Participation in the information system adaptation process in the public sector in Mozambique

José Leopoldo Nhampossa
Department of Informatics, University of Oslo
P.O. Box 1080 Blindern
N - 0316 Oslo, Norway
+4791580592; +4724092734

leopoldo@ifi.uio.no

Jens Kaasbøll
Department of Informatics, University of Oslo
P.O. Box 1080 Blindern
N - 0316 Oslo, Norway
+4722852429

jensj@ifi.uio.no

Jorn Braa
Department of Informatics, University of Oslo
P.O. Box 1080 Blindern
N - 0316 Oslo, Norway
+4722852408

jbraa@ifi.uio.no

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1. INTRODUCTION

In the 1980s, efforts to reform health information systems (HIS) to systematically collect, analyze, and report data for improved management in developing countries were undertaken by national program managers of vertically structured programs. "This was due to foreign assistance to the health sector being typically focused on the programs rather than the entire health system" (Sauerborn and Lippeveld 2000, p.6). Many countries decided to attack the problems of HIS at its roots through integrated initiatives. Countries like Cameroon (Sauerborn 1991), Chad (Lippeveld et al. 1992), Tanzania, (Rubona 2001), Mozambique (Mwaluko et al. 1996), and Pakistan (Mujahid 2002) focused on routine HIS for primary level care facilities.

Mozambique is a country in transition with a very high level of illiteracy, shortage of manpower, and resources. In this context, the Mozambican government promotes international "North-South-South" co-operation programs to attempt reduce the economic & social discrepancies between the different communities, organizations and citizens. Historically, such co-operation lines were established at high levels, addressing mainly the top-level interests and policies in the name of national

benefits. This phenomenon has to do with all sectors of the national economy and health is not exception.

While the primary health care (PHC) was the strategy selected to extend health services to most peripheral areas in the country, the dominant centralized organizational culture in the health services implies that there is limited spread of an information culture in the districts whereby the information and communication technology (ICT) infrastructure is concentrated in the capital cities. This makes it extremely difficult for the PHC strategy to work effectively in practice. There is thus an asymmetric distribution of infrastructure and access to ICT, which hinders the implementation of PHC. In Mozambique health was the first sector to install a national-wide information system (IS). At province and national levels the Mozambican HIS is supported by a computer based IS (SisProg) developed in 1992. This system was established and is working since then in all 11 provinces as well as at national level. Data from the districts are entered into SisProg and subsequently sent in an electronic format upward to the Ministry of Health (MoH), where is automatically stored in the national version of SisProg. Since its inception and installation, SiProg has been historically reported to have serious design, implementation and maintenance problems. The system was recognized to be top-down, locked to old technology, lacking flexibility to meet the organizational changes and not providing the expected data and information to support planning and decision making.

In this context the need to develop a new system which would be integrated with the present system aroused. The district health information software (DHIS[1]), which was developed under health information systems Program (HISP)[2] principles of

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decentralization, open source, empowerment of local management (Braa and Hedberg, 2002), was purchased and adopted for piloting in Mozambique in a cooperation basis.

The implementation of DHIS came with promise of changing and improving the information culture while converting the management exercise from raw data to indicator based and integrating the vertical flows at district level. The starting point of HISP is that the promise can be fulfilled by improving the routine health information processes (more than 60% of the time of health workers is spent on health information transactions, such as collection and collation of data in various forms and registers, and its subsequent transmission to upper levels of the administrative structure) and by cultivating a culture of information whereby the health staff realize the value of information to support their action. Improving these processes will then directly impact on work, and the health staff can focus more time on providing care to the community as compared to filling up endless forms that ultimately are marginal to their work of providing health care to the community.

In these terms, HISP was established in Mozambique aiming to (1) Conduct a longitudinal study on the degree of use and diffusion of ICT and the use of information at district and provincial levels in Mozambique, with special emphasis on the health sector and (2) Strengthen and further develop the health information system (HIS). The HISP started in South Africa formed the basis for the establishment of HISP in Mozambique in 1999, when a memorandum of understanding was signed for a pilot project implementation of HISP in three districts, namely Chókwe, Maxixe and Cuamba. For accomplishment of the first phase, academicians and students from Eduardo Mondlane Univesity were involved in administrating the questionnaires in the field. The first phase of the program was finalized with a publication reporting on the actual and potential usage of ICT at district and provincial levels in Mozambique with a focus on the health sector (Braa et al., 2001).

The terms of reference of the above mentioned memorandum of understanding, included the use of participative approaches for piloting HISP philosophy and available tools. The fact that participatory approaches have become one of the mandatory principles in developing world (Rydhagen, 2003) and that they were determinant factor for the HISP success in South Africa, helped the counterparts of HISP in Mozambique to adopt them to adapt DHIS to the organizational setting of the MoH.

The present work draws on the trajectory of participative and prototyping (Budde at al, 1992) strategies applied in the effort of adapting DHIS into the Mozambican setting to be used by MoH, the official institution responsible for providing public health services through specific institutions, such as health units, district or province health directorates.

2. BACKGROUND

For systems development different strategies are described in the literature. Such strategies are no longer used in individualized or uncoordinated way, but rather are embedded in an overall development strategy. They offer procedural suggestions covering all activities in the software development life cycle or prescribe specific method for use during these activities. One strategy consists in implementing standardized methodologies, based on

traditional engineering disciplines. Such engineering approaches are perceived to be more rigorous, predictable, "academic" and to not take into consideration the local needs and user priorities. Although there are no approved "silver-bullet" strategies, participative approaches show promise for improved systems development or adaptation.

For use in this paper, participative strategies are described as the adopted methodology to adapt DHIS in Mozambique, since they represent a context-sensitive development process and capture elements of user involvement (Bostrom and Heinen 1977a and 1977b; Markus, 1983; Mumford, 1983). In Scandinavia, participative approaches developed, practiced and evolved since the 1970s (Aarhus, 1975; Bjerknes et al, 1987) and this fact is linked to the traditional and well developed setting, whereby conditions for law regulated relationship between IS researchers and strong national trade unions are present and there is a positive attitude to new technology.

The starting point of the Scandinavian design approach is that every human should have the right to participate equally in decisions concerning his or her life. This is about the importance of inclusion of skilled users on the process of design and use of computer-based information systems (Bjørn-Andersen and Hedberg, 1977; Ehn, 1993). The Scandinavian approach is politically significant, interdisciplinary, and action-oriented research on resources and control in the process of design and use of computer-based information systems. It raises questions of democracy, power, and control at workplace and assumes that the participation of skilled users in the design process can contribute importantly to successful design and high quality product (Ehn and Sandberg, 1979). Therefore users are designated co-designers and systems development is an organizational, technical and human change process.

Scandinavian designers who sought to make systems design more participatory and democratic turned to prototyping, which opens the possibility of developing a model that does not normally have all the required features or provide all the functionality of the final system. Having the major advantage of being relatively inexpensive and quick to build, prototyping can help to clarify the requirements and evaluate the feasibility of a particular system design. In the IS literature one important distinction is made, concerning the Scandinavian versus North American concept of prototyping, seen as meeting very different needs in Scandinavia and in the US. While in Scandinavia prototyping is used to involve users into the design process and make them designers with decision-making role in operational planning and organizational and technological change, in US the role of users is limited to just test, ratify or tweak the work of external designers (Spinuzzi, 2002).

3. ANALYSIS AND DISCUSSION

While a foreign software can be used as a starting point (Heeks, 1999) to design, develop or strengthen local systems, as far as is adjusted to the socio-economic and technological context in question (Avgerou, 1996; Waema, 1996), the attempt to apply participative and prototyping approaches in Mozambique encountered a number of challenges. They were related to the organization (the MoH), the program (HISP) and the individuals (who were expected to use the system). The organization specific challenges of participation were the time required for adaptation

of DHIS, availability of financial resources, involvement and commitment of top management authorities and on the other hand, the individual specific challenges of participation were the willingness to participate, ability to participate and user behavior.

Time concerns and availability of financial resources.

The HISP vision is to invest energy and resources to address institutionalization, sustainability and scalability concerns, as illustrated in the sentence bellow:

...through training, support and capacity building, encouragement and development of district based HIS for health data management and promote electronic communication systems where appropriate.

This is a long term goal which requires for its achievement time and financial resources. The initial and subsequent project funds were provided by the Norwegian Government to support research activities (piloting, publication, field work), rather than scaling up the implementation of DHIS national-wide. The idea of HISP was to draw recommendations based on the research and piloting, on how to address the health information needs of the MoH and how the DHIS could support it. On the other hand the MoH was lacking appropriate tool to support management and informed decision making. Since DHIS was reported as a successful story, whereby the national level [authorities] endorsed HISP for national rollout in South Africa (Braa and Hedberg, 2002), the MoH along with the HISP team, decided to implement it the pilot sites. The prototyping process started, focusing only in the three pilot districts, but by recommendation of the local Provincial authorities a shift was observed from just one district to cover the all province[3] (districts with proper infrastructure, e.g. electricity), but the recommendation was not accompanied by the required resources (e.g. financial, human) to support the initiative. The only human support available was the HISP team, composed by health professionals, academicians, Master and PhD students, who are involved in some other activities beside the project ones. We ended up in chicken-egg situation whereby the MoH wanted to see results of the DHIS implementation (e.g reports generated from the DHIS) in the districts and in the other hand district and provincial authorities were not using the DHIS because were waiting for a special sanction from the top level to formalize the use of the DHIS software, to avoid working using several systems at the same time. So although the MoH top managers were part of HISP team, their commitment was partial and unpredictable, since they were also involved in some other initiatives.

Cooperating with the top level.

The process of participating with the MoH shifted between periods of joint work and negotiations. During the periods of joint work, the managers from the MoH participated in the project team in the training and adaptation of the system. In between these periods, these managers defended the ministry's policies and negotiated terms with the project.

The interaction between the project and the MoH resembles that of a consultancy and its customers. Gundersen (2004) describes this interaction as a shift between a market relation and a clan, in

the way that these organizational forms are defined within the transaction cost theory (Ciborra, 1993). The relation between two actors in a market has the form of exchanges of values according to terms agreed upon. In clans, the actors cooperate towards common goals and share culture and professional competence. When a software consultancy negotiates terms with a customer, they operate under the market conditions. After the deal is closed, system developers from the consultancy establish a team with users from the customer organization, and this team is working towards a common goal of creating a system. During this period they establish a clan relation. However, when decisions concerning acceptance of solutions are to be made, the team usually takes up the roles as actors in a market again, negotiating terms from their own points of view.

Participative processes have to cater for these shifts of focus between cooperating in a clan and negotiating in the market relation. Gundersen (2004) suggests prescheduled points of decision. In this case of interaction with the health sector in Mozambique, the periods of negotiation often appeared as consequences of processes within the Ministry and therefore not according to plans that the project could set. Private companies doing consultancy work for the public sector would guard themselves against shifting policies through contracts, and academic or NGO funded projects could learn a lesson from their experience in market transactions. Since breaking up the clan at some points seems unavoidable, having a strategy for dealing with these situations would be better than regarding them as crises.

Cooperation between levels.

In addition to clans and markets, the transaction cost theory includes bureaucracy as the third way of organizing interactions. The health sector in Mozambique is an organization with a strict bureaucratic structure between the managers, the doctors, and the nurses and other clinical staff. In order to adapt the software system to the health sector, creating a minimum of common understanding of the information system at all levels required some interaction between the levels. Establishing clans including the lower level health workers and the managers from the Ministry of Health seemed impossible; the health personnel in the clinics were too afraid of their bosses. Instead, the HISP team created clan like groups including low level health staff and doctors, and other groups with doctors and the MoH people. Through these ad hoc groups, interactions between the levels took place, and some common ground was established.

In countries with strict bureaucracies, the project teams have a challenging task of creating communication across the levels. The absence of legislation concerning worker participation and culture of democracy at work puts a heavy burden on project teams, which have to create clan like conditions including people from all levels for periods of the adaptation process.

Willingness and ability to participate.

Awareness and sense of ownership creation was one strategy adopted to build the will to participate and align the MoH needs and HISP goals. This was enabled through discussions held in HISP organized meeting, seminars, workshops and training sessions with health workers, top and middle managers and doctors. The lack of basic skills (e.g. arithmetic calculations,

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[3] The three districts were located in three different Provinces whereby the average number of districts is 14.

statistics) and eSkills we believe contributed to the inability to participate. These sessions were organized differently in different places and levels, focusing on eSkills and management enhancement they helped to also build the ability among users to participate with constructive ideas as to identify the gaps of the current system and address them when prototyping the DHIS.

The state of being an owner is recognized to contribute positively to create the interest among the beneficiaries of whatsoever project to participate with muscle power (Rydhagen, 2003) in design process. The underlying idea is that the beneficiaries are supposed to own the project and participate in all parts of the process, from planning to evaluation (IDS, 1996). Although the initiators and the driving force of the HISP project are an academicians and software developer from Norway (educated within the Scandinavian setting), the fact that the initiative, decisions and responsibility were transferred to the locally created HISP team, ensured the sense of ownership and thus the conditions for proper DHIS adaptation.

Should engineering approaches to software development be abandoned in favour of participatory and prototyping methodologies?

For informing and illustrating the discussion towards the answer to the above question, we use the case of HISP in Mozambique, whereas both the philosophy and the DHIS application are being transferred to a new and different setting. There are enormous discrepancies between the Scandinavian and Mozambican settings. It concerns social, cultural, political and technological aspects. For instance the high educated manpower, strong commitment to democratisation at work place, positive attitude to new technology, existence of conditions for law regulated relationship between IS researchers and strong national trade unions. These issues of fundamental importance are almost absent in the Mozambican setting.

The assumption that systems built by engineering approaches can be unproblematically transferred across contexts becomes magnified in diverse contexts as in developing countries. IS cannot be understood the same way as engineered artefacts that can in a standard way solve real-world problems. In order to improve IS development it is key to develop systems that are close to those models of reality of users. And in developing countries, these models of reality are indeed very different than the kinds in the developed world from where such engineering approaches originate. However despite considerable research in software development applying participatory and prototyping methodologies, its successes have not been seen in contexts as diverse as in developing countries such as Mozambique.

4. CONCLUSION

The current case did not allow development of a system from scratch, although this was the basis of the participatory design principles. Nevertheless, the principles were followed to some extent in the process of adapting the DHIS in Mozambique. Participatory design requires that the adaptation of the software in an organization takes place in close collaboration between users and developers, and such collaboration took place at the multiple levels, national, province and district.

The focus on mutual learning process enabled bridging the gaps between the designers' and the users' understanding of the

existing system and the envisagement of the new system. The developers and trainers were a team of computer specialists and medical doctors, such that those adapting the system already are somewhat familiar with the health system and learnt more during the training sessions. The mutuality of the learning was achieved through recurring discussions on ways that the system should be adjusted to fit the health information processes, such that the computer personnel learnt many facets of the health system activities during the course.

The strong bureaucracy in the public sector required three strategies in order to achieve participation. First, the communication between the top level managers and health workers normally takes place one way, top down, but interaction was enhanced by involving academician who were seen as neutral but sensitive to the MoH management problems. Second, participation between system developers and users at the lower level required extensive skills training, due to the users' low level of education. Third, interaction between at the top level took place as an alternating process of negotiation and participatory design. Similar transitions can be expected in cooperation with the upper managers of bureaucracies due to the loyalty squeeze they may experience between the possibly shifting policies of the top leaders and their commitment to the project.

The Scandinavian version of prototyping was crucial in facilitating participatory approaches using a flexible tool (DHIS) to address the constantly changing needs of the national HIS in Mozambique. However problems were encountered in the overall process. They are related to the fact that initially the focus was on implementing HISP ideals at the district instead of multiple levels (MoH, province and district) as was expected by the top level authorities. Shifting the focus to include the MoH and province levels, time misalignment, and lack of resources (e.g. human, financial, and technical) contributed to the delays in implementing the HISP ideals and the DHIS software across the country.

5. ACKNOWLEDGMENTS

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