Community-based Participatory Design in the third world

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ABSTRACT
This paper argues that participatory design (PD) approaches are of particular importance in the third world. Local adaptation of information systems, empowerment and the creation of local commitment and ownership through a participative process are issues of vital importance in third world computing. These are all central issues in a participatory design tradition. The participatory design tradition typically addresses the workplace while a third world environment typically consists of economically deprived communities where the majority might be without formal employment. This paper discusses how the participatory design tradition can be expanded in order to be adapted to third world conditions. In this context it is suggested that the community should become both a participant and an area of focus.

Keywords
Action-based projects, community, health care, information system, participatory design, third world.

MOTIVATION
This paper discusses appropriate approaches to system development in Africa and more generally in a third world environment. Through a focus on empowerment, participation and a bottom-up approach there are reasons to believe that the participatory design tradition could give important inputs to third world system development. The early union-based Scandinavian projects may prove particularly important. The aim of this paper is to discuss the relevance of the participatory design tradition in exploring ways to use information technology (IT) to develop and empower deprived communities in the third world. Because this is a little explored area, emphasise will be on presenting empirical material from two cases from the health sector in South Africa that I participated in. The first case is about the development of a hospital information system in one of the former homelands where prototyping and participation were the central issues. The second case addresses the expectation of the new South Africa: a new health system providing basic health services to everybody. Here the complexity and uncertainty of third world computing are demonstrated alongside the central role that the community can play in third world participatory design aof information systems. At an international economic policy meeting in 1995, Thabo Mbeki, the vice president of South Africa, told the world leaders that the majority of the world's population had yet to make their first telephone call. This illustrates one of the huge gaps in development between the first and the third world. It has been argued that differences in economic development between countries and regions are explained by differences in technological development (Fagerberg, 1989). From this perspective information technology is regarded as a key factor in technological development (Ayres, 1991) and the distribution and exploitation of IT is consequently seen as closely linked to economic development. Sectors and areas where IT is at best poorly applied will tend to lag increasingly behind sectors where IT is highly applied. Thus necessitating ways to exploit IT to promote development of economically disadvantaged sectors and regions in order to start counteracting this tendency in the third world.

But there are serious problems to this technology-driven development strategy which has commonly relied on market economics to bring about development. When IT is introduced in developing countries it will typically be in the form of applications and systems that are "first world solutions" to "first world problems". Such IT solutions are most easily exploited in areas of developing countries that are at best only imitations of the first world--the modern industrialised sector. Successful transfer of technology will often rely on the transfer of the entire *context* of the technology, including work routines and organisation (Kerbal, 1991). As a consequence technology transfer is also transfer of culture and world views, in general, and of ways of solving problems and of defining what problems are to be solved, in particular.

Many have argued that health care is an area where the third world can enhance development by exploiting information technology (see Braa et al., 1995). To better understand how this is taking shape a brief background on health, IT and South Africa is given. A discussion of the participatory design tradition in early Scandinavian projects in comparison with a third world context is also presented here. Clearly there is a need to expand the participatory design tradition in order to adapt it to the third world conditions. In contrast to the technology-driven market approach of technology transfer to the third world, this

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paper ofers examples of how the community can become both a participant and an area of focus for technology development. New policies are based on the community as a key level for social development in the third world. Such development will rely upon community participation in decision-making for social development at the local level (Midgley et al., 1986).

Specifically, this paper argues that the participatory design tradition can be useful in empowering the community and facilitating their participation in management of health services at the local level. The participatory design tradition typically has addressed the workplace while a third world environment typically consists of economically disadvantaged communities where the majority is without formal employment. Thus it is important to recognise that third world participatory design approaches need to emphasise the community, rather than the workplace.

PARTICIPATORY TRADITIONS AND THE THIRD WORLD

The early Scandinavian system development research projects have been important in the evolving participatory design tradition. The focus in these early projects was on empowering workers who where affected by or threatened by new technology and on exploring ways in which their influence over technological solutions could be ensured (Sandberg, 1979, Bjerknes et al., 1987)[2]. As the book-title *Design at Work* (Greenbaum & Kyng, 1991) illustrates, the focus of even later projects remained in the workplace. In discussing Scandinavian systems development research projects and their concern for democracy, Bjerknes and Bratteteig (1995) outline four levels where these projects have addressed technological influence: 1) work situation; 2) workplace or organisation; 3) inter-organizational relations, and 4) working life (comprising legal laws and regulations for the society, including the working life). All are concerned with workplace activities.

In a third world environment the workplace is not a similarly important arena for social and political development. If we hold on to the tradition of striving for democracy and technological influence in third world computing we need to shift the focus from the workplace to the community and add the community level(s) to the above list. Greenbaum and Madsen (1993) put forward three rationales for using participatory design approaches:

- a pragmatic perspective, a functional way to increase productivity;
- a theoretical perspective, a strategy to overcome the problem of lack of shared understanding between developers and users;
- a political perspective, a democratic strategy to give people the means to influence their own work place.

In addition to the three that they suggested, I propose a community perspective as strategy to enhance both the community as well as prepare technical development that goes beyond mimicking the first world. This perspective is derived from the political perspective, but is extended to encompass both the workplace and the community. In the studies that I present here members of the community are users of the health services. A participatory design approach including these users as participants focuses on the end-use of the technological systems to be developed, i.e. community based public health care services. A central issue is to ensure community involvement and to strive towards influence, a pre-condition for community empowerment.

In exploring community based participatory design approaches, lessons from the early Scandinavian projects may be useful. This tradition can be divided into three phases. The first two phases are the first and second generation of political and union-based projects in the collective resource approach (Ehn & Kyng, 1987). The third phase is no longer union based, focusing instead on computing in contexts where ethical issues are raised. (Bjerknes, Bratteteig, 1995). This third phase I believe includes the present politically neutral participatory design tradition.

The first generation of collective resource projects aimed at empowering workers rather than management in questions regarding technological changes and threats to the workplace. The workers they addressed were not defined by profession or skill but by the fact that they were in opposition to and oppressed by capital. The unions participating in the Iron and Metal Workers Union project (NJMF) (Nygaard, 1979) were organized according to employer and not according to profession or skill. The unions thus included a wide variety of skilled and unskilled workers. The strategy at the local level was to develop knowledge about the technology in question and to propose technical alternatives to those proposed by management. One of the first reports from the NJMF project was called "Knowledge is power" and their approach could now be called "empowering through learning". The knowledge thus developed then formed the basis for action at the central trade union as well as the political level. A technology agreement giving all unions the right to negotiate over new technology resulted from the NJMF project. The second generation collective resource approach projects shifted toward producing technological alternatives by designing for skilled workers (e.g. the UTOPIA project (Bodker et al, 1987, Ehn & Kyng, 1987) and the FLORENCE project (Bjerknes et al., 1987)). As a consequence the focus narrowed down to smaller groups of skilled workers, contrasting with the first projects which aimed at empowering all workers.

This paper offers evidence that the broad and multi-levelled "empowering through learning" approach of the first generation of Scandinavian projects, in combination with a focused "design for empowerment" version of the second generation, will provide important inspiration for a emerging community participatory approach to information system design.

HEALTH CARE AND INFORMATION TECHNOLOGY

Implementation of a primary health care (public health care) approach is a key element in the two cases presented here. Public health care is a preventive and holistic approach to health care, as opposed to the traditional curative and instrumental hospital-based approach (WHO,1978). The district health model is proposed as the most effective way of delivering primary health care and of organising health services (Amonoo-Lartsen et al., 1984). Key issues in district-based care are:

- the decentralisation of authority to a local management team
- sectoral and intersectoral cooperation and
- community participation in the services.

Local analysis and use of information is a crucial factor in the primary health care concept (Wilson et al, 1987). Where the hospitalinformation system focuses on the part of the population entering their premises as patients in a patient database, theprimary health care system must encompass the entire population living in a geographical area--a district. Everyone knows what a hospital is, while the district concept is much more difficult to grasp and there are still few, if any, working examples of district based information systems to learn from. Traditional health information systems collect data in order to make *retrospective* analysis - at a higher level. In primary health care the challenge is to analyse and use the information *immediately*, at the same level where it is collected , thus local information to support local action (Opit, 1987). Community interests mean that theinformation system must give them the possibility to both survey the health system and the health status of the population and to set and assess targets. For these reasons information systems to support primary health care need to be tightly connected to the work process and community interests which are dynamic and changing.

Health services in South Africa

In South Africa the differences in development between the first world and third world are staggering. While the white minority of the country is served by one of the most technically advanced (private) health services in the world, the majority is left with very poor health status and fragmented, typically third world health services. Reconstruction of the health sector is among the priority areas in the Reconstruction and Development Program (RDP) (ANC, 1994) of the new government of national unity. The primary health care approach will be the underlying philosophy for the restructuring of the health system and the development of decentralised public health districts will be a crucial step in achieving this. The Development of a National Health Information System is a prioritised task. The process is now under way to provide all hospitals and clinics with basic information systems for patient administration over the next few years, with drug administration as a next step. All clinics and hospitals will be networked.

The exisitng health system is fragmented in every conceivable way - by race, type of service and geographic region. The race fragmentation is relatively obvious, with different authorities providing services for each of the four race groups (whilte, coloured, black and Indian). Wthin that framework, different services provide preventive and curative health care separate from specialised "vertical" services such as tuberculosis, obstetrics and psychiatry, and rural services are provided by regional services councils. Each "homeland" and each province in South Africa had its own separate system functioning independently. The result was that until May 1994 there were fourteen "departments of health" at the central level and more than 400 local authorities and regional service councils of different types. The unified district health system with new managerial structures responsible for public health care at local community level is intended to solve this outdated and complex administrative problem.

The two cases

System development in thethird world must handle situations and problems that range from those relatively well known from the first world to those where new solutions addressing problems particular to the third world must be developed. The two cases from South Africa illustrate each end of this range. The first case from Mdantsane is of the first type and pre-dates the new South Africa (after the elction of April 1994). The focus of this case was on a hospital information system that exemplifies a well defined problem area and a relatively mature technology from the first world. A main lesson is that the participatory design approach used in the development of the system was a pre-condition for its success. The second case, from Mitchell's Plain, is of the second type. It is curently ongoing and addresses the expectations of the new South Africa: a new health system providing basic health services for all including community participation in its management. Here the complexity and uncertainty of third world computing are demonstrated. The problem area is not well defined, there are no examples to learn from and new solutions must be developed. Also in this case participation is a pre-condition for progress but in a way that transcends known participatory design practices that focus on workplaces.

My background in the first case was a four day visit to the sites. Before the visits I had studied the system documentation and discussed the project several times with the person who initiated the project and developed the system. In the second case I have participated in the project as a researcher since the start of its initial phase in October 1994. The research has been funded by the Norwegian Research Council.

CASE I - A HOSPITAL INFORMATION SYSTEM IN MDANTSANE

Mdantsane is a rather typical poor South African township with a population of 300 - 350.000 people situated on the outskirts of East London. As part of the apartheid policy, Cecila Makiwane Hospital, was built for the black population in Mdantsane in 1978..When the homelands

were created the 1200 bed hospital became the referral hospital of Ciskei as well as a local hospital where it provides comprehensive public health care service through mobile teams and 18 clinics. In Ciskei a group of progressive doctors created an unified health system based on a public health care approach with health districts containing a hospital and a number of clinics managed from the hospital.

In 1988 the manager of the pediatric department (6 wards, 250 beds and a outpatient section) at the hospital, who was also a computer enthusiast and a programmer, started to develop an information system. The first objective was to improve communication between the hospital and the communities they served. The hospital got many questions from clinics and doctors about the patients they had referred, but they had no feed-back mechanisms. The system now produces a letter to the referral parties within two days of arrival and one when the patient is discharged including diagnosis, treatment in the ward and recommended follow-up treatment. A copy is given to the patient. All clinics are provided regularly with a report on all patients from their area and reports on preventable diseases.

Apart from this communication function the system is tailored to the needs of the doctors who are the only users. They register patients, use the patient records and print reports. A networked computer is placed in each ward and one is in the manager´s office. The core of the system is a basic patient record database including diagnosis and treatment history. Some reports are used in day-to-day management like the daily ward report while others are periodical statistics used for retrospective analysis of the major health problems incurred by children, such as gastro-enteritis, pneumonia and malnutrition. The system is not part of the hospital´s (paper based) patient management system and thus represents a kind of double book keeping.

The first basic prototype was developed by the manager of pediatrics working "every night in six weeks". Eight 286 PCs were purchased and installed in the wards, the outpatient section and in the manager's office. The system was programmed in Clipper. Every night during the first three weeks the system had to be modified in order to run properly. Features to make the system more user friendly were added over the next nine weeks after the initial testing. During the next nine months the system underwent a continuous further development as a collaborative effort between the programmer/ manager and the other users; the doctors. After a year the system was developed into its final form. According to the managing doctor:

> "Literally every day during one year I had to recompile the system. Every day people pointed at some problems or they suggested improvements. Then it was important to give them what they wanted the day after, before they forgot it. In the beginning the focus was on technical problems but very soon constructive comments and proposals took over."

Shortly after the managing doctor left the hospital and a new manager took over the department. He is also an enthusiast and committed to the system but he has so far not been able to maintain or develop the system further. The system is very much a "legacy" system; it is difficult to redevelop for other than the one who developed it. There are no resources available to hire a programmer. The manager would have had to do the programming after hours, leaving too little time to get a good enough understanding of the system. Thus the system has been more or less unchanged for the last 7 years. Small problems have accumulated to bigger ones over the years (e.g. the file system needs to be reorganised), the environment has changed and new needs and requirements have emerged.

The system is very much running by its own momentum. There has been no moral or technical support from the part of the hospital to the system and there is no dedicated computer person in the hospital to maintain it. Despite this low-tech environment the system has been quite robust. During the eight years it has been in operation only about one PC and one keyboard a year have been replaced due to malfunctions. The main technical problem is cockroaches and their droppings - they love the heat and the darkness inside the keyboard. "Nine out of ten times a malfunction in the keyboard is repaired by turning it upside down and shaking it." Dust is also a serious problem.

The registration of all patients is extra work, but the doctors I met all said that the benefits of the system far outweigh the burden, and close to 100% of the patients are being registered. All notifiable infectious diseases like tuberculoses, measles etc. are to be reported on special forms to the Ministry of Health. For various reasons this was regarded as a burden by the doctors and it is not always done. Now, however, based on the diagnosis entered by the doctors the system generates the reports of notifiable diseases "automatically". This feature is very popular and the system did not get a general acceptance before it was implemented.

When the system was introduced to the surgical department it was a failure. The surgeons did not see the benefits in the same way as the pediatricians did. A main reason for this was said to be that the surgeons had other professional interests and needs. Pediatricians are more biased towards preventive care, and have a more holistic approach to the patient and her medical history than the surgeons who on their side have a more narrow and technical bias, "more case than cause oriented."

To see how the communication part of the system was perceived from the other end, I visited one of the clinics. It employs 8 nurses and 6 other staff and refers about 80 pediatric patients to the hospital every month. The head nurse told me that they were "very happy with the system". The direct benefit of the system was that they were able to learn what happened with their patients in terms of diagnosis, treatment and results. For example, they might refer a patient with what they believed was pneumonia and get back a diagnosis of asthma. They have approached other departments at the hospital and asked them to provide them with similar feedback without results.

In a new project all clinics in Mdantsane are being provided with PCs linked to the hospital with modems. It is a pilot project with an aim to asses the potential of computer aided communication in using the hospital as a resource for the clinics. Nurses and health workers are encouraged to put forward all kinds of problems and get answers and feedback from experts in the hospital.

Analysis of Case I

A system that has worked well for 8 years without major problems in a low-tech environment, is a rare case in South Africa and in Africa in general. According to the developer the most important lessons on good practice in system development were: The system must fit very well with the users needs and through their own experiences the users must feel that the system improves their situation. If not, the system will not be used. Ensuring real user involvement. requires something to be put in front of the users, preferably a real application, and that suggestions and ideas from the users are implemented as soon as possible. The system should be based on local initiative and be driven from within and at least one person, the person responsible, must be committed to drive the system and the process.

The information system in this case was developed with evolutionary and "rapid" prototyping in close participation with the users. The fact that the system is regarded as very useful by the users and was developed with a bottom-up approach csupports Walsham (1992) who advises developing countries to move towards "bottom-up" approaches to decentralised information systems, since "top-down" approaches are unlikely to be successful.

The problems addressed and the technology used by the system development process was easily defined and well known; a patient record database and patient administration. As a result, the basic system could be implemented comparatively rapidly and the participatory development process could focus directly on the doctors needs. Another reason for success was that both the application and the user group were small.

The communication part of the project was more limited. The clinics did not use the reports for home-visits as was the intention. As a first step the clinics should have been included as participants in designing the system. BIn retrospect a clinical database would have been useful,. since addressing the needs of primary and preventative health care needs to transcend the hospital context presented in this case.

CASE II: MITCHELL'S PLAIN - DISTRICT-BASED PRIMARY HEALTH CARE

Mitchell's plain is a commuter town on the outskirts of Cape Town, created for "coloured" people in the 1970's as a result of the notorious apartheid "group areas act". Coloured people were defined by apartheid as being neither white, black nor Indians, but people of mixed race. The incident rate of tuberculoses is possibly the highest in the world. Unemployment, gangsterism and violence are alas rampant. Health services are run in fragmented lines with four major authorities running the various services.

Mitchell's Plain was one of the first places in the new South Africa where representatives from the different parts of the health services came together to start building anew unified management structure at district level. Alongside the seforum, an umbrella organisation with representatives from grassroots and community based organizations, was a driving force. In the new health structure the communities are given the right to participate in managing the health services in a district.

Many of the community organizations have a history dating back to the struggle against apartheid. Eastridge/ Beacon Valley development committee established in 1983 is a good example of a community action program. It has about 45 members engaged as coordinators, group leaders or community workers in 8 sub-committees such as safety and security, sport & recreation alongside health. They run an advice office and an education center in their community center. They have been aedriving force behind the public health care forum and have a motto that states: "Health action, as an entry point to social action and holistic development." As one community activist explains: "Health makes the ideal vehicle to social and political action in a wide range of areas because the health system is well developed and requires an intra-sectoral approach". Tuberculosis, as an example, is as much a socio-economic disease as it is a medical one - it can only be eradicated through social action.

One of the first priorities identified by the embryonic district health management team was the need for adequate information on the area. An initial survey done in October 1994 identified significant gaps in available infrastructure as well as lack of information specific for Mitchell's Plain about health status, institutions and service management. An information committee was established to plan, develop and implement a Health & Management Information System (H&MIS). The process started with an identification of all the role-players in the area and an analysis of the flow of information between the various levels. Diagrammatic representation of the current flow (see figure[3]) shows the fragmentation and lack of coordination of information.

A follow up survey using questionnaires and focus group discussions was conducted to identify staff attitudes to collecting data and quality of service delivery (Braa, Heywood, King, 1996). The results show that data is kept on most activities ranging from inpatients, ante natal and immunisation to home visits and community activities. The survey found that the health care professions did not think that the statistics were useful in their daily work, or as one put it: "Keeping stats is a waste of good time". Everuone had to keep statistics on what they do and spent a minimum of one-half hour a day totalling and transferring data onto other forms. Each clinic sends a 30 page booklet of raw data to the head office every week, and a copy is kept on file locally.

Data is not available at one central spot in the district because of the fragmented nature of service delivery. Therefore, data can not be analyzed and coordinated at the

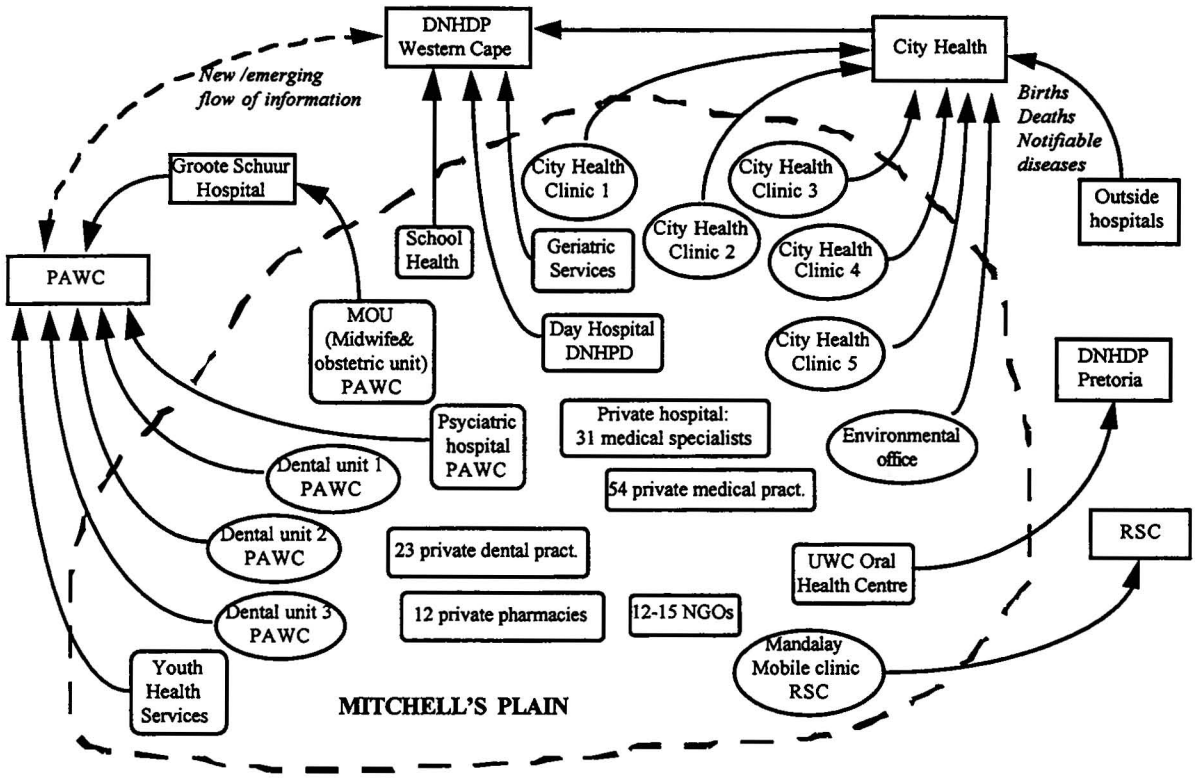

Figure 1. The figure shows the flow of information in Mitchell's Plain health district. Abbreviations: DNHDP (Department of National Health and Population Development (pre-election name)); PAWC (Provincial Administration Western Cape); RSC (Regional Service Council); NGO (Non Governmental Organization); UWC (University of Western cape); City Health (Cape Town City Council Department of Health.) Circles and boxes inside the dotted line are health services and the boxes outside are all different head offices. Points to be made are that health services are reporting to different head offices such that coordination of information is impossible at both district and central level and there is little or no feedback.

district level. As the figure illustrates, data is sent to different sections of different head offices so there is no way it can be coordinated at higher levels either. Information is transmitted in raw form, with no compilation or analysis amd there is no local use of data.

These results paint a grim picture of the present information systems. It is however important to emphasize that information systems are integrally linked to the structure and functioning of health services and these systems were developed to support the centralized and vertically organized health service of the past. It is no wonder that the information systems of the apartheid era are inappropriate to support the emerging district system. This health data was collected and analyzed to make retrospective analysis rather than to support local management. A reason why huge amounts of raw data is being sent to head office, e.g. name and address of all home visits, is to control the work of the health workers and not to empower them.

The survey has been followed up by a series of meetings and selection of a steering committee with representations from all health institutions as well as from the community. Plans have been drawn up to act on the findings of the survey, defining information needs and setting up a step by step process to develop ways of using information for decision making for management and service delivery at institution and district level. A first step is to identify the priority health problems at each level and to define concrete targets to aim for in order to solve these problems. The next step is to define indicators to be used to assess how the targets are met, to define the data needed to calculate these indicators and to set up routines to collect this data. A third step then is to start using this system of targets and indicators in the daily work, to refine and develop it on an ongoing basis and to develop what is loosely labeled an "information culture".

The project in Mitchell's Plain and similar projects in two other townships in Cape Town form an overall pilot project and have now (April 1996) gotten funding from Norway for personnel and equipmentt. The plan for the project includes a participatory approach using techniques such as prototypes, maps and wall charts in well defined sub activities in and between the institutions and in the community group. One focused activity is mother and child healthcare involving a cross section of institutions. The project group sees its main objective to provide information support to district management by developing information systems at institutional and district levels in parallel. The district system will include aggregated data from all the systems. The information system is understood to include the organizational setting and involves collecting, analyzing and using information regardless of whether it is paper- or computer-based.

The community has their own perspective about the information system. Community participation in the planning, managing, monitoring and evaluation of health services will rely upon appropriate information. In order to have influence in building the new health structure, the community will need regular, useful feedback on the achievements and constraints of the health services. In defining their requirements to the health services they need information on the general situation in their community on population, health and socio-economic conditions. Also they plan to use mass media in order to get maximum coverage in interaction with their constituency. Their need for insight into the health services is rather congruent with the needs of health management and - workers. Information on and from the community, on the other hand, is an area where the community has particular interests in documenting their needs.

The community activity is the least defined one because there are no examples to draw from. As a guideline a scenario was described and discussed. The scenario states the problem as: Tuberculouis is the most serious health problem in Mitchell's Plain with over crowded houses as a main cause. According to the scenarios a proposed action is to make a survey of the housing situation and plot it on a map, finding data on all known cases of TB and plotting them on a similar map. If the two patterns match it can be documented that bad housing is a dominant factor behind the high incident rate of TB. Since the health services are not responsible for building houses this information must be turned into action at a political level. Following this scenario the community, empowered by their own information system, has the potential to achieve more than the health services do. This scenario "correlated" very well with theprimary health care forums ideas aboutprimary health care activities to be turned into social and political action. A next step will be to collate information from many sources and produce a health and socio-economic profile for Mitchell's Plain and a corresponding action plan.

Differences in perceived goals and background may cause some problems in the collaboration between the community and the service providers. The health service part of theinformation system is much better defined and understood than the community part and the community has no examples to learn from. Together with a general lack of knowledge about IT in the communities this has caused people from the community to be "sidelined" in meetings and work-shops by people from the health services that have a much better understanding of their own needs and requirements for the information. Discussions tend to become technical, like what are the most useful data and indicators from maternal and child health, how to best represent different forms from the hospital in a database, etc. These are all special purpose questions of importance to the different sub-areas of the project and they are typically discussed in the expert language of the medical and information system professions. These languages are more or less alien to the community. To solve this problem our project is demostrating that it is necessary for the community to establish and develop their own area of technological expertise.

Analysis of Case II

In Mitchell's Plain it is the health system itself that is in focus and the aim is to provide the best possible health services to the communities. The information system to be developed shall support this process. Traditional system development aims at support for work processes that are relatively stable and that already exist. This is difficult in Mitchell's Plain where work processes, services and management structures are not yet in place and are being developed alongside theinformation system. The problems to be solved by theinformation system is not easily defined and there is no well defined step-by-step way forward to proceed. As a consequence there is substantial uncertainty in connection with the system development process. In such situations (Andersen et al, 1986) recommend explorative approaches and close user participation. The project´s prototype and participatory approach is along these lines.

The uncertainty is highest with respect to the community part and theprimary health care/district concept. The task of involving the community in both theprimary health care based health system and as participants in the system development process are problematic ones. The concept of aninformation system to support the community must be explored through experimentation. In sub-parts of theinformation system within institutions and in focused areas like mother and child health and nutrition, problems to be addressed and requirements to the system are more well-defined. In these areas the case from Mdantsane might serve as a learning example. Here the creation of local ownership and commitment and the development of a system serving local needs, both issues ensured through a participatory process, were the crucial factors. In creating communication and learning with regard to theinformation system at these different levels the entire tool-box from the participatory design tradition might be useful.

The user-role (levels) is also more complex than is usual in traditional system development. Health workers, district management and the communities are all users of theinformation system at different levels - all having different interests and relationship to the health system. Most of them are not users in the workplace-user sense, users as addressed by the participatory design tradition.

A particular aspect of the community's role is that they are users of both theinformation system and the health system. In their perspective theinformation system is to *empower* them by strengthening their involvement in the health system and the wider society.

Some researchers have proposed that health information should be restricted to the scope of action of the management in question (Sandiford et al, 92). From this perspective only information that may be acted upon is relevant according to this approach: The health services have no influence on housing and other socio-economic factors. Thus information on these issues is not relevant because it is outside the potential scope of action.

The community, on the other hand, will have a much wider scope of action if they turn the information into political and social action. This is exactly what the community organization wants to do and that is the reason why they are interested in theinformation system. From this perspective participation will empower the community and enhance involvement in a wider area. In this perspective also, the community will have particular requirements both to contents and focus of theinformation system.

The community approach includes many levels of activity: activities including activists and representatives from the community, activities where the broader community is approached, e.g. by using local radio, local papers and open meetings, and activities on the political level where more global goals on social development are addressed. Thus, a community based participatory design approach must be multi-levelled.

In the first phase of Scandinavian projects the workers aimed at influence with respect to the new technology in a situation where they were threatened or seriously affected by technological changes. In Mitchell's Plain the situation is different. Here as in many other places in the third world the communities are side-lined by the world economy and only indirectly by the technology. The objective in Mitchell's Plain is take control over the new technology and use it to empower and develop the communities. In order to achieve this the community must learn about the technology within the framework of their own knowledge and language and they must explore how it can be used to their benefit. Here the early Scandinavian projects may provide useful inspiration.

COMMUNITY PARTICIPATION AND THE SCANDINAVIAN TRADITION

This section looks at possible relations between community participation and participatory design as practiced in the Scandinavian tradition.

Can a community be compared with a union in the Collective Resource approach (Ehn & Kyng, 1987)? A community only makes sense in this respect as a organized unity striving for social development and/or political power. In pursuing its political goals a community has the potential to develop organizational structures which can be used to exercise power. The Mitchell's Plain case as well as the recent history of South Africa exemplifies this. It is a matter of fact that it was the Struggle carried out by the communities in the townships that made South Africa ungovernable and eventually over turned Apartheid - and not the unionized labor by the way of a general strike.

Communities may be compared with unions in terms of being made up of organized units pursuing concrete goals. But there are important differences apart from the obvious ones. For example, a community consists of many different organizations, political groupings, ethnic and social groups, each having different goals and agendas. For this reason different constituencies will typically be engaged depending on the issues in question. Some issues are controversial and there will be political conflicts while on other issues there is consensus. In the Mitchell's Plain case there is a general consensus in the communities over both the need for, and the importance of, an information system to support them. But there is a potential political conflict regarding the control of the process. In Mitchell's Plain the community structures are allied either with the African National Congress (ANC) or with the Nationalist Party. The community information committee has been elected by the structure of health committees mostly allied with the ANC, because that was the functioning structure at that time. As the Nationalist Party has just won the local election in Mitchell's Plain it is possible that their organization will now want to be more involved. This might increase the level of political conflict, but due to the consensus on the overall goals among the communities it should be possible to solve them along the way. Thus, despite the complexity and potential conflicts it makes sense to conceive of a community as an entity for the purpose of trying to develop and use IT to their advantage. Thus communities resemble unions in that their organizational structure and political struggles are based on coalitions of experience and local knowledge.

An important difference between South African communities and Scandinavian unions, is that technological solutions are not being imposed by management in South Africa. In Mitchell's Plain the community is primarily ignored, rather than threatened by technology. Thus for exploiting IT for their advantage, they not only have to learn about it but they also have to decide how it should be used. For this reason lessons from the second generation collective resource approach projects can be adapted from "designing for skill" to something like "designing for empowerment". It is empowerment and social development and not skill that are the issues in the community, clinics and hospital in Mdantsane and in Mitchell's Plain. The cases illustrate the potential for the broader and multi-levelled approach of the first generation of Scandianvian projects to be coupled with the empowering focus of the second generation projects and adapted to South African conditions.

The community has a "double" relation to the information system being developed in Mitchell's Plain: Together with health workers and health management the community participates in the running of the health services and information systems are needed to support this. But the community's requirements for improvements related to health go beyond what can be achieved through the health services. They included housing, jobs, sanitation, etc. These issues need to be be addressed at a more global and political level with community based development of nformation system supporting them. This multi-levelled approach has some parallels with the Norwegian Iron and Metal Workers Union project where local and national (political) action supported each other.

Health workers, health management and the community are all engaged in the participatory design process in Mitchell's Plain and the entire participatory design-toolbox may turn out to be useful. But at all levels of the design and system

development process there will be strong elements of empowering as was shown in Mdantsane. Development of deprived communities in the third world is basically a political issue and resources are hard to come by. As a consequence the politically neutral approaches and techniques from the present third phase of the participatory design tradition will have to be explicitedly applied within a political framework.

PARTICIPATORY DESIGN AS A MEANS TO COMMUNITY EMPOWERMENT

In Case 1 the information system has been running for eight years and demonstrates that sustained system development is possible in a typical third world environment with limited resources and little support.

In the second case in Mitchell's Plain local commitment and ownership in the "project-process" and a participatory process have been at least as important as was the case in Mdantsane. Whereas in Mdantsane the technology and problems were relatively known, this is not the case in Mitchell's Plain and traditional system development as well as work-oriented participatory design have to be transcended. Two major development issues are:

- Traditional system development aims at support for work processes that already exist or are planned. In Mitchell's Plain the aim is to support and provide services to the community--services that don't yet exist.
- Traditional participatory design focuses on users in a workplace context. In Mitchell's Plain the focus is on improvement of the health services and on the community and their involvement.

In Mdantsane the system development process had to handle situations and problems that are relatively well known from the first world. The objective was to make an adaptation to the local third world context. In Mitchell's Plain neither the problem situation nor the solutions are known from the first world. The general objective is to develop a deprived area and empower the community. Systems development is generally categorized as a process of identifying problems and defining their degree of uncertainty (see Andersen et al, 1986). I use the following general categories in describing the situations I saw in South Africa:

- Uncertainty regarding the *context* of the system development process. This is the case when problems and solutions are well known from the first world, but users, organizations and society in the third world environment have limited knowledge about and experience with IT.
- Uncertainty regarding the *goals* of development which includes the problems to be solved and possible solutions. These are problems like those found in the second case, which are not yet solved in the first world.

When the uncertainty is high (Andersen et al, 1986) recommend experimental approaches and user participation. I argue that when the uncertainty of the first type is high, as in the first case, user participation is crucial and techniques from a wide range of praticipatory techniques will be important. When uncertainty of the second type is high, a participatory approach is as crucial, but in many cases the participatory design tradition will have to be extended to include the community both as participants and an area of focus, as is the case in Mitchell's Plain.

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[1]During 1996-7 I will be working at Department of Community Health, University of Cape Town, South Africa, but email and mail may be sent through the Norwegian Computing Center.

[2] In the 1970s I worked with the Norwegian Iron and Metal Workers union which was a key participant in the first workplace technology and democracy projects.

[3] This figure is developed as a result of a participative process involving people from the health services that took part in the information committee. Many repetitive drawings were corrected and added to. This was the first time information flows from all institutions were seen in relation to each other and it has been much used as an illustration of the (former) fragmented health structures.