necessary first step in order for the users to learn about the DHIS and the customisable potential of the application. Before reaching the participatory customisation phase, a certain amount of basic skills had to be in place (Ehn, 1993), and we experienced that this training helped the users to get rid of initial 'barriers' to participate and empowered them to influence the design of the localised version of the system (Byrne and Sahay 2003). We also experienced that participation increased as the users got a better understanding of the DHIS. An example is how some users developed a hospital information module after first familiarising themselves with the basic features of the DHIS, and being participants in the customisation of a routine health information module.

A challenge during the training and customisation process was to be able to interact with the right users. To develop sustainable systems, it is important to focus on providing training to the intended users of the system in a long term perspective, and not spend resources on nonusers who are not involved in the actual use or maintenance of the system. From the Tanzanian case we have seen that participants in training sessions have been selected for the wrong reasons, e.g. related to internal power-relations, and not for the best of the organisation.



www.jhidc.org

Journal of Health Informatics in Developing Countries

Vol.2 • No.1 • Jan 08 Page 6

# 6. Summary – Tanzania in a wider context

To strengthen our discussions we will look at the Tanzanian case in a wider context comparing our experiences and findings with other similar case studies in the global HISP network (Braa *et al.* 2004).

# 6.1.How power and politics influence participation

We have seen how local managers in the Tanzanian health system to some degree hampered the participatory process by letting personal interests influence the selection of participants. Furthermore, the lack of full national support led to reluctance to commitment by the local managers and thus less tangible results to convince the national level to scale up.

Conditions for participation differ across the other HISP countries; in India top political support was needed and obtained through political negotiation in an open society. In Cuba, top level support was to some extent present, but only through the statistical line management, which in turn made it difficult to meet the right users in a fragmented health system (Braa, Titlestad and Sæbø, 2004). However, in Cuba support from the political structure is needed in order to carry out local level participation, and a problem in Cuba is that such support is not easily negotiated openly (ibid.). In South Africa the participation at all levels was made possible by aligning a range of actors around common goals of improving health care in deprived communities, and in many ways it was a continuation of the anti-apartheid movement. The political activity (and freedom) and engagement in South Africa have provided good conditions for a participatory approach (Braa and Hedberg 2002). In Mozambique the conditions for participation are good, people are willing and they are definitely allowed to. Problems are rather related to the implementation of design decisions coming out of the participation (Braa et al. 2004).

### 6.2.Local capacity-building

In Tanzania, it was difficult to establish institutional support due to the existing bureaucracy and unwillingness to allocate human resources. National level personnel did not participate whereby they tended to be busy and reluctant, and as a result they became unaware of the capability of the customised DHIS. The development of "long-term" national teams involving participants from multiple levels of the MoH has been important in South Africa, Mozambique and India (Braa et al. 2004). Also in Cuba there were attempts to create such a national team with the overall responsibility for the project. However, this was not successful as there were not enough resources allocated and it was not prioritised by the health authorities, i.e. lack of political support. In Cuba there are several small nodes of skilled groups, but due to lack of a national nucleus they are not communicating (Sæbø and Titlestad, 2003).

### 6.3. The customisation processes

In the process of localizing the DHIS in Cuba the software supported a collaborative process where

the users, also with a limited technical background, could quickly come up with suggestions on how to tailor the application. The fact that we had a core application ready, kick-started the participatory process in a normally difficult start-up phase. The way we could implement new ideas and suggestions "on the fly" and show results right away, helped to keep the users active and motivated to participate. The build-in functionality to easily translate the user interface to any desired language was of major importance in Cuba, where we needed a Spanish translation. In stead of spending a lot of time reprogramming the code to translate the application, this was taken care of by a separate multi-language module, and could be done by the local health statisticians without any need for special technical skills (Braa, Titlestad and Sæbø, 2004). When translating a user interface dominated by medical terminology, it is a huge advantage that medical domain experts and not the developers themselves are able to do the translation process.

In South Africa where the software has been used for eight years, we have experienced a flow of suggestions on how the application can be used for other purposes than it was initially designed for. The target domain of the software is now much broader, and though some of the new functionality has requested real programming efforts by the developers, many of the new areas of use have emerged from the flexibility of the software and the ability to customize it to new user needs, and hence did not demand additional programming. Thus, by learning from hands-on experiences with the application, some users have become local experts and extremely important participants in the continuous process of customizing and improving the use of the software.

### 6.4.Concluding remarks

In conclusion we can say that system development in the context of LICs is highly influenced by social, economic, and political factors. The context of multileveled organisations like a national health system represents power imbalances and many different users groups with varying technological skills. Developers often need to build local technological capacity among the intended users prior to involving them in participatory actions. Training in computer use and design enables the intended users to be more than passive participants and empowers them to contribute to the design process. Moreover, the developer needs to tackle issues of power relations and imbalances and seek for allocation of resources to strengthen learning and design processes. Achieving active participation and commitment of top-level personnel have proven important in both motivating and enabling local-level users and decision-makers to participate in systems design. In order for the intended users to better learn and participate in the design, we argue that they need something they can see and interact with, a customisable system where design changes are easily visible to non-technical users. Through participatory customisation the intended users learn by practising and doing, gradually building up use and design skills and thus increasing their ability to customise the system themselves. In the long run, the users are better prepared to handle system



Journal of Health Information	tics in Developing Countries	3
Vol.2 • No.1 • Jan 08	Page 7	

changes and improvements without involving the developers, and thereby establishing a culture of design and technology use at the workplace, in their own context.

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Journal of Health Informatics in Developing Countries

Vol.2 • No.1 • Jan 08 Page 8

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Journal of Health Informatics in Developing Countries