INFORMATION TECHNOLOGY AND HEALTH SERVICE DELIVERY

An Investigation into the Personal Digital Assistants Project in rural Uganda

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ABSTRACT

Lack of adequate information on disease management and treatment is one of the pressing health care problems in Africa. Determining priorities when planning health interventions is also not easy due to lack of reliable evidence and methods of identifying priorities. Great developments in the new information and communication technologies (ICTs) during the last few decades have aroused much hope that they can help deal with such health issues. This is due to factors such as the ability of these technologies to go beyond boundaries of space and time and to carry out multiple functions at amazing speed. Many developing countries are therefore increasingly acknowledging that there is an urgent need to harness these ICTs to address locally relevant problems. In Uganda, a country where funds, electricity, telephone lines and skilled medical personnel are not readily available, Personal Digital Assistants (handheld computers) have emerged as one of the channels through which medical information can be availed to health workers in rural areas. The Personal Digital Assistants can also facilitate health information management. Premised on the modernisation theory of development, the theory of the information society and the diffusion of innovations paradigm, this thesis investigates the way the digital assistants are playing the two roles above and how, in so-doing, they affect health service delivery in selected rural areas in Uganda. It highlights the fact that by making medical information available to health workers, the PDAs have boosted the health workers' capacity to handle health issues. Furthermore, they have automated the health information management reporting system, the result being complete, timely and accurate reports that act as early warning systems and facilitate health planning. The thesis argues that in spite of the fact that there are obstacles to the use of new ICTs in Third World settings, through an assessment of the benefits they can bring and the risks countries face if they ignore them, the obstacles can be dealt with and the ICTs' maximum potential to contribute to social change realised.

ABBREVIATIONS

CD-ROMs	Compact Disc-Read Only Media
CME	Continuing Medical Education
DDHS	District Director of Health Services
GNP	Gross National Product
GSM	Global System for Mobile Communications
HIV/AIDS	Human Immune Virus/Acquired Immune Deficiency Syndrome
HMIS	Health Management Information System
HSD	Health Sub-District
HSSP	Health Sector Strategic Plan
ICTs	Information and Communication Technologies
IDRC	International Development Research Centre
ITU	International Telecommunications Union
MHCP	Minimum Health Care Package
MoH	Ministry of Health
MoWHC	Ministry of Works, Housing and Communications
MTN	Mobile Telephone Network
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NHP	National Health Policy
PDA	Personal Digital Assistant
PEAP	Poverty Eradication Action Plan
PHC	Primary Health Care
RCDF	Rural Communications Development Fund
RCDP	Rural Communications Development Policy
RESCUER	Rural Extended Services and Care for Ultimate Emergency Relief
TBA	Traditional Birth Attendant
UCH	Uganda Chartered HealthNet
UHIN	Uganda Health Information Network
UNCSTD	United Nations Commission on Science and Technology for Development
VHF	Very High Frequency
WHO	World Health Organisation
WSIS	World Summit on the Information Society

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CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.0. Introduction

> The digital revolution, fired by the engines of Information and Communication Technologies, has fundamentally changed the way people think, behave, communicate, work and earn their livelihood. It has forged new ways to create knowledge, educate people and disseminate information. It has restructured the way the world conducts economic and business practices, runs governments and engages politically. It has provided for the speedy delivery of humanitarian aid and healthcare, and a new vision for environmental protection (World Summit on the Information Society).[1]

It is an accepted view among many scholars and researchers that in the last three decades, an information revolution has been taking place, catapulting us into an information society where the new information and communication technologies (ICTs) dominate (Castells, 2000; Bell, 1999; Brody, 1990). In this society, too, information and knowledge, produced by the new ICTs, are key to socio-cultural, economic and political development. The possession of information confers power on its owner.

The dominance of this notion has placed the new ICTs at the centre of efforts aimed at promoting development. In the developed countries, the ICTs have infiltrated most sectors of society, while in the developing countries; the process is beginning. Many ICT projects have sprung up to address issues such as gender discrimination, access to markets for produce and low health indices. Uganda has also jumped into the fray, coming up with a national ICT policy that recognises ICTs as a catalyst for development. On this basis, the country has set out to integrate the technology in its development plans.

Uganda's health sector is one of those that are benefiting from these initiatives, with the new ICTs being employed, for instance, to promote health service delivery in rural and isolated areas. This is necessary, considering the fact that only 49% of Uganda's

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[1] Why a Summit on the Information Society, http://www.itu.int/wsis/basic/why.html: accessed 08/02/2005

population lives within five kilometers of a health facility (MoH, 2002). The relationship between the new ICTs and health service delivery is the focus of this study.

The thesis argues that the expectations which the new ICTs generate for health improvement in developing countries stem from their role as an instrument for continuing education and their use as a mechanism to improve the efficiency of routine medical surveillance. This is because information underpins the assessment of health needs, the development of health strategy and the monitoring of progress. Equally, communications provide the essential links for consultation, discussion and dissemination of knowledge between health professionals, other individuals and organisations affecting health and the general public (Hughes et al., 2002).

The thesis highlights the fact that the new ICTs should not be regarded as a magical potion that can completely change the situation on their own. They need to be used together with the conventional communication media. Furthermore, in harnessing ICTs, it is necessary to put in mind the context in which they are going to be applied and the various factors that may impinge upon their effective utilisation.

1.1. The Problem

Since the mid-1970s, there has been a steady growth in new ICTs and their application in development. Among other things, these ICTs are expected to help people in developing countries find markets for farm produce, arrange for the delivery of inputs like raw materials, supplies and tools, expand educational opportunities and promote telemedicine (Chandrasekhar and Ghosh, 2001). Because of this potential, it has been said that new ICTs could be part of the solutions to the problems of developing countries, such as poverty, poor health indices and poor governance.

On the other hand, critics charge that the new ICTs' potential is being exaggerated and that the developed countries are just using the technology as part of their foreign policies (Hanson and Narula, 1990). Hanson and Narula state that by a transfer of technology these countries may reinforce consolidation of their economic power and dominance but

they may not be willing to transfer their top-level advanced technologies to the developing countries. What they may transfer is only second- or third-level technology, thereby creating even more of a disadvantage for development, and exacerbating colonial legacies of exploitation, cultural domination, or force (ibid.: 7).

Other criticisms stem from the claim that new ICTs cannot offer the same benefits to developing countries as they have offered the developed. Melkote and Steeves (2001) say this is because serious constraints exist that will inhibit the use of ICT-based information by people in Third World countries, especially those in rural areas.

These arguments notwithstanding, it cannot be denied that some of the new technologies match the requirements of developing countries. Furthermore, these technologies lend themselves well to the creation of localised communications media. With these capacities, the technologies can enable people in developing countries to access appropriate and useful information for development, and they can diffuse opportunities to rural and/or underserved areas.

This study uses, as its point of departure, the difficulty of providing essential health services to people in rural areas in Uganda, a developing country in sub-Saharan Africa. Since the country has not yet reached a level where new ICTs can directly benefit individuals, the study focuses on analysing the way these ICTs facilitate health practitioners' work, which, at the end of the day, contributes to the quality of the services they offer to the people.

The study focuses on rural areas because rural health care delivery is demanding and at the same time challenging. The rural health practitioner frequently works in an isolated environment, with inadequate resources and limited or distant specialist back-up resources. S/he is often expected to perform a generalist role in every aspect of clinical practice. Because of this, s/he must develop and maintain a special base of knowledge and technical skill in a variety of clinical areas. The practitioners also encounter barriers to participation in professional development and continuing education programs. These

include being far removed from library resources or having no libraries at all, and the long, costly distances to meetings/workshops organised by their professional associations (KDE, 2003).

1.2. Objectives of the Study

This study aimed at achieving four major objectives. These were:

1. To show how new ICTs have been put to use in the health (service delivery) sector of Uganda, and the kind of benefits they have wrought;

2. To look at the obstacles in the way of developing countries' maximum exploitation of new ICTs;

3. In line with the above, the study also aimed at coming up with suggestions on how the obstacles could be tackled, or recommendations on how the new ICTs could best be harnessed;

4. The last objective was to explore the debate surrounding new ICTs and the information society, in the same vein exploring allegations by critics that new ICTs' importance to developing countries in this day and age is being over-hyped and over-estimated.

1.3. Research Questions

The study set out to answer the following questions:

1. Can new ICTs contribute to an improvement in the health of people in developing countries?

2. How are the new ICTs being harnessed to help improve health service delivery in rural Uganda?

3. What constraints and/or challenges do new ICT users (individuals and nations) face, and how can they be overcome?

1.4. Justification

A study on new ICTs as tools that facilitate information transfer and exchange to promote development in Uganda was worth doing because of the following reasons:

First, almost half of Uganda's population has poor access to health services, due to factors like poor quality of the services, long distances from those services and the cost of using them. Furthermore, there is a shortage of health professionals in the country (PEAP, 2001: 126), and the few who are available are concentrated in urban areas. It was therefore necessary to investigate attempts to use the new ICTs to improve the delivery of health services to people with little or no access to these services, since the ICTs have been hailed for having the capacity to facilitate social change and improved quality of life, and to improve the cost-benefits of rural social service delivery (White et al., 1994).

The second reason was that the experiences of other countries – both developed and developing – that have employed new ICTs in their socio-economic sectors show that used in the right way and for the right purposes, these ICTs can have a dramatic impact on the achievement of specific social and economic development goals, as well as playing a key role in broader national development strategies. Ghana applied them in her public health planning and administration system, where a test survey using Personal Digital Assistants (PDAs) was carried out in conjunction with a measles immunisation programme. The test was a success, gathering epidemiological data with unprecedented speed and ease. In only three days, 2,400 surveys were completed, something that usually took up to six months.[2] In India, too, ICTs have been employed in numerous projects, many of which have brought trade, health services and education closer to the people.[3] These success stories were therefore reason for investigating the application of ICTs on

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[2] Stockholm Challenge, http://www.challenge.stockholm.se/feature_right.asp?IdNr=26: accessed 01/11/2003

[3] One example is the model 'wired village' project around Warana Nagar in the Kolhapur and Sangli districts of Maharashtra, India, whose goal was to bring computers to rural and semi-urban areas in the country. It was designed as a pilot project that would demonstrate the contribution an Information Technology (IT) infrastructure could make to the socioeconomic development of a cluster of 70 villages. The project aimed at providing villagers with agricultural, medical and educational information at facilitation booths in their villages, and access to the Internet. Reports showed that it had led to more informed use of facilities at village level primary health centres and increased opportunities for distance education. The Indian Government's IT Task Force even recommended that the 'wired village' project be replicated across the country's villages (Chandrasekhar and Ghosh, 2001).

the Ugandan front, being a developing country that has perceived the technology as potentially useful.

Third, there are a number of barriers to the use of new ICTs in Uganda and other developing countries in general. These include lack of electricity, poor ICT infrastructure, low literacy levels and the prohibitive cost of the technology. It was therefore important to explore possible ways of going round such barriers and fully making use of the opportunities that ICTs have to offer. As the United Nations Commission on Science and Technology for Development (UNCSTD) reported:

> Although the technological revolution in information technology and telecommunications has aroused much interest among policy-makers, the business sector, the media and the academic world in industrialised countries, little is known about the obstacles to accessing information technology and the diffusion and use of information technologies in developing countries, particularly the low-income economies. These issues, especially the impediments to the diffusion of information technology, need to be better understood (UNCSTD in Mansell and Wehn, 1998: 6).

Lastly, I hoped that this work would help in guiding policy-makers and individuals/organisations that would like to start up projects aimed at harnessing the new ICTs in developing countries. Mapping and measuring the economic and social impact of ICTs in developing countries is becoming an important tool for generating information needed for informed policy choices (ibid.).

1.5. Motivation for the Study

For quite some time I have been intrigued by the digital divide, a topic that I wrote about in one of my term papers. Preparing the paper, I came across the RESCUER (Rural Extended Services and Care for Ultimate Emergency Relief) project, which had been started in eastern Uganda in 1996 to address the problem of high maternal mortality. Only about 38% births in the country were attended to by trained health workers, the rest being left to traditional birth attendants (TBAs), who are not formally trained but acquire their skills through apprenticeship.

The RESCUER project was started in order to train and equip the TBAs with the help of the VHF (Very High Frequency) radio. Fixed base stations were put at the health units, mobile walkie-talkies given to the TBAs and vehicle radios put in the referral hospital ambulance and the District Medical Officer's vehicle. The aim was to link the TBAs with the formal health delivery system, such that when an obstetric emergency occurred in a village, a TBA used a walkie-talkie to call for assistance. If the TBA could not manage the case, a vehicle with a midwife from the health unit would collect the patient. The result was an increased number of deliveries under trained personnel and increased referrals to health units, which led to a reduction of about 50% in the maternal mortality rate in the three years that followed.[4]

Having read this, I wondered how much a computer could do, if a walkie-talkie, as simple as it is, could make such a difference. This is why, for my master's thesis, I decided to study how handheld computers have facilitated the extension of health services and resources to people in rural areas in my country. The majority of Uganda's population (around 80%) live in rural areas, yet an estimated 70% of the country's ICTs are in urban areas (Panos, 2004). Most of these people are untouched by educational opportunities, electrification, or other means that would bring them in touch with information technology. They are therefore in more need than anyone else.

1.6. Background to the study

Health and development are inextricably linked, because good health is a fundamental goal of development as well as a means of accelerating it (development). In developing countries, poor health has been a cause of both high death rates and slow development. The causes of this range from poverty and thus inability to go for treatment, lack of access to health facilities and lack of information about the prevention and treatment of diseases.

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[4] The project is documented on *Maternal Health Care in Rural Uganda*, http://www.worldbank.org/afr/ik/iknt40.pdf accessed 10/11/2003

In many African countries, Uganda inclusive, preventable diseases have claimed millions of lives. An estimated one million people on the continent die from malaria each year (Kyomuhendo, 2004). The disease does not only cause ill health and death but also has a great impact on the economic development of the individual, the family, the community and the nation as a whole. According to the MoH, a poor malaria-stricken family in Uganda may spend up to 25% of its income on treatment and prevention. Malaria also leads to loss of household incomes through absenteeism from work. A study in Apac, Kampala and Rukungiri districts showed that malaria was responsible for 54%, 33% and 50% of absenteeism from work respectively per month in the above districts. On average, seven working days were lost per malaria episode.[5]

Malaria is closely followed by HIV/AIDS, a leading cause of death among adults in Uganda (PEAP, 2001: 24). According to the Poverty Eradication Action Plan (PEAP 2001-2003), 10% of the adults in the country are infected with the virus which causes AIDS, and very few of these have access to retroviral therapy because of its prohibitive cost. Full-blown AIDS is debilitating for the victim and imposes a burden of care on close relatives. People spend considerable sums of money on medical treatment in the course of full-blown AIDS, and the expectation of death may reduce savings (ibid.).

Because of the risk that poor health poses on the economy, the Government of Uganda has attempted to come up with measures to prevent, control and deal with health threats. Among its efforts have been both enhancing the health sector's capability to ensure better health for the people and increasing the people's capability to protect themselves from disease. The latter have included a comprehensive multi-media communication programme, which is out to inform the public about health threats and their impact on them as individuals and the economy at large, and also out to change the people's behaviour. An example is the HIV/AIDS campaign going on in the country, on radio, television, newspapers, magazines, posters and billboards. The campaign promotes abstinence, faithfulness to partners and condom use.

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[5] The Burden of Malaria in Uganda, http://www.health.go.ug/malaria.htm: accessed 14/11/2004

In spite of such efforts, diseases still continue to affect and kill people. This is why efforts are being directed towards health workers to ensure that they are well informed and, subsequently, capable of handling different health problems. Among the various kinds of information needed is technical health information that practitioners look up in reference sources as they work. More important than this kind, however, is the health information and educational activities meant to develop or increase the knowledge and skills of health practitioners. This is called Continuing Medical Education (CME), and it is the kind of information that this study is interested in. This is because:

> To provide high quality health services, health professionals (both qualified and nonqualified) require access to effective ongoing professional development and continuing education programs (KDE, 2003).

However, many of the health practitioners in Uganda, particularly in rural areas, have no access to the medical information and research that are meant to act as their CME. There are few libraries in the country, and most of these have very old resources. In the rural areas, there are hardly any libraries. Rural health workers therefore remain largely not updated on current health information relevant to their practice, which information would have translated into improved patient care. Much as there is no conceivable way in which a newly developing nation like Uganda can create conventional and well-stocked libraries to fill this gap, there is also very little possibility for health practitioners in these areas to benefit from the research facilities available in other places, such as the developed countries, without functional communication links.

The solution to this situation partly lies in making low-cost data networks available, which will enable these health workers, by remote access, to use the information sources that exist. The benefits are expected to be even greater if the networks are global, for international telecommunications would allow many large-scale medical research facilities to become resources for the whole world (Pool, 1990: 173). Pool believes this will accelerate the progress of the underdeveloped countries.

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The other category of information that this study deals with is the information gathered from medical surveillance. In the health sector it is important to carry out regular medical surveillance because:

> Good surveillance is the cornerstone of effective communicable disease control. Without it, it is impossible to track disease trends, recognise new disease threats, identify serious outbreaks, monitor control measures or design effective immunisation policies. Once a major outbreak occurs, it is vital to have a data management system that supports efficient data capture and information flow, and that can provide a master list of up-to-date case-based information in real time.[6]

In Uganda, surveillance is done through the maintenance of a Health Management Information System (HMIS), which, by making use of the new ICTs, can become more efficient. The new ICTs therefore have a special place both in educating health practitioners and facilitating effective HMIS maintenance, which is why this study's intention is to investigate how they (ICTs) are playing these two roles.

1.7. Uganda Health Information Network

Since 2003, Uganda Chartered Healthnet (UCH), a non-governmental organisation, has implemented the Uganda Health Information Network (UHIN) project. UCH is run with the support of Canada's International Development Research Centre (IDRC), WideRay, a wireless technology company in USA and SatelLife, an American non-profit organisation. UHIN has put in place information and communication infrastructure to collect and exchange health data and information. It has done this through testing the use of handheld computers in the districts of Mbale and Rakai in information transfer (HMIS) and health information sharing and exchange (CME).

The main UHIN objective was to design a two-way information system that would provide a nationwide wireless network to health care providers, with a goal of improving their ability to treat patients more effectively and combat the spread of disease through

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[6] Surveillance, Information and Data Management, http://www.sars-expertcom.gov.hk/english/reports/reports/files/e_chp10.pdf: accessed 01/12/2004

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improved CME, automation of data gathering and faster communication through email (First User Needs Survey, UHIN, 2004). UHIN works with cellular networks, whose coverage in Uganda is fast expanding, in combination with portable transmission devices.

1.8. ICT Policies

Policy-making is the initial phase in which problems are recognised and specific governmental efforts made to determine directions (Mowlana, 1997: 168). Projects such as UHIN are mushrooming in Uganda because of the government's decision to incorporate ICTs and make them integral to the development process, as reflected in the country's national ICT policy (2001). The 1995 UNCSTD Working Group on Information Technology and Development noted that there is sufficient evidence of the potential of ICTs, so all governments and other stakeholders need to build new capabilities for producing, accessing, and/or using these technologies. It added that to build these capabilities, each country should establish and implement a national ICT strategy that is responsive to sustainable development goals (Mansell and Wehn, 1998: 7). It is for this reason that countries and regional and global bodies have come up with ICT policies that will enable the maximum use and/or exploitation of the new technology for their benefit (ibid.: 12). It should be noted that in this section on policies the term ICTs is used to refer specifically to new ICTs.

1.8.1. International Policy Initiatives

The World Summit on the Information Society (WSIS) is the first UN summit of its kind, and it aims at creating an inclusive information society. It was born out of the realisation that while the digital revolution has extended the frontiers of the global village, the vast majority of the world remains unhooked from it. To discuss this dynamic, the International Telecommunication Union (ITU) resolved in 1998 to hold a WSIS and place it on the UN's agenda.[7] The first phase of the summit took place in December 2003 in Geneva, Switzerland, and the second is slated for November 2005 in Tunis, Tunisia.

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[7] Why a Summit on the Information Society, http://www.itu.int/wsis/basic/why.html: accessed

Improving the health of people with little or no access to health services and resources was high on the summit's agenda, and it pointed out that it would do this through promoting e-health. Continuous medical training, education and research through the use of ICTs would be encouraged. The summit also set out to alert, monitor and control the spread of communicable diseases through the improvement of information systems. The other strategy was to encourage the adoption of ICTs to improve and extend health care and health information systems to remote and underserved areas and vulnerable populations.[8] UHIN's handheld computer project exists within this sphere, as this study will later show.

1.8.2. Policy Initiatives for Africa

Hope in ICTs for development is shared by Third World countries too. The African countries have formed an initiative called the New Partnership for Africa's Development (NEPAD), which in reality is a pledge by African leaders that they have a pressing duty to eradicate poverty and to place their countries, both individually and collectively, on a path of sustainable growth and development, and at the same time to participate actively in the world economy and body politic.[9]

The African community, through NEPAD, recognises the role of ICTs in the African development agenda. NEPAD perceives ICT as a priority area that can help all African countries achieve economic and social development objectives. According to the NEPAD policy paper, 'intensive use of ICTs can bring unprecedented comparative advantages to the continent' (CIDA, 2002). The paper argues that ICTs can be helpful in remote sensing and environmental, agricultural and infrastructure planning; be used to identify and exploit opportunities for trade, investment and finance; and in conflict management and the control of pandemic diseases, ICTs are expected to contribute to the organisation of an efficient early warning mechanism by providing the tools for constant monitoring of

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08/02/2005
[8] World Summit on the Information Society: Plan of Action,
http://www.itu.int/wsis/docs/geneva/official/poa.html: accessed 08/02/2005
[9] NEPAD, African Forum on Science and Technology for Development, http://www.nepadst.org/: accessed 08/02/2005

tension spots. Because of this, the NEPAD lists ICTs as one of the areas that should be fast-tracked in Africa's development (ibid.).

Although such ICT policies are forward-looking, Servaes (1999: 181) argues that they are simply a portrayal of concern about missing 'the so-called information revolution', or a fear of remaining 'backward'. He says this is why the majority of policy decisions relate to spending public funds on acquiring the latest generation of computers and new technology in general. And, in this rush, the specific socioeconomic and sociocultural contexts in which technology transfer has to be considered are often overlooked (ibid.).

1.9. Literature Review

Not much has been written about the new ICTs and their contribution to health in particular. Most of the available literature has explored the conventional media and their role in improving health, modernising agriculture and promoting good governance. In this review, I looked at literature regarding the new ICTs, health and rural development, since each of these aspects has a bearing on the study.

Jørn Braa et al.'s *A Study of the Actual and Potential Usage of ICTs at District and Provincial Levels in Mozambique with a Focus on the Health Sector* (2001) discusses appropriate strategies for developing an ICT infrastructure to meet the needs of the health sector in Mozambique. Admitting that ICT can strengthen the health information and management systems in the country, the writers recommend that ICT educational programmes for entrepreneurs, health workers and managers should be developed. They add that a strategy should be developed to integrate all districts and provinces in the country, so that those with poor ICT capacities can benefit from those that are better off.

Alex Pott's report *Rural Development and the Flow of Information: Do ICTs Have a Role?* (2003) explores the relationship between new ICTs and rural development in Uganda. Pott believes that these ICTs, rather than being inherently good or bad, have the potential to be a tool for social and economic development. The crux of his report is not the technology, but the information it carries and delivers. Pott says that for ICTs to have

a role in rural development they must carry information that is relevant to the users. For emphasis, he says it is only when the focus is on people, not technology, that ICTs play an important role in rural development.

Dralega's thesis *ICTs and Rural Women Empowerment* (2002) examines the role the technology plays in uplifting the status of the Ugandan rural woman. She argues that ICTs' advent situates women within a global economy over which they can exercise little or no control. She suggests that national policies should be engendered, that is, used to achieve gender justice in the ICT sector, and women-friendly ICT systems implemented.

The Panos Institute's report *Completing the Revolution: The Challenge of Rural Telephony in Africa* (2004) examines the progress being made towards universal telephone access on the continent. It notes that a lot of progress has been made in Uganda, as reflected in the country's policy initiatives and the fact that the country has one of the largest teledensities in the developing world (2.67 telephones per 100). However, such figures hide the actual reality, for it is mainly the urban areas that have telephone connections. The report therefore calls for more attention to be paid in national and global policy-making to providing rural telephony, warning that if this is not done, rural Africa will continue to lag behind.

In *Into or Out of the Digital Divide?* (2000) the Panos Institute still tackles the question of universal access to new ICTs for Southern Africa. The authors note that when the question of access comes up, there are arguments that how can the developing world even begin to talk about 'universal' access to new media when questions about 'universal' access to conventional media have yet to be answered? Nevertheless, the authors accept that ICTs are here to stay, so one cannot but hope to positively engage with, rather than disengage from, the phenomenon.

Much as these publications are a springboard for this thesis, I also hope that the thesis will contribute to the available literature regarding ICTs and development, especially in the health sphere.

1.10. Thesis Outline

This chapter has introduced the study and explained why I set out to do it. The chapter also outlines the objectives of the study, together with the research questions to be answered. The chapter looks at a couple of global and regional ICT initiatives, which explain why a lot of attention is being given to ICTs today. It also includes a review of the literature considered relevant for this study.

In Chapter Two, the theories in which this study is rooted are analysed. These theories were selected because of their relevance to the topic at hand, and a look at the various aspects and features of these theories gives a clearer understanding of why the new ICTs are being given such a prominent place in society. It also shows where the ICT critics' views stem from, revealing that, to some extent, their claims hold water.

Chapter Three is a discussion of the methods used in gathering the data for this study. The study being both quantitative and qualitative in nature, I triangulated these two research methods. The chapter also justifies the selection of the methods and respondents, and presents the way the data collected was analysed to produce meaning.

In Chapter Four the health and communication policies of Uganda are presented. This serves to show the environment within which UHIN's handheld computer operates. This chapter justifies the existence of the project, for it shows that both policies have provisions for organisations such as UHIN, and what UHIN is doing is provided for in Uganda's health policy.

Chapter Five presents the findings of the study. The findings are also discussed and interpreted, in this way attempting to answer the study's research questions and achieve its objectives.

The last chapter, Chapter Six, is a summation of the study. It includes the conclusions that the researcher drew from the study and the recommendations made to facilitate the harnessing of the new ICTs for development, especially in developing countries.

CHAPTER TWO

THEORETICAL AND CONCEPTUAL FRAMEWORK

2.0. Introduction

This chapter presents the conceptual and theoretical guidelines used in the study. It describes the concepts as they were used, in this way defining the sphere within which the study operates. In broad terms, this is a study on how information and communication are used to facilitate development, which is why development communication theories (modernisation and diffusion of innovations) are its backbone. The study goes beyond this field to include aspects of the information society, necessitating the analysis of the information society theory. These theories serve as interpretive tools and also help to contextualise the study. The main theory is the modernisation theory of development, into which is couched the information society theory. The diffusion of innovations theory ties up these two. All the three theories are linked by the importance they attach to information technology as able to bring about change in society.

2.1. Definition of Concepts

Concepts are the building blocks of theory and represent the points around which social research is conducted (Bryman, 2004: 65). In a subtle way, they help to shape the boundaries within which a given object or phenomenon is examined, in this way forming the parameters within which to operate (Mowlana, 1997: 170). For the purposes of this study, the following concepts were used as explained below.

2.1.1. Information and Communication Technologies

ICTs have been defined as any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form (Hughes et al., 2002). ICTs are divided into old/conventional and new ICTs. The old ones include radio, television, newspapers and magazines, while the new ones include computers, telefaxes, telephones, CD-ROMs, cable television and satellite systems. Literature identifies the conventional

ICTs with the term media technology, and the new ones with information technology. This study is about the new ICTs. In the study, sometimes the term new ICTs is used interchangeably with new media to mean the same thing. When the new ICTs made their entry, there were predictions that they would replace the conventional ones (Williams et al., 1988: xi). However, far from doing this, the new ICTs are complementing the conventional. They enable the provision of other communication services that were once inaccessible or costly.

The new ICTs focused on in this study are computers. Although they are ICTs in their own right, computers are integral parts of most modern telecommunication systems. Some of the world's most sophisticated computers serve as 'switches' for major communications networks. Furthermore, miniaturised computer-like components enable the operation of most transmission and receiver technologies, ranging from telephones to television sets (ibid.: 7). There are different kinds of computers, and they include personal computers, laptops and handheld computers. It is the handheld computers that are the subject of this study.

2.1.2. Continuing Medical Education

Continuing Medical Education (CME) consists of educational activities that serve to maintain, develop, or increase the knowledge, skills and professional performance and relationships that a physician uses to provide services for patients, the public or the profession (American Academy of Paediatrics Grand Rounds Journal).[10] The content of CME is that body of knowledge and skills generally recognised and accepted by the profession as within the basic medical sciences, the discipline of clinical medicine, and the provision of health care to the public. This definition of CME recognises that all continuing educational activities which assist physicians in carrying out their professional responsibilities more effectively and efficiently are CME (ibid.).

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[10] Continuing Medical Education, http://aapgrandrounds.aappublications.org/cme/faq.shtml: accessed 01/12/2004

2.1.3. Health Management Information System

The term Health Management Information System (HMIS) refers to a system of generating health information, which information is primarily used to support management decisions, especially for resource allocation.[11] It is used in determining how to prioritise resources for health services. According to Uganda's Health Unit Procedures Manual (MoH, 2001: 1), the health management information collected in the country is used to improve the ability of health units to provide optimal preventive and curative care. The information can be collected manually, using paper, or automatically, using computers. Computers are becoming indispensable in record keeping, inventory and other aspects of management information systems in hospitals and other organisations (Bell, 1999: xxxvii). The long-term goal of the HMIS is to optimise health care delivery and achieve health for all. To achieve these goals, the HMIS process must provide accurate, timely and relevant information.

2.2. Theoretical Framework

Communication for development has emerged as a specific field in media studies, born out of the belief that communication processes can be used to improve and/or change people's livelihoods, thus contributing to development. Scholars reason that communication media can be used as agents of development, since information is one of the prerequisites of socio-economic development (Moemeka, 1994; White et al., 1994; Pool, 1990).

Wilbur Schramm and Daniel Lerner kicked off investigations into the traditional media's place in development, but one of the first people to research on the new ICTs was Edwin B. Parker (Williams et al., 1988: 29). He had pioneered research on computers and communication satellites. He pointed out, for instance, that field experiments on development communication in Third World nations seldom explained more than 10% or 20% of the variance of such dependent variables as knowledge about, and adoption of, health and agricultural innovations. In contrast, he might explain 70% to 80% of the

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[11] Asiimwe, personal interview: 10/01/2005

variance in health adoption behaviour in studies of two-way satellite radio communication linking Eskimo and Indian villagers in Alaska with medical expertise. Therefore instead of accepting communication technology as a given, Parker considered it as a variable that communication scholars could control, influence and study (ibid.).

2.2.1. The Modernisation Theory of Development

Discussions today about new ICTs having power to promote development, for example through facilitating the delivery of health services to hard-to-reach areas, areas with few health centres and/or few medical personnel, are a resurrection of the modernisation theory of development, also commonly known as the dominant paradigm. Melkote and Steeves define modernisation as a transition, or a series of transitions from primitive, subsistence economies to technology-intensive, industrialised economies; from subject to participant political cultures; from closed systems to open, achievement-oriented ones (2001: 74).

Modernisation is the oldest and most deeply rooted view in Western development thinking (Servaes 1999: 5). It came up during the late 1940s and 1950s, arising from the notion that international mass communication could be used to spread the message of modernity and transfer the economic and political modes of the West to the newly independent countries of the South (Thussu, 2000: 56; White et al., 1994). The mass media were believed to have the potential to transform traditional societies by bringing images of 'modernity' to them.

Daniel Lerner was one of the earliest exponents of this theory. From research in the Middle East (*The Passing of Traditional Society*, 1958), he presented the Western path of 'development' as the most effective way to shake off traditional 'backwardness', arguing that Western society provided the most developed model of societal attributes (power, wealth, skill, rationality), and that from the West came the stimuli which undermined traditional society (Thussu, 2000: 56; Servaes, 1999).

It is little wonder that today, most communication practice and scholarship in Third

World development literature are consistent with the modernisation theory (Melkote and Steeves, 2001: 103-4). Melkote and Steeves explain that at both the macro and micro levels, communication is viewed as a product and reinforcer of economic growth and development. At the macro level, the communication scholars who support this perspective back global and national policies that facilitate 'free flows' of media and information technology, content and hardware, for they view these products as crucial for Third World development and participation in the global economy. At the micro level, they support persuasive marketing campaigns (in areas like health, agriculture and population) as the most efficient means to transform traditional individuals and societies.

Viewing development as the bridging of gaps between traditional and modern by means of imitation processes, to the advantage of the latter (Servaes, 1999: 19), the theory emphasised the massive transfer of capital-intensive, labour-saving technology, mainly from industrialised nations to underdeveloped countries. Echoes of these ideas are still present today. Computers, mobile telephones, telefaxes, CD-ROMS and a multitude of digital technology have been applied in the West, and now they are being seen as the solution to developing countries' problems, too. Schramm's explanation for this is that the transfer of communication media to the Third World automatically results in economic welfare (Schramm, 1964, in Avgerou and Walsham, 2000: 265).

Such ideas have made the modernisation theorists receive criticism for seeking the explanation for countries' underdevelopment in chiefly internal causes that could be solved by external (technological) aid, rather than in their trade or external relationships with industrialised countries (Servaes, 1999: 7). Dependency theorists have argued that the emphasis on technological transfer has led to greater technological dependence of developing countries on the more advanced ones (White et al., 1994: 84).

The modernisation theory also believed in centralised planning, mainly by government economists and bankers, to guide and speed up the process of development. Because of this, development became the highest priority for most national governments in developing nations, once they obtained independence (Rogers, 1983: 120). Today,

institutions like the United Nations, World Bank and the International Monetary Fund make decisions on what nations should do, and even oversee the implementation of these decisions. Using ICTs as an example, Nulens and Audenhove say they do this because of the conviction that these tools can benefit their users. The authors note:

> In recent years they (organisations) have introduced a multitude of programmes and initiatives in this field. Their impact is not confined to the implementation of specific programmes alone. By way of support in policy formulation processes, policy assessments, conditional loans and so forth, they can have considerable influence on policy formulation in developing countries (Nulens and Audenhove, 1999: 451).

Modernisation's inherent features brought severe criticism against it. The theory assumed that the mass media were a neutral force in the development process, ignoring how they are themselves products of social, political, economic and cultural conditions. As Kranzberg argues (in Castells, 2000: 76), technology is not neutral. Furthermore, since it supported the transfer of technology and the sociopolitical culture of developed societies to 'underdeveloped' societies, the theory is charged with being a veiled synonym for Westernisation, described as the copying or implantation of Western mechanisms and institutions in a Third World context (Servaes (1999: 176). Servaes elaborates:

> I do not believe in the idea that Western technology can be borrowed without taking in Western culture at the same time. In my opinion, science and technology are much more than the mere instruments they were expected to be; they cannot be just borrowed or bought (ibid.).

The modernisation theory also asserts that development is a linear process. Societies are believed to move from being traditional all the way to modernity in a sequence. This was propounded by Walter Rostow (1953), who asserted that a traditional society changes itself in successive phases into a modern society after a leap to self-sustaining growth based on a combination of industry-promoting, financial, and infrastructural measures (Servaes, 1999: 21). Rostow outlined five stages through which, in his opinion, all societies have to pass – the traditional society, the pre take-off stage, take-off, the road to maturity and the consumption society.

However, proponents of the multiplicity paradigm say there is no universal path to development. Instead, development must be conceived as an integral, multidimensional, and dialectic process that can differ from one country to another. This means every society should define development for itself and find its own strategy of achieving it. At the same time, this also implies that the problem of development is a relative one. Therefore, according to this paradigm, no part of the world can claim to be developed in all respects (Servaes, 1999: 6; White et al., 1994: 86).

By considering the mass media as 'magic multipliers' or major vehicles for disseminating information that motivated social change to a diverse public within a short period of time, modernisation perceived the role of communication in a linear, cause-effect-oriented way, ignoring the importance of two-way communication and the effect of feedback on the effectiveness of messages. The theory was also criticised for not paying attention to media content, for instance exposure to the mass media was misconstrued as an indicator of development, with no thought being given to the kind of content disseminated (Suriyasarn, 1998).

The emphasis placed on the media has been interpreted as modernisation stressing the increase in investments in communication technologies, rather than in development communication (White et al., 1994: 77). This, according to Pool (1990: 183), has resulted in two quite different theories of the role of communication in the process of development. That which modernisation subscribes to is the infrastructure approach, which sees communications facilities as tools to be put in people's hands for them to use. The development communication approach proposes that certain kinds of content will teach people what they need to know to progress, while other kinds of content inhibit progress. It starts with a conviction among educated idealists as to what the masses in pre-industrialised countries must learn, and it evaluates communications by whether they are teaching that or not (ibid.). The latter is the theory that this study is premised on.

Rostow's five stages of development assumed that the modern and the traditional lifestyles were mutually exclusive. The crux of the matter, Lerner argued, was 'not

whether, but how one should move from traditional ways toward modern lifestyles' (Lerner, 1958, in Thussu, 2000: 59). However, these modernisers failed to comprehend that the dichotomy of modern versus traditional was not inevitable. Thussu (ibid.) illustrates the futility of their case by quoting the example of the West's efforts at modernising the Arab world, despite which Islamic traditions continue to define it. He says these cultures can in fact also use modern communication methods to put their case across.

The fact that the theory was predicated on a definition of development that followed the model of Western industrialisation and modernisation, measured primarily by countries' Gross National Product (GNP), is another source of criticism. This is because by so doing, it failed to recognise that the creation of wealth on its own was insufficient; the improvement of life for the majority of the populations was dependent on the equitable distribution of that wealth and its use for the public good (Thussu, 2000: 58). The writer adds that the theory failed to ask questions like development for whom and who would gain or lose, ignoring any discussion of the political, social or cultural dimensions of development. This is why 'in many Southern Hemisphere countries, income disparities in fact increased over the succeeding years – despite a growth in GNP' (ibid.: 58).

The failure of the modernisation paradigm gave rise to the alternative or pluralist paradigm, in which scholars began to reconsider the role of communication in development. In this paradigm, development is defined as 'a widely participatory process of social change in a society, intended to bring about social and material advancement… for the majority of the people' (Rogers, 1976, in Suriyasarn, 1998). This paradigm rejects the notion of universality of development and economic-based perspectives. Instead, development problems are analysed at different levels – from international to local, and development is perceived to be need-oriented, endogenous, participatory, self-reliant and equitable (ibid.).

Structuralists like Emile McAnany (in White et al., 1994: 85) on the other hand focused on the external and internal structures in society and communications in order to explain

underdevelopment. McAnany argued that social, economic and political structures enter into the formation of the problems of the poor. He believed that communication has a modest role to play in development, but the necessary condition of this role is some changes in the environment other than the addition of information.

Other scholars, especially from the Third World, argued that the modernisation theory generally benefited Western media and communication companies, which had expanded into the Third World in the name of modernisation and development, but in actual fact in search of new consumers for their products. The theory was also considered too simplistic to solve world problems (Avgerou and Walsham, 2000: 265).

With these developments, modernisation was supposed to have passed, but White et al. (1994) note that 'the dominant paradigm of modernisation never *really* passed'. While communication and development scholars turned their back on it, national governments, international aid agencies, the power blocs and transnationals continue to practice and propagate the old paradigms. This is reflected in the fact that catching up with the industrialised countries remains the ambition of developing countries' governments. Modernisation was simply revised, with a shift from support for the mass media to what Thussu (2000: 60) calls 'an almost blind faith' in the potential of new information and communication technologies.

The revised version accepts a greater role for local elites in the modernisation process, but Western technology's importance remains crucial. This version says modernisation requires advanced telecommunication and computer infrastructure, preferably through the 'efficient' private corporations, thus integrating the South into a globalised information society (ibid.). This explains the massive research and debate going on about the place of the new ICTs in society.

2.2.2. The Information Society Theory

The information society theory is more of a continuation of the modernisation theory of development. Like the modernisation paradigm, the theory of the information

society believes strongly in the central place of (information) technology in society, and with this its resultant information and communication roles, which are regarded essential for development.

Enormous advances have been made in communication technologies, resulting in rapid increases in information flows globally. This is largely a result of the convergence of specific technologies into a highly integrated system, within which the old, separate technological trajectories become literally indistinguishable (Castells, 2000: 71-72). The convergence involves computers, which provide information storage and data transfer capabilities previously unknown; satellites, which relay information over vast distances quickly; and digitisation, which converts any kind of communication data – pictures, sound, text – into a binary code that can be readily transmitted, decoded and delivered to the intended individual or audience (Melkote, 2001: 30).

Although the new ICTs share many characteristics with the traditional media, they are also different. They are interactive, in that participants in a communication process (using the ICTs) have control over, and can exchange roles in their mutual discourse. To the extent that a special message can be obtained by each individual in a large audience, the new media are de-massifying. They are also asynchronous, meaning that they allow for the sending and receiving of messages at a time convenient for the individual user rather than requiring all participants to use the system at the same time (Williams et al., 1988: 10-13). It is because of such capabilities that the new ICTs are regarded as being better than the conventional. These capabilities are the reason why questions are raised about the ICTs' potential, how they are adopted and implemented, and the larger social questions concerning their benefits to humanity.

The technological breakthroughs that have given rise to, among other things, the new ICTs, are said to have led to an information society, a view supported by scholars such as Daniel Bell and Manuel Castells, and the WSIS, which states that:

ICTs are today what industrial machines were during the industrial revolution; they have revolutionised the ways of working, transformed the economy, had an irreversible impact on the way people live, and have shaped a new society, the 'information society'.[12]

There is no agreed-upon definition of the information society, and most writers define it by its characteristics, especially information. Melody (1990, in McQuail and Windahl, 1993: 201) defines it as 'one that has become dependent upon complex electronic information and communication networks and which allocates a major portion of resources to information and communication activities'. Martin (1995: 3) says it is:

a society in which the quality of life, as well as prospects for social change and economic development, depend increasingly upon information and its exploitation... living standards, patterns of work and leisure, the education system and the marketplace are all influenced markedly by advances in information and knowledge.

The idea of the information society has its roots in post-industrialism literature, a social science notion of the 1960s and 1970s. Post-industrialism is said to have marked the end of the industrial capitalist era and the arrival of a service or leisure society. Bell, a post-industrialism proponent, held that just as the agrarian society was replaced by the industrial society as the dominant economic emphasis shifted from land to manufacturing, so does the post-industrial society develop as a result of the economic tilt towards the provision of services.

The information society is therefore developing in the context of post-industrialism (Lyon, 1988: 2-3). Information, driven by information technology, is emerging as the dominant power factor in the information/post-industrial age, in the same way that land was in the agricultural period and capital in the industrial (Mowlana, 1997: 175). The information society is therefore the 'third wave' (Lyon, 1988: 2). Bell strengthens the argument for this when he says:

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[12] A Common Vision of the Information Society?
http://www.itu.int/osg/spu/wsis-themes/Vision/Vision.html: accessed 06/01/2005

We are today on the rising slope of a worldwide third technological revolution. It is a rising slope, for we have passed from the stage of invention and innovation into the crucial period of diffusion… Yet the phenomenon cannot be reversed, and its consequences may be even greater than the previous two technological revolutions (Bell, 1999: xxxii-xxxiii).

It is strongly believed that in this information society, information technology, the major index, has a broad potential social impact and will lead to development. Castells argues that because information is an integral part of all human activity, all processes of our individual and collective existence are directly shaped by the new technological medium (2000: 70). According to Bell, 'technology is the basis of increased productivity, and productivity has been the transforming fact of economic life' (Bell, 1973: 191, in Webster, 2002: 42). Just like the modernisation paradigm did, Webster says such a belief in technology implies that technology is neutral; that it is aloof from the social world. However, he rhetorically asks whether it can be seriously suggested that technologies are at once the motor of change and simultaneously untouched by social relations (ibid.), indicating that neutrality is far from a fact here.

Because information technology has the capacity to push the boundaries erected by geographical location, and with them the limitations once imposed by time, making it possible to link different places and continents (Webster, 1996: 19), the information society is also said to be a networked society. Castells (2000: 77) considers being networked very important because it enables one to access information from anywhere and interact with whomever one needs. This is not surprising, since back in 1981 Arthur C. Clarke prophesied that the new ICTs would unify a much fragmented world into 'one big gossiping family' (Clarke, 1981, in Hanson and Narula, 1990: 5). Castells concludes that inclusion on the network is a *requisite* of full participation in today's society (ibid.:106).

The apparent power of information technology highlighted in the preceding paragraphs has contributed to claims that technology will enable Third World countries to develop by helping them leap-frog or 'jump straight from a non-industrial to an information society' (Lyon, 1988: 11; Pool, 1990). The World Bank shares these sentiments, and in a

1996 report said:

> The information revolution offers Africa a dramatic opportunity to leapfrog into the future, by breaking out of decades of stagnation or decline. Africa must seize this opportunity quickly. If Africa cannot take advantage of the information revolution and surf this great wave of technological change, they may be crushed by it. In that case, they are likely to be even more marginalised and economically stagnant in the future than they are today (in Dralega, 2002).

As Bell says, the leaders of the Western nations consider their societies to be post-industrial (Bell, 1999: x), so the challenge countries such as Uganda face is to make the transition to the post-industrial stage and partake of its benefits. The issue, however, is how practical this is. The fact that a developing country like Uganda is aiming to achieve the same benefits from information technology as a developed country like the USA, for instance, is begging a question of applicability and appropriateness of these goals for Uganda. In view of marked differences between these two countries in levels of availability and accessibility of basic telecommunication services as well as political and cultural structures, there are many obstacles in Uganda's path. Access to telephones is still very low, for instance, and the country has only 182,000 computers for its 26 million people (Uganda Telecommunications Sector Policy Review, 2005)!

Information technology is criticised for widening the North-South divide instead of narrowing it as expected. The Southern Hemisphere countries are becoming more dependent on the North, instead of independent (Lyon, 1988: 13). Apart from increasing inequalities *among* countries, the emphasis on information technology is also said to exacerbate inequalities *within* countries. The reason is that information is not steadily diffused in a general way through all social echelons, for instance intellectual and managerial skills, which are required to exploit information economically, are unevenly distributed in society. Furthermore, advanced hardware and software for information processing are expensive, so the few who can afford them are scarcely challenged by others using inferior machines (Lyon, 1988: 18).

Lyon (ibid.: viii) adds that the information society proponents also assumed that the new

kind of society is generally desirable, which is not the case. There are societies that view information technology as a threat to their cultures and ways of life. At the WSIS summit in Geneva, the President of Zimbabwe, Robert Mugabe, said information technology is being used by the West to recolonise the Third World.[13] Mugabe added that the Internet and computer revolution are 'spin-offs of the same industry that allow for the conquest of our societies… the same platforms used for high-tech espionage' (ibid.).

Furthermore, many of the anticipated benefits of the information society have failed to materialise so far as the majority of people in advanced countries are concerned, for example a leisured lifestyle, political participation and an emphasis on the quality of life (Martin, 1995: 4, Lyon, 1988: 10), showing that the consequences of information technology are being exaggerated.

According to Martin (1995: 8), it is premature to talk about information societies because of the fact that technological sophistication is not in itself a sufficient condition for the attainment of information society status, although it may be a necessary prerequisite. The key to such developments lies in the extent to which these technologies have become an integral part of the everyday life of the citizen and the uses to which they are put.

Mowlana adds that information is not the exclusive property of the post-industrial stage, therefore there is no exclusive information society. He says that of the characteristics of the three waves – land, capital and information – information has had the longest and most pervasive impact throughout human history. To him, 'information in the form of skill and knowledge preceded capital formation, and in many ways characterises all three stages' (Mowlana, 1997: 175). He implies that scholars are confusing information with data, for he says that a major characteristic of the post-industrial age is its ability to produce data, and not necessarily information, in large quantities (ibid.: 176).

In spite of the doubt over whether an information society really exists, the fact that

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[13] *Internet a Tool of British Imperialism, says Mugabe* http://www.futuretalk.org/03/q4/12102763.html: accessed 05/04/2005

information technology and information itself have become defining factors of development and progress have brought every country to the conclusion that they either harness them or perish. This is why there are initiatives such as the WSIS, and policies and projects aimed at spreading ICT and encouraging its use in socio-cultural, economic and political spheres.

For the developing countries, Uganda included, this will be an uphill task. Nevertheless, information technology's potential and the fact that these technological developments are irreversible necessitate effort being made to harness it. And developing countries stand to gain a great deal from communications technologies. By joining the most advanced international telecommunications networks they can take advantage of the latest knowledge that exists, and by extending two-way telecommunications down to the village level, they can encourage villagers to participate in the decision-making processes of the nation (Pool, 1990: 196). The use of low-cost technology is one of the efforts at harnessing ICTs, an example of which are the handheld computers that this study focuses on. Such projects also seek to pay more attention to the kind of information the technology delivers, other than the technology for its own sake.

2.2.3. The Diffusion of Innovations Paradigm

The other theory relevant to the study is the diffusion of innovations theory, one of the most conceptually useful models for understanding the relationship between technology, individuals and society (Hanson and Narula, 1990: 27). The theory came out of the modernisation paradigm, evolving as the local-level framework to guide communications planning for modernisation (Melkote and Steeves, 2001: 120). It was introduced into the context of development by Everett Rogers, who propagated it in developing countries, arguing that it had cross-cultural applications (White et al., 1994: 81).

The diffusion of innovations theory analyses and explains the adoption of a new product or a new way of doing a certain task (Singletary and Stone, 1988: 80). Diffusion is the process by which an innovation is communicated through certain channels over time

among the members of a social system[14] (Rogers, 1983: 5-6). Rogers adds that diffusion is a kind of social change, because when new ideas are invented, diffused, and adopted or rejected, leading to certain consequences, social change occurs (ibid.).

On the other hand, an innovation is defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption. The perceived newness of the idea for the individual determines his/her reaction to it (ibid.: 11).

Just like the modernisation theory of development, a main theme in the diffusion of innovations theory is the suggestion that static societies are brought to life by outside influences, technical aid, knowledge and by the diffusion of ideas (Melkote and Steeves, 2001: 122). Technology is crucial to this theory, and White et al. (1994: 80) claim that in later years Rogers began to use technology as a synonym for innovation.

Modernisation is therefore a process of diffusion whereby individuals move from a traditional way of life to a more complex, more technically developed, and more rapidly changing way of life (Melkote and Steeves, 2001: 122).

One of the shortcomings of those who subscribe to the notion of the post-industrial society is that they assume that the new society brought about by information technology is generally desirable (Lyon, 1988). To this end, Rogers cautions that it should not be assumed that the diffusion and adoption of all innovations is necessarily desirable, for studies reveal harmful and uneconomical innovations that are generally not desirable for either the individual or his/her social system.[15] Furthermore, the same innovation may be desirable for one adopter in one situation but undesirable for another potential adopter in a different situation.

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[14] A social system is a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The units in a system may be individuals, organisations, families or nations (Williams et al., 1988: 72).

[15] An example of this was the introduction in the 1960s and 1970s, by several multinational corporations, of bottle feeding with prepared infant formula among poor mothers in Latin America, Africa and Asia, to replace breastfeeding. This was widely accepted until children began getting diarrhea due to highly diluted milk since parents did not have enough money to buy enough powdered milk for their children, and poor sanitary conditions regarding the preparation of the formula and the bottles used to feed the babies. The result was that bottle feeding was discouraged and government public health campaigns started encouraging breastfeeding as a healthier practice than bottle feeding (in Rogers, 1983: 100-103).

According to Rogers (1983: 15-16), the characteristics of innovations, as perceived by individuals, help to explain their different rate of adoption. These characteristics are relative advantage, compatibility, complexity, trialability and observability.[16] Trialability explains why many new projects, including the one under study, are first introduced as pilot projects for a given period of time, and then, if the pilot is successful, they take off for a longer period of time. As Singletary and Stone (1988: 81) say, most individuals will not adopt an innovation without trying it for a probationary period first. They add that those innovations that do not offer a small-scale trial will be adopted more slowly.

Bell states that apart from the five factors above, the rate of diffusion will also vary depending on the economic conditions and political stabilities of societies (1999: xxxii). This means that the technology might be available, but as long as people cannot afford it, or as long as there is no political willingness towards adopting it, the technology's diffusion will not be successful.

The essence of the diffusion process is the information exchange by which a new idea is communicated to others (Rogers, 1983: 17-18). Communication takes place through mass media and interpersonal channels. Mass media channels are usually more effective in creating awareness-knowledge of innovations, whereas interpersonal channels are more effective in forming, and in changing, attitudes towards a new idea (Williams et al., 1988: 71). Interpersonal channels involve a face-to-face exchange between two or more individuals. Most individuals evaluate an innovation that they are considering adopting, not because of scientific research by experts, but through the subjective evaluations of near-peers who have previously adopted the innovation (ibid.). The handheld computer project under study here makes use of interpersonal channels of communication in exchanges between UHIN and the health practitioners using the technology.

As with several other models of communication, recent developments in the diffusion

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[16] Relative advantage refers to the degree to which an innovation is perceived as better than the idea it supersedes; compatibility the degree to which it is perceived as being consistent with the existing values, past experiences, and needs of potential adopters; complexity the degree to which an innovation is perceived as difficult to understand and use; trialability the degree to which it may be experimented with on a limited basis, and observability the degree to which the results of an innovation are visible to others (Rogers, 1983: 15-16).

model have departed from a strictly one-way, downward directed communication approach (Windahl et al., 1992: 57). Traditionally the model emphasised linearity of effect, hierarchy and social structure, but in recent times, horizontal exchanges of communication as well as communication from below in social systems have become more important (ibid.: 57-58).

In the diffusion paradigm, an individual's decision about an innovation does not happen instantly; it is a process that occurs over time, with a series of actions and decisions. Rogers (1983: 20) calls it the innovation-decision process, defined as the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, through implementation of the new idea and finally to confirmation of this decision.

Based on when they embrace an innovation, Rogers categorises adopters[17] in the following way: the first category is that of the innovators (2.5%),[18] who are venturesome and anxious to try out new ideas; then the early adopters (13.5%), who are local opinion leaders. They are respected by others and maintain that respect by discreet use of innovations. The third category is the early majority (34%), who are characterised as deliberate. They have high interpersonal communication among peers but are not leaders. The late majority (34%) are skeptical and cautious, and they do not adopt until most others have done so. Last come the laggards (16%), who are traditional, socially isolated, locally oriented and without opinion leadership (Rogers, 1983; Singletary and Stone, 1988).

Explaining how an innovation ends up being adopted by a society, Singletary and Stone (1988: 81) say it is because of the 'diffusion effect'. This means that the more widely accepted the innovation is, the more pressure there is on others to accept it as well. However, the others could also accept the innovation on their own, having seen its

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[17] Adopter categories are the classifications of members of a social system on the basis of innovativeness, the degree to which an individual or other unit of adoption is relatively.

[18] The percentages are based on a normal statistical distribution, which puts 68% of the population within the limits of the standard deviation. The categories are ideal types and should be treated as such (Windahl

benefits. Williams et al. (1988: 74) say most individuals do not adopt an innovation until they learn of their peers' successful experience with it.

Related to the above is the fact that an innovation (which is interactive) is of little use to an individual unless others also adopt it (ibid.). Therefore a 'critical mass' of adopters is necessary for the utility of the new idea to be sufficient for an individual to adopt. The usefulness of the new communication system increases for all adopters with each additional adopter. Prior to the formation of the critical mass, any given adopter is unlikely to have peers who will share with him/her about the benefits of the innovation.

To sum up the theory, consideration by an individual to adopt any innovation depends first on general attitude towards change and then on attitude towards the specific innovation (Singletary and Stone 1988: 81). So the innovation may be good, but as long as the individual has a problem with altering his/her actions, behaviour or ideas, efforts to make him/her adopt it might not be very successful.

The model is not without its weaknesses. Among these is a pro-innovation bias, which is the implication that an innovation should be diffused and adopted by all members of a social system. This shortcoming is common to all the theories selected for this study. Nelkin (1973, in Rogers, 1983) calls it the 'technological fix', meaning an overdependence on technological innovations to solve complicated social problems. Rogers observes that this bias is seldom straightforwardly stated in diffusion publications, but assumed and implied. The result is that it leads researchers to ignore the study of ignorance about innovations and to underemphasise the rejection or discontinuance of innovations (ibid.: 92).

Diffusion research has also been charged with often siding with the change agencies that promote innovations rather than with the audience of potential adopters. Rogers explains that this originates from the issue of 'who sponsors diffusion research', among other pro-source factors. He admits that it is likely that some of the factors underlying a particular

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et al, 1992: 62).

social problem may be individual[19] in nature, and that any effective solution to the problem may have to deal with changing these individual factors. But in many cases the causes of the social problem lie in the system of which the individual is a part. Such biasness can be an obstacle to finding relevant solutions to problems, because 'how a social problem is defined is an important determinant of how we go about solving it, and therefore of the effectiveness of the attempted solution' (Rogers, 1983: 103-4).

The last criticism is that diffusion researchers have not paid much attention to the consequences of innovations, especially the issue of how the socioeconomic benefits of innovations are distributed within social systems. Rogers observes that when the equality issue has been investigated, 'we often find that the diffusion of innovations usually widens the socioeconomic gap between the higher and the lower status segments of a system' (ibid.:118). He adds that the tendency for the diffusion of innovations to increase socioeconomic inequalities has especially been noted in the developing nations of Latin America, Africa, and Asia, although it can occur in any system. This issue, too, has been highlighted in the other two theories.

2.3. Summary

There are major themes running through these three theories, such as their emphasis on economic development; technology and information as prime solutions for the problems of the less developed countries; the criticism that technology increases inequalities in societies and the fact that they advocate for a top-down/linear form of communication as opposed to two-way communication. These theories help to explain the increasing attention being given to the new ICTs today, which is reflected in, for example, UHIN's handheld computer project and the WSIS.

The theories also explain how the adoption of new technology and ideas, for example the handheld computers and the new way of carrying out health management information reporting that came with them, takes place. The critique of the theories highlights the

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[19] Individual-blame is the tendency to hold an individual responsible for his or her problems, rather than the system of which the individual is part (Rogers, 1983: 103).

reasons why some people think that instead of bridging the digital divide, especially between the developed and developing nations, the new ICTs are simply widening it. The criticisms also point out hitherto ignored areas regarding technology and society, to which attention needs to be paid. The essence of these theories is that this study employs them as interpretive tools; they guide the analysis and interpretation of the data collected, enabling the successful evaluation of UHIN's handheld computer project.

2.4. Conclusion

This chapter has discussed the theories that inform the study. What these theories advocated and argued are the foundation stones of the important position that new ICTs have assumed in the world today. However, the criticisms of the theories question this position, pointing out that the arguments for these ICTs should not necessarily be accepted as they are. Certain factors need to be taken into consideration. The chapter also highlights the main concepts that are used in this study, in this way demarcating the field within which they are to be talked about.

CHAPTER 3

METHODOLOGY

3.0. Introduction

This chapter discusses the methods used to collect the data in this study. The chapter also justifies the selection of the research methods used. Apart from explaining how the research was done, it is regarded crucial that the methods followed in generating a set of findings are made explicit to make it possible to replicate a piece of research (Bryman, 2004: 78). This chapter also talks about the problems encountered in the research process and how they were overcome.

Research methodology in mass communication is defined as the structured sets of procedures and instruments by which empirical phenomena of mass communication are registered, documented and interpreted (Jensen, 1991: 8). Research methods are divided into two broad groups – quantitative and qualitative methods.

3.1. Quantitative and Qualitative Research Methods

Quantitative research is defined as the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that the observations reflect (Jensen and Jankowski, 1991; Bryman, 2004). On the other hand, qualitative research is the non-numerical examination and interpretation of observations for the purpose of discovering underlying meanings of patterns and relationships (ibid.).

Qualitative research methods permit the evaluator to study selected issues in depth and detail. This is because the researcher approaches the fieldwork without being constrained by predetermined categories of analysis, and Patton argues that this contributes to the depth, openness and detail of qualitative inquiry (Patton, 1990: 13). Since qualitative research deals with a small number of people and cases, it increases understanding of the cases and situations studied, although the small number at the same time reduces the

generalisability of the findings. In contrast, quantitative research makes it possible to measure the reactions of a great many people to a limited set of questions, thus facilitating comparison and statistical aggregation of the data. This gives a broad, generalisable set of findings presented succinctly and parsimoniously (ibid.: 14).

Quantitative research methods include randomised experiments, quasi-experiments, multivariate statistical analyses and sample surveys. In contrast, qualitative methods include ethnography, case studies, in-depth interviews, and participant observation (Cook and Reichardt, 1979: 7). The choice of research method depends on the demands of the research situation at hand.

Cook and Reichardt suggest that 'a researcher should not adhere blindly to one of the polar-extreme paradigms that have been labelled quantitative and qualitative but can freely choose a mix of attributes from both paradigms so as to best fit the demands of the research problem at hand' (1979: 19). This is referred to as triangulation. When different methods are used/combined, they should be seen as complementary to each other rather than in competition. In this study, I used both quantitative and qualitative research methods.

3.2. Triangulation

Triangulation entails the use of more than one method or source of data in the study of social phenomena (Bryman, 2004: 275). Patton argues that it is one of the important ways of strengthening a study design (Patton, 1990: 187). Triangulation can operate within and across research strategies. Denzin (in Patton, ibid.) identifies four basic types of triangulation:

1. Data triangulation, which is the use of a variety of data sources in a study;
2. Investigator triangulation, the use of several different researchers or evaluators;
3. Theory triangulation, the use of multiple perspectives to interpret a single set of data; and
4. Methodological triangulation, which is the use of multiple methods to study a single problem or program.

Although triangulation is expensive and time-consuming, its benefits make it worth applying. Methodological triangulation is advantageous because it offers the necessary variety of methods needed to tackle the multiple purposes that research usually has (Cook and Reichardt, 1979: 21). Second, when used together for the same purpose, the two method-types can build upon each other to offer insights that neither one alone could provide. And third, since quantitative and qualitative methods often have different biases, each can be used to check on and learn from the other (ibid.). Studies that use only one method are more vulnerable to errors linked to that particular method than studies that use multiple methods in which different types of data provide cross-data validity checks (Patton, 1990: 188). It is because of these factors that triangulation is credited with improving the reliability and validity of studies (Wimmer and Dominick, 1997: 104).

This study engaged three types of triangulation, leaving out investigator triangulation. The dominant form of triangulation was methodological, where both quantitative and qualitative research methods were used on an (more or less) equal level. On the quantitative side, I wanted to be able to find the facts from a relatively large number of respondents and therefore be able to generalise my findings to all of them. I also wanted to test the theories that form the foundation of this study. However, it was also important to find explanations for *why* and *how* things happen, which necessitated the qualitative strategy's intervention. In regard to data triangulation, I had various sources of data, ranging from people to documents.

3.3. Study Area

The study was conducted in Uganda, a landlocked country in East Africa. It is bordered by Kenya, Tanzania, Rwanda, the Democratic Republic of Congo and Sudan. The country approximately covers 236,040 square kilometres[20] and has a population of about 25.6 million people. Uganda enjoys a good climate and fertile soils, and is basically an agricultural country. The majority of the population lives in rural areas, largely consisting of smallholder subsistence farmers who contribute more than 70% of the country's

wealth (RCDP, 2001).

Uganda has 56 districts, each with an administrative unit run by a local government. Kampala is the capital city, and this is where most of the ministries, including the Ministry of Health, are located. Out of these 56 districts, the main body of the study took place in two, which are Mbale and Rakai districts. Rakai district is located in the south-west of the country bordering the Republic of Tanzania. Its population is around 488,602 people. On the other hand, Mbale district is in eastern Uganda, bordering Kenya. The district has a population of about 720,925 people.

These two districts were not simply selected out of the 56; they are the only ones in which UHIN has piloted the handheld computers, so the study had to take place there. Although I could have taken a representative sample from either, I decided to take samples from both districts. This is because I wanted to find out whether the handheld computer users' perceptions about the technology and its contribution were the same in both places, or whether they varied according to district. I also took a sample from Kampala, for that is where the UHIN offices are located. Since I had to talk to people working with the project, and also working at the MoH, the study extended to cover this district.

3.4. The Quantitative research process

Under the quantitative strategy are various ways of carrying out research. One of the commonest is the survey. Williams et al. (1988) list surveys as one of the different approaches to the study of new media, among mathematical modelling, controlled experiments, quasi experiments and longitudinal studies.

There are two major types of surveys used by researchers, and these are descriptive and analytical surveys (Wimmer and Dominick, 1997; Jensen, 2002). Descriptive surveys attempt to picture or document current conditions or attitudes, that is they describe what exists at the moment, while analytical surveys attempt to describe and explain why

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[20] Uganda, http://www.infoplease.com/ipa/A0108066.html: accessed 03/03/2005

certain situations exist. Results from analytical surveys allow researchers to examine the interrelationships among variables and to draw explanatory inferences (Wimmer and Dominick, 1997:137). For this study, I used the analytical survey because not only did I want to show what UHIN's project was doing, but also to explain and analyse the project's work.

Surveys have disadvantages, one of which is that causality between variables may sometimes be difficult to explain due to the involvement of many intervening variables (ibid.: 138). There may also be problems with questionnaires and/or interviews, such as the unwillingness of people to respond. However, surveys make it possible to collect large amounts of data from a variety of people, and they are also credited with producing reliable and useful information (ibid.), which strengths contributed to my selection of this method. Social survey research is conducted using a variety of instruments, the commonest being questionnaires and interviews.

3.5. Sampling

Because it is sometimes not possible to study every individual/unit/object in one's target population, a sample is usually taken. Williams et al. define sampling as the selection of some subset of respondents or other objects of study from the relevant population of all such respondents or objects (1988: 62). To justify sampling, the authors say a researcher may want to study only a subset instead of the entire population because it would be impractical (too costly, time-consuming, difficult to analyse) to collect data from all respondents (ibid.).

There are two kinds of samples – probability and nonprobability samples. A probability sample is one that is selected according to mathematical guidelines whereby the chance for selection of each unit is known, while a nonprobability sample does not follow the guidelines of mathematical probability (Wimmer and Dominick, 1997: 62). Probability samples are divided into categories that include simple random samples, systematic samples, stratified random samples and multi-stage cluster samples (Bryman, 2004; Jensen, 2002).

Non probability sampling includes quota, snowball, convenience and purposive sampling. Quota sampling aims at producing a sample that reflects a population in terms of the relative proportions of people in different categories, such as gender, age groups and socio-economic groups. Convenience sampling involves using a sample that is simply available to the researcher by virtue of its accessibility (Bryman, 2004: 100). Bryman adds that this kind of sampling plays a more prominent role than is sometimes supposed. With snowball sampling, the researcher makes initial contact with a small group of people who are relevant to the research topic and then uses them to establish contacts with others (ibid.). These last two kinds are the ones I used to get the sample of health practitioners.

There were two kinds of samples for this study, and these were the medical practitioners using the handheld computers, and other members of society who were involved with the project in some way. One would wonder why, since the project looks at the way handheld computers are facilitating health service delivery, the survey was carried out among health practitioners and not members of the population. There are two (related) reasons for this.

The first reason is that it is to the practitioners that UHIN distributed the handheld computers, and the second is the fact pointed out by Melkote and Steeves that ICTs in developing countries currently have a greater enabling value in building capacity within intermediary institutions (such as schools, non-governmental organisations and health units) than in directly affecting the poor (Melkote and Steeves, 2001: 266-7). This is because realising the full potential of new ICTs in developing countries will require things like appropriately skilled personnel and good infrastructure, which are not yet present.

Chandrasekhar and Ghosh (in WHO, 2001: 851) emphasise this further by saying that the effect of ICTs on health differs from their impact on other sectors in crucial ways. This is because achieving some of the benefits of ICTs requires that health workers are reached and not necessarily the final beneficiaries. They say:

Conceptually, this implies that the potential of ICTs in the health area lies in their mediatory role between differentially endowed segments of the health system and between the health system, the health service provider and the beneficiary. In this role they promise to be a much better medium for delivering specific health services and of serving as a tool that can help reorganise the health system and render it more efficient (WHO, 2001: 851).

3.5.1. Study Population and Respondents

The health practitioner sample was got through snowball and convenient sampling. In Rakai, handheld computers were distributed throughout the whole district, that is, without being restricted to particular health sub-districts (HSDs), while in Mbale, the handhelds were distributed in two HSDs. Each district received 83 handheld computers.

To get the health practitioners who received these handheld computers, I elicited the help of the people at UHIN. UHIN's ICT point person, Caesar Scott Barole, put me in touch with the UHIN project officers for Mbale and Rakai. I went to Mbale first. There, the District Director of Health Services (DDHS), Francis Abwaimo, availed me with a vehicle and a driver. Then with the guidance of the project officer, Joyday Agatha Gloria, I went to those health units where there were health practitioners using handheld computers. I interviewed those practitioners I found at the health units.

Convenience/availability came into the picture because of the fact that in some of the health units, I did not find the practitioners there. Some were on leave, some sick, while others had gone for workshops. Mbale and Rakai are rural areas. Most of Mbale is mountainous, covered by Mountain Elgon and its ranges, and most of the roads outside the district's centre are very poor. Furthermore, the health centres are scattered throughout the district, separated by long distances. Once I left a health centre, it was difficult to go back. A similar situation confronted me in Rakai, where, although there are no mountains, the health centres lie, on average, about 20 kilometers from each other. At some of the centres which the project officer Jude Okiria and I went to, the people using the handhelds were not present. We would therefore go on to the next one hoping to find a potential interviewee. As Bryman rightly notes, the resort to convenience sampling is usually a product of such factors as the availability of certain individuals who are

otherwise difficult to contact (2004: 333).

This factor also partly influenced my decision not to restrict the survey to health practitioners of a particular designation/position, for example nursing assistants or midwives only. The handheld computers were distributed to practitioners of different positions, so I interviewed these different people, since all were using the tools. Had I restricted myself to one category, I would have risked leaving out other users and not getting a reasonable sample, given the difficulty of finding people at their work places. Therefore I interviewed 64 handheld computer users in total, 33 from Mbale and 31 from Rakai.

Patton says there are no set rules in determining sample size. He argues that 'sample size depends on what you want to know, the purpose of inquiry, what is at stake, what will be useful, what will have credibility, and what can be done with available time and resources' (1990: 184). This is why I considered 64 handheld computer users an adequate number of respondents for this study. They would produce enough information to answer the study's research questions.

3.6. Quantitative Research Instruments

3.6.1. Structured Interviews

The structured interview is one of a variety of forms of research interview, but it is the one that is most commonly employed in survey research (Bryman, 2004: 109). Bryman adds that the goal of the structured interview is for the interviewing of respondents to be standardised so that differences between interviews in any research project are minimised. The structured interview can be conducted in person or over the telephone.

To find out how the handheld computers were used, I administered structured interviews to the 64 health practitioners in person. At each health unit I went to, I would sit with the respondent and interview him/her, while writing down his/her responses as accurately as I could. Structured interviews have several advantages. It is possible for the interviewer

to clarify for the respondents in case they have not understood a question, and the interviewer can probe respondents to elaborate an answer or seek any other information that is related to the response they give. These advantages played into my hands, since I did not have a lot of information about the project in the beginning.

It is for the same reason that I used mainly open-ended questions in the structured interviews. With these questions, respondents are asked a question and they can reply however they wish, as opposed to closed-ended questions which are presented with a set of fixed alternatives from which respondents have to choose an appropriate answer. Open-ended questions have many disadvantages, the major one being that a lot of time is needed to collect and analyse the responses (Wimmer and Dominick, 1997). However, because of the benefits they promised I overlooked these disadvantages. Such questions are useful for exploring new areas or areas in which the researcher has limited knowledge, and they allow for answers that the researcher did not foresee in designing the questionnaire (ibid.: Bryman, 2004). Patton adds that open-ended responses permit one to understand the world as seen by the respondents. He says:

> The purpose of gathering responses to open-ended questions is to enable the researcher to understand and capture the points of view of other people without predetermining those points of view through prior selection of questionnaire categories (Patton, 1990: 24).

I also had close-ended questions in the interview, which I used for those questions that required simple Yes/No answers, and for which I did not need explanations and elaborations. Initially I had a research assistant to help me administer the interviews, but because it was more effective to go from one health centre to another due to the long distances separating them, instead of different people going to different health centres, the assistant was not really necessary.

3.7. The Qualitative research process

This process involves the researcher conducting studies in the field, in natural surroundings, trying to capture the normal flow of events. The qualitative research

instruments employed in this study were in-depth interviews and document analysis.

3.7.1. In-depth interviews

The major way in which qualitative researchers seek to understand the perceptions, feelings and knowledge of people is through in-depth, intensive interviewing (ibid.: 25). Bower says a commonsensical justification for the wide use of interviewing is that the best way to find out what people think about something is to ask them (in Jensen, 2002: 240).

In-depth interviews yield rich, detailed answers because the interviewees are not restricted in their responses. The interviewing is also flexible, in that the interviewer can depart significantly from any schedule or guide that is being used, and ask new questions that follow up interviewees' replies (Bryman, 2004: 319-20). I used these interviews for the key informants. I had an interview guide with a list of broad questions for the respondents, all of whom I met in their offices. To get these respondents, I used the purposive sampling method. Bryman explains that:

> Such sampling is essentially strategic and entails an attempt to establish a good correspondence between research questions and sampling. In other words, the researcher samples on the basis of wanting to interview people who are relevant to the research questions (2004: 333-4).

Talks with UHIN staff resulted in suggestions of which people could serve as rich sources of information for this study. Caesar Barole, Joyday Agatha Gloria and Jude Okiria assisted me in identifying the people that I could interview at UHIN, in Mbale and Rakai and at the MoH. I did not know very much about UHIN and its project, therefore I needed to get all the information I could from the people who could provide it. It was also necessary to get information about what the Government of Uganda thinks about the place of ICTs in the country's development, so I interviewed a Member of Parliament who sits on the Science and Technology Committee in the Parliament of Uganda. This kind of selection of respondents is in line with Patton's assertion that the logic and power of purposive sampling lies in selecting information-rich cases for study in depth. He

explains that information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of research, thus the term *purposive* sampling (Patton, 1990: 169).

The category of key informants was made up of the DDHS' of both districts, the UHIN project director, UHIN content manager, UHIN project officers, the Vice-Chairman of the Science and Technology Committee in the Parliament of Uganda and an official from the MoH's HMIS department. In total, I interviewed eight (8) key respondents. I used different interview guides for the content manager, the MoH contact person, the Member of Parliament, the DDHS' and the UHIN project director and project officers (see appendices). The reason for this is that these people interact with the project on different levels, so they had different information to offer. I recorded these interviews using a tape recorder and later transcribed them.

3.7.2. Document Analysis

The analysis of documents (secondary data) can be done together with other research methods to answer research questions or test a hypothesis. Doing this allows the researcher to learn from and eventually add to previous research (Wimmer and Dominick, 1997: 25). Document analysis yields excerpts, quotations or entire passages from organisational or program records and official publications and reports (Patton, 1990: 10). Jensen says one advantage of analysing documents is that such data is 'found' rather than 'made' through the researcher's intervention in the field, so it is not biased by the researcher (Jensen, 2002: 243).

In this study I used, among others, documents from UHIN. The organisation has carried out several evaluations of its handheld computer project, and these proved to be pivotal to the study. This literature, which included a pilot report, a cost-effectiveness study and two user needs surveys, was availed to me by UHIN.

I also analysed a number of policy papers made by government (of Uganda) bodies. These included the national ICT policy and the first volume of the Poverty Eradication

Action Plan. Together with these was the data from the MoH, such as the inventories of health services and the government's health policies. The Ministry of Works, Housing and Communication's e-Readiness Assessment Report was also very useful. It is a detailed report documenting the present ICT situation in Uganda, with suggestions on the way forward for the country. The other documents were the Rural Communications Development Policy for Uganda and the Uganda Telecommunications Sector Policy Review, both made by the Uganda Communications Commission. These two documents also comprehensively discuss the ICT infrastructure situation in the country, highlighting the needs that have to be met in order to fully harness the technology's potential to contribute to development.

Online documents were another source of data. These included the MoH's official website and the web portals for various districts in Uganda. Mbale, for example, has a website (www.mbale.go.ug), while that of Rakai is still being developed. These websites are set up by the government, and they are aimed at providing all relevant information about the districts to interested parties. Furthermore, on the Internet I was able to find out more details about handheld computers, and the other countries in which they have been used. I also found the information about the WSIS from the Internet. Being a very recent occasion, I was not able to find books about the summit.

3.8. Data Analysis

The challenge in research is to make sense of massive amounts of data, reduce the volume of information, identify significant patterns and construct a framework for communicating the essence of what the data reveal (Patton, 1990: 371-2). Since I used two methodological approaches in collecting the data for the study, it was necessary to use two types of data analysis, too.

For the structured interviews, I used Univariate Analysis. This is the analysis of one variable at a time (Bryman, 2004: 227). In this case I took question by question, analysing the responses to it. For the closed questions I counted the responses to each option and then translated them into figures. These were later displayed in the form of

frequency tables. A frequency table provides the number of people and the percentage belonging to each of the categories for the variable in question. The tables gave me a clear picture of the proportion of respondents that subscribed to each of the different views, which facilitated the interpretation of the findings.

For the open-ended questions I read through the answers, from which I derived different codes. Jensen explains that a code is a representation of a portion of the field of study, capturing and fixating certain qualities of a person, event, text, or other unit of analysis for the purpose of later comparison. He adds that the aim of having codes is to arrive at exhaustive and mutually exclusive categories (Jensen, 2002: 246).

Having got the codes, I was able to assign the different responses to appropriate categories. I converted these into figures, and displayed them, too, in the form of frequency tables. I later took some of the frequency tables (from both the closed and open-ended questions) into a computer programme, Microsoft Excel, where they were manipulated to form charts. The results were then visually displayed in form of bar charts. According to Miles and Huberman (1994), data display in the form of figures and graphics are special aids in the interpretation of data (in Jensen, 2002: 247).

To analyse the qualitative data from the in-depth interviews, I used both cross-case analysis and case analysis. For those respondents for whom I used the same interview guide, I used cross-case analysis. Following the questions on the guide, I went through each of the interviews, grouping together the responses to each question. This way, it was possible for me to identify running themes and also to mark similarities and/or differences in the respondents' views and perspectives. Talking about extracting themes (thematic coding), Jensen says it is the very occurrence of a particular theme or frame in a context of communication which is of primary interest to qualitative research (Jensen, 2002: 247).

I analysed the interviews for the respondents who had their own interview guides using case analysis. This involved writing a case study for each person interviewed and finding

out how their responses related to the research questions. In the analysis of the interviews I was guided by the constant comparative technique, which was first articulated by Glaser and Strauss (1967) (in Wimmer and Dominick, 1997: 86). It is made up of four steps, and these are:

1. Comparative assignment of incidents to categories
2. Elaboration and refinement of categories
3. Searching for relationships and themes among categories, and
4. Simplifying and integrating data into a coherent theoretical structure.

3.9. Problems encountered

The fact that I went to the health units in the company of the project officers presented a problem. Some of the respondents thought I was involved with the project, and were therefore not very objective in their responses. They kept saying only good things about the project and the handheld computers. I had to explain to them that I was a student and not one of UHIN's staff, which allowed them to open up. I also attempted to solve this problem by interviewing the health practitioners without the project officers nearby.

Thinking I was part of UHIN, the respondents ended up complaining and engaging in long explanations about the problems they face with the handheld computers, and the other capacities that they would like the computers to have. They would even ask me to ensure that the problems are dealt with. I still had to remind them that I did not work for UHIN and was carrying out research for academic purposes. I would then go on to the next question.

3.10. Conclusion

In this chapter I have discussed the major research methods employed for this study. I did not use quantitative or qualitative methods in isolation, but combined them. The qualitative methods enabled me to get detailed information about the project and the subject at hand, while the quantitative methods made it possible for me to talk to a relatively large number of health practitioners, getting different views.

The chapter also includes a justification of the selection of the specific research instruments used. I have explained the procedures followed to select the sample populations, and to obtain information from them. The problems I faced in collecting the data have also been included. Since the process of data collection is not an end in itself, I have discussed how I analysed the data collected. As Patton states, the culminating activities of qualitative (and quantitative) inquiry are analysis, interpretation and presentation of findings (Patton, 1990: 371). This also explains why the following chapters present and discuss the findings of this study.

CHAPTER FOUR

UGANDA HEALTH AND COMMUNICATION POLICY ENVIRONMENT

4.0. Introduction

This chapter discusses the health and communication policy environment in Uganda. Government policies can impede or aid the development, diffusion and spread of information technology, so a discussion of these two policies will help give the context within which the handheld computer project operates. The chapter highlights the fact that the MoH's appreciation and embracing of the private sector as a partner in health service delivery is a major reason for UHIN's existence. It also asserts that the communication policy's position that the new information technology needs to be harnessed to facilitate the flow of relevant information, and the subsequent national ICT policy form the foundation for UHIN's attempt to contribute to health service delivery using handheld computers.

4.1. Uganda's health system

In 1999, the Government of Uganda adopted a new National Health Policy (NHP). The policy was formulated within the context of the provisions of the Constitution of the Republic of Uganda 1995, the Local Governments Act 1997, and the Poverty Eradication Action Plan. The overall objective of the health sector, as derived from the NHP and the Health Sector Strategic Plan (HSSP), is to reduce morbidity and mortality from major causes of ill health and the disparities therein (MoH, 2004). The underlying philosophy of this vision is the provision of Primary Health Care through the Minimum Health Care Package (MHCP). This package is designed based on data and information about Uganda's national health profile, and on affordable cost-effective interventions (UHIN Pilot Report, 2004: 6).

4.1.1. The National Health Policy

With a mission to ensure the attainment of a good standard of health for all the people in

the country, the MoH has a daunting task ahead. Among others, it intends to fulfill this mission by developing health information and quality assurance systems that facilitate district and national planning and policy implementation; providing efficient and effective systems and interventions for the aversion of or early identification and control of epidemics, and co-ordinating and facilitating all stakeholders in the health sector to achieve the national goals for health. The other objective is to ensure that sufficient health professional development is undertaken to meet national requirements. This will ensure minimum standards of professional practice (MoH, 2004).

Just like the ICT policy does not mention health outright, the MoH's policy does not specifically mention that ICTs will be incorporated in its activities. It simply implies so. The ministry has earmarked the private sector and non-governmental institutions as its partners in providing health services, and is out to encourage and support the sector's participation in all aspects of the national health programme. This means that organisations like UHIN are part of the health service providers in the country, and as the findings in Chapter Five show, UHIN's work is an attempt to meet the MoH's objectives listed above.

4.1.2. Decentralisation

Decentralisation in Uganda is perceived as a developmental model. The post-independence Constitution of Uganda[21] provided for decentralisation based on regional governments, which were abolished in 1966 when the Constitution was abrogated and all executive powers vested in the presidency. The central government centralised all powers until 1993, when the parliament enacted the Local Governments Statute. This culminated into a decentralisation policy. All the functions, powers and services were gradually transferred from the central government to the local governments at the district level. One major objective of the decentralisation policy is relevant to this study, and that is: To bring political and administrative control of services to the point where they are actually delivered, thereby improving accountability and effectiveness, promoting people's feelings of ownership of programmes and projects executed in their areas. This explains

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[21] Uganda attained independence on October 9, 1962.

why the UHIN project uses the district as its point of reference and base of operation.

In the context of decentralisation and the NHP of 1999, the government restructured the organisation and management of the national health system. The MoH retained the core functions of policy formulation, setting standards and quality assurance; resource mobilisation; capacity development and technical support; provision of nationally coordinated services; coordination of health research and monitoring and evaluation of the health sector performance. On the other hand, the following functions were decentralised to the districts: implementation of the NHP; planning and management of district health services; provision of disease prevention, health promotion, curative and rehabilitative services, with emphasis on the MHCP and other national priorities; control of other communicable diseases of public health importance to the district; health education and health data collection, management, interpretation, dissemination and utilisation.

Furthermore, health service delivery has been devolved to Health Sub-Districts (HSDs) or service zones within each district. These are intended to be functional subdivisions of the district health system aimed at further decentralisation of the management of routine health service delivery from the district office to lower levels. This is hoped to lead to improved planning and management of district health services; increased equity of access to essential services; to achieve an optimum balance between curative care, disease prevention and health promotion, and foster community involvement in planning, management and delivery of health care. In the 56 districts in the country are 214 HSDs in total (UHIN Pilot Report, 2004: 7).

4.2. The Communication Policy

The basis of the formulation of an Information and Communication Policy for Sustainable Development was the government's awareness of the need to improve the quality of information and the means of its delivery (White Paper, 1999: 5). The government noticed that little advantage could be taken of the opportunities offered by the decentralisation policy if the information needed to provide them with meaning and

purpose was not available or, when available, could not be effectively transmitted to the people who needed it (ibid.: 4). Thus in 1997, the policy was drafted, its objectives being to ensure the comprehensive provision of information for development and to ensure that the information reaches its targeted recipients in forms best-adapted to their needs and the circumstances of reception.

To achieve these objectives, it was necessary to coordinate all the available resources for communication. Important to note, for this study, is the fact that the policy recommended that the available resources be further extended and reinforced by incorporating those *new technologies of communication* (italics author's emphasis) that are most suited to the country's needs and circumstances (ibid.: 11). This is the basis of Uganda's ICT policy.

Like the NHP, the Information and Communication Policy for Sustainable Development was formulated within the premises of the 1995 Constitution of the Republic of Uganda. The Constitution contains two articles directly related to communication: Article 29 on the freedom of expression and Article 41 on the right of access to information. These reflect on the principle of communication being a human right as outlined in the Universal Declaration of Human Rights of the UN and the subsequent International Covenant on Civil and Political Rights. Hanson and Narula observe that:

> The notion of communication as a basic human right has become popular since the Universal Declaration of Human Rights was advocated in 1948. Technologies in many cases, particularly in the area of telephony, are no longer considered luxury appliances, but rather necessities. These technologies, and the means to make them work, must be cost accessible to the general public (Hanson and Narula, 1990: 15).

The other relevant right to Uganda's communication policy is the right to development, asserted by the African Charter on Human Rights and the UN Economic Commission for Africa (White Paper, 1999: 6).

4.2.1. Uganda's ICT policy

The country's ICT policy exists within the context of global thinking about the growing

importance of new ICTs (see Chapter One) and the subsequent national acknowledgement of their importance. Drafted in 2001, the policy aimed at facilitating the government's implementation of its long-term national development programmes, which include the Poverty Eradication Action Plan and the Plan for Modernisation of Agriculture (MoWHC, 2001). The policy recognises that for these programmes to be effected, timely and relevant information must be available, which availability is to be made possible using new ICTs. These ICTs are identified as one of the mechanisms that can help the country 'leap-frog' certain development stages and also benefit from the global economy.

The policy's main goal is to promote the development and effective utilisation of new ICTs over the 10 years following its coming into effect. To achieve this, a number of objectives are laid out, one of which is to promote the establishment of an appropriate infrastructure that supports ICT development and helps achieve universal access to ICTs in the country. Fair competition and private investment in the ICT sector is also to be promoted, with emphasis on developing and encouraging local participation. To echo Hanson and Narula (1990: 13), these objectives are aimed at diffusing technology among people and creating scientific ambience to assimilate technology in their lifestyle.

Improving health through ICTs is not mentioned specifically in these objectives. However, under the objective of providing better infrastructure and accessibility to ICTs in the country, the technology can be employed to extend health services and resources to people in hard-to-reach areas and areas without enough qualified health personnel. The cabinet approved the draft in 2003, and it is now awaiting debate and ratification in parliament. When wholly implemented, it is hoped that the policy will boost Uganda's ICT capacity.

Uganda has gone further than establishing an ICT policy. The country liberalised the economy, along with the telecommunications sector, as part of the structural adjustment policies of the World Bank. It has also completely scrapped taxes on computers in an attempt to make them more affordable and thus accessible. In 2002, it waived a $500

licence fee on communication services providers such as fax bureaus, Internet cafes and phone kiosks to increase the availability of the services and make them cheaper.

4.2.2. The Rural Communications Development Policy

Uganda is one of the first African countries to establish a universal access fund – the Rural Communications Development Fund (RCDF). This fund comes from a one percent charge on the overall revenues of telecom providers in the country. It is meant to support the provision of basic communication services in otherwise unfeasible areas, such as rural areas. Although rural areas contribute a significant portion of the country's wealth, they have the least access to communication services. This has isolated them and denied them the opportunity to initiate valuable interactions with the outside world. It is no wonder then that this study looks at attempts to extend information and communication services to health practitioners in rural areas of Uganda.

4.2.3. The State of Communications in Uganda

The country is rapidly improving its ICT capabilities and infrastructure. The momentum has only picked up in the past years, especially after the advent of Mobile Telephone Network (MTN), the leading service provider in Uganda. Infrastructure and facilities have improved qualitatively as well as in sheer numbers. However, the cost of communications is still high, limiting access, especially in the rural areas. The table below represents the growth in telecommunications in the country:

Table 4.1. Uganda Telecommunications Growth

Indicator	Dec-95	Dec-96	Dec-97	Oct-98	Dec-99	Feb-01	Jul-01	Jul-02	Jun-03
Population (million)	19.17	19.75	20.31	20.9	21.6	23.3	24	24.63	25.63
Teledensity –Fixed	0.23	0.23	0.24	0.27	0.27	0.26	0.23	0.27	0.25
Teledensity –Mobile	0.01	0.02	0.02	0.06	0.34	0.81	1.35	1.83	2.42
Combined Teledensity	0.24	0.25	0.27	0.33	0.61	1.07	1.58	2.10	2.67

Source: Uganda e-Readiness Assessment Report, 2004

There are far more mobile telephone connections than fixed lines in Uganda. With a mobile phone teledensity of 2.42 compared to 0.25 for fixed lines, it gives credence to the claims by development scholars and experts that the new ICTs have enabled developing countries to skip some stages of development to more advanced stages. As Pool says, countries short of capital and other resources can actually grow faster than the advanced industrialised countries, partly because of the advantage of coming second and being able to borrow rather than invent advanced technology (Pool, 1990: 170).

Uganda's relatively high mobile phone teledensity is also one of the reasons that explain UHIN's opting for wireless technology for the running of the handheld computer project. However, these numbers are deceptive in themselves. They do not reflect equal accessibility to these telephone services, for the reality on the ground shows that mobile phones, for example, are mostly used in urban areas, and it is not uncommon to find people in the higher income brackets having several phones at their disposal.

Computers in the Country

Ownership of computers is still very limited, with only 3.5% of the urban population having access to computers in their homes. The corresponding figure for rural is 0.4%. The national penetration is 0.7%. Based on these figures, there are only 182,000 computers for the 26 million people in Uganda (Uganda Telecommunications Sector Policy Review, 2005: 41). For those who have computers in their homes, only about 10% have a working Internet connection, meaning that ordinary people are not yet using computers as an aide to communication and information access. Among those who have Internet connection to their homes, the typical monthly bill is about 85,000 shillings (US$49). Even if it was not for the other challenges, such a cost puts the possession of an Internet connection to the home out of the reach of more than 90% of the population (ibid.).

4.3. Conclusion

The chapter has presented the broad health and communication policy environment

within which UHIN operates. It has also looked at the coming of decentralisation in Uganda and how this vested many responsibilities in the districts, which structure has guided the mode of operation for the handheld computer project under study here. The chapter has also looked at the state of health services and communication systems in Uganda. By so-doing, it has captured the situation in the country, which is important because the environment in which a project operates determines and influences how it works.

CHAPTER FIVE

PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

5.0. Introduction

Chapter Five presents and discusses the information I gathered in regard to the handheld computer project's intervention in health service delivery in Uganda. Since I used both quantitative and qualitative research methods, my presentation follows two different but integrated approaches. I present the findings in form of both statistics and analysis. As Cook and Reichardt say, quantitative researchers tend to translate their observations into numbers, whereby numerical values are assigned to the observations via counting and measuring (1979: 37). On the other hand, qualitatively inclined researchers prefer to record their data in the language of their subjects. This is because the actual words of the subjects are thought to be critical to the process of conveying the meanings of the participants, which eventually become the results or findings of the research (ibid.).

5.1. Handheld Computers/Personal Digital Assistants in Uganda

In 2003, IDRC, WideRay and SatelLife launched a nationwide wireless network in Uganda. The network is built around the country's relatively well-established cell phone network, handheld computers, and wireless servers called jacks. The handheld computers are commonly known as Personal Digital Assistants (PDAs) to the users in Uganda, so this is the term mainly used in this section of findings.

How PDAs work

The PDA is a portable handheld device that performs many of the same functions as a personal computer. The user interface on a PDA is the entire face, which is a touch-screen that enables users to select programs and navigate functions by touching the screen with their fingers or with the accompanied pen-shaped stylus. The bottom portion of the screen is the area where a user inputs data either by using the installed 'graffiti' software which reads the handwriting of the user and translates it into text, or by using a

virtual keyboard that appears on the screen.

PDAs are almost always equipped with personal organisation programs such as an address book, diary/journal, calculator and meeting calendar, applications such as Microsoft Word, Excel and Power Point, and communications software that facilitate email and navigation on the Internet. They are also commonly equipped with an infrared sensor that enables one PDA to communicate with other PDAs as well as with wireless networks using a connecting jack (Phipps et al., 2003). However, the PDAs used in Mbale and Rakai districts are not yet connected to the Internet.

In scaling up the project to provide wide coverage for the health care initiative, a central wireless server was installed in Uganda's capital, Kampala. It is linked to computer systems at the MoH, and at the UHIN offices at Makerere University Medical School.

Fig. 5.1. An illustration of how the information flow takes place
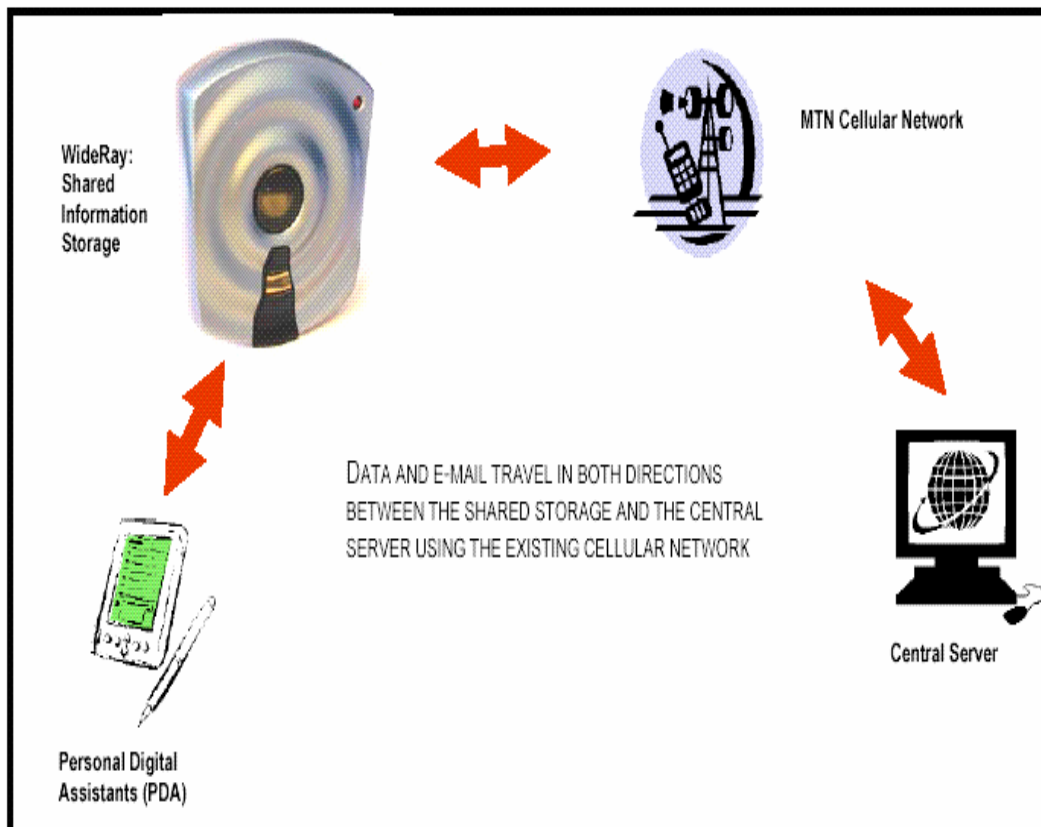
Source: Phipps et al., 2003

As the diagram shows, the server manages the entire network and communicates with the jacks in the field over the cellular phone networks, which in turn communicate with the PDAs. Each jack stores medical content sent to it from the central computers in Kampala and, in turn, relays reports received from the PDAs back to the capital. As opposed to Internet, what UHIN has is an Intranet, whereby information is shared among different people in this network, and no one from outside can access it. Information technology has been localised to meet the needs of the rural practitioners (see Pool, 1990: 191). The Ministry of Works, Housing and Communications has lauded the technology for being reliable in remote locations, including those with no electricity or fixed telephone lines (Uganda e-Readiness Assessment Report, 2004).

5.2. The districts

Mbale lies 230 kilometres from Kampala. According to the Mbale district website, officials say one of the leading causes of health problems in the district is ignorance. On average, the district has one health unit per sub-county, one referral hospital (Mbale Hospital) and one district hospital (Bududa). The district also has six HSDs, 22 dispensaries/maternity units and some community-based units under construction. Six of the 22 dispensaries/maternity units are headed by a doctor and have theatres.[22] Mbale got 83 PDAs, three jacks and 14 solar chargers. These were distributed in only two HSDs.

Table 5.1. Mbale Health Indicators[23]

Variable	Number of people
Population per doctor	20,734
Population per nurse	5,413
Population per midwife	12,837
Percentage of formally trained health workers	50%
Percentage of population within 5kms of a health unit	81%

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[22] Mbale District, http://www.mbale.go.ug/overview/health.htm: accessed 04/01/05
[23] Ibid.

The table shows that the district lacks medical personnel, and the few who are available are overburdened. It also shows that half of the medical personnel in Mbale are not formally trained, a problem that is not only restricted to Mbale but common in the whole country, Rakai included.

Rakai is situated 190 kilometres from Kampala. Poverty is prevalent in the district, since many families have lost their principal breadwinners to the HIV/AIDS pandemic. Most of the people cannot afford the health services in the area and the services are inaccessible (they lie over great distances) to most inhabitants. Furthermore, many people suffer or die from diseases that could have been prevented or cured.[24] Rakai is divided into four HSDs. In all, the district has 99 health units.[25] PDAs were distributed to practitioners in the whole district without being restricted to a particular HSD as in Mbale. The district received 83 PDAs, five jacks and 10 solar chargers from UHIN.

Table 5.2. Rakai Health Indicators

Variable	Number of people
Population per doctor	27,144
Population per enrolled nurse	8,884
Population per midwife	10,622

Source: Rakai district health office

Details about the proportion of trained health workers in Rakai were not available, but the table above shows that the district does not also have enough medical workers to serve its population. As mentioned in Chapter One, it is because of such factors that communication tools are being turned to, so that the available health workers' capability to handle patients is boosted and the best made of the available resources through prioritisation and proper planning.

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[24] International Care and Relief: Uganda – Long-term Sustainable Development, http://www.icrcharity.com/reproductive_health.html: accessed 04/01/05
[25] Rakai district presentation by Dr. Robert Mayanja in conference at Entebbe, 13-15th May, 2004

5.3. Users' perceptions of PDAs

The first question for the health practitioners required them to say what they thought a PDA is. Most of their answers reflected the fact that they think it is a smaller version of a computer, for they gave answers such as 'it is a small computer', or 'it is a handheld computer' and others, 'it is a portable computer'.

The respondents' definitions also brought out the fact that the PDA is a communication tool. Some said it is a handheld computer that helps them access information easily and send it fast to wherever it is needed. Others said it is an easy way of sending and receiving information.

Another characteristic of the respondents' definitions is that they linked the PDA to the health sector, explaining that it is a tool that had been brought to help improve health services. PDAs can be used in other sectors, but the respondents' linking them to health could be explained by the fact that it was their first time to see and use PDAs, and they were using them to improve health service delivery. So they gave answers such as 'a PDA is a device meant to make the information/communication system within the health sector better, thus improving the health service delivery'. Others defined it by stating some of the functions it serves, saying it is a simple portable device that can be used for reporting health management information, reading medical and daily information and making calculations. These functions are explored in the following section.

5.4. Uses to which the PDA is put

The research showed that the health practitioners use the PDAs for many different purposes as illustrated in the graph below. The respondents were not restricted on how many uses to mention, so these results are a reflection of the frequency with which the different functions/uses were mentioned. For both districts, HMIS reporting emerged as the function with the majority votes. 95% of the practitioners said they use the PDAs for reporting HMIS results, 76% for CME, 73% for calculations and 39% for reading news. Beaming, the term that means sharing information from one PDA to another using the

infrared function, got 19%. These are the functions that are most related to the health practitioners' work.

A range of other functions were mentioned. 67% of all the respondents said they use the PDA for playing games, a proportion greater than that which uses the PDA for reading news and sharing information with each other (beaming). Others said they use the PDA as an alarm clock, for storing personal addresses, as a calendar and diary. One respondent said he uses the PDA as a status symbol.

Fig. 5.2. How the health practitioners use the PDA
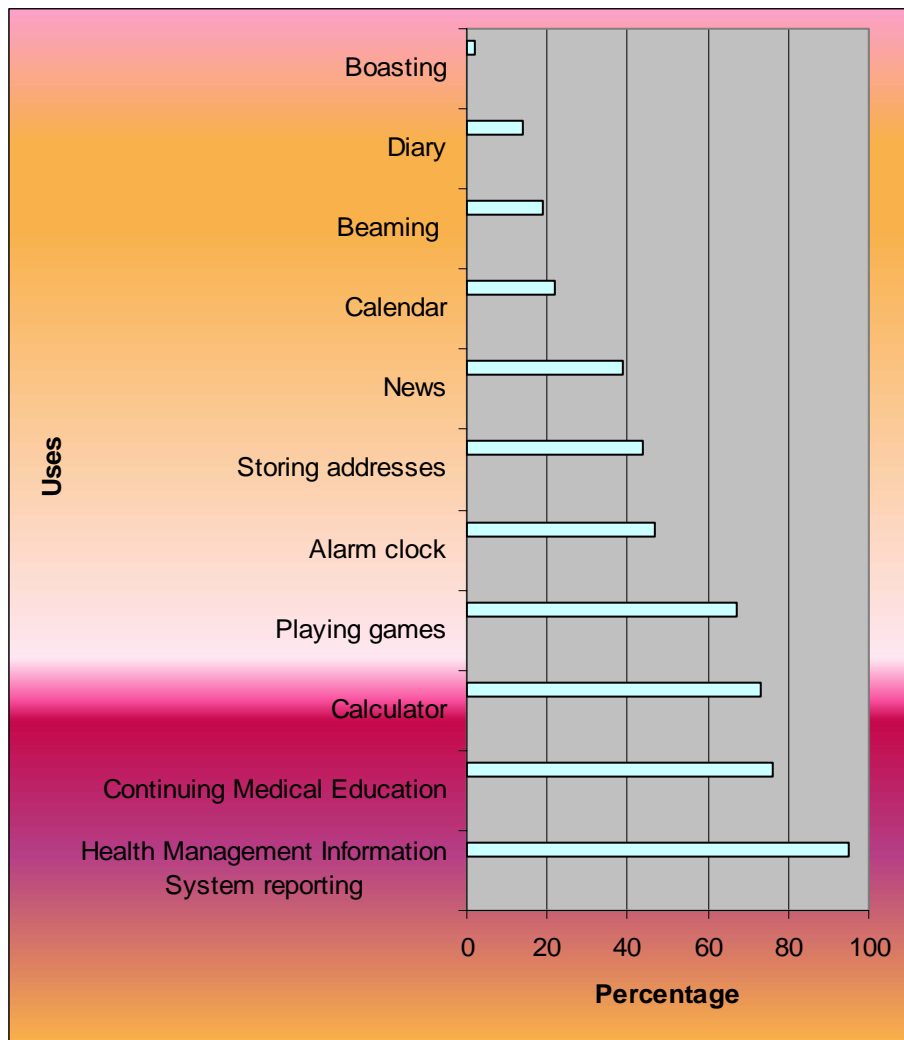
None of the functions that the PDA is supposed to serve (HMIS reporting, CME,

calculating, reading news and sharing medical information) got a 100% response rate. I interpreted this as signaling a misuse of the tools by some of the practitioners; for some of them playing games on the PDA takes precedence over HMIS reporting and reading medical information. Misuse and under use of technology is a common problem. Many studies have shown that in most African countries, people use the Internet for keeping in touch with friends/family and surfing, as opposed to research. Others just use the computers as advanced typewriters (Braa et al., 2001), yet there is much more they can do. It is therefore necessary for users to know the productive functions they can use the technology for.

5.4.1. Health Management Information reporting

According to Dr. Patrick Okello, the UHIN Project Director, the organisation's primary objective in initiating the PDA project was to improve health outcomes through better health service delivery. To achieve this, they singled out facilitating better HMIS reporting and CME for health practitioners in rural areas.

The HMIS is the official routine reporting system for the MoH. The objective of the HMIS in Uganda is to provide an integrated system of relevant and functional information on routine basis. It is designed for use at the health unit, HSD, district and national levels for planning, monitoring and evaluation of the health care delivery system. These tasks are necessary in order to continually improve the quality of health care in the country.

The HMIS design is aimed at making the system generate accurate, timely and relevant information in order to fulfill the above objective. The MoH has made important steps in using the system to monitor the implementation of the Health Sector Strategic Plan (HSSP). HMIS reports move from health centres to HSDs, districts and the central levels, and each level is required to provide feedback to complete the communication. The weekly and monthly forms (Form 033b and Form 105) were uploaded onto each PDA, from which the health workers fill them.

The weekly and monthly forms

The weekly form (033b, see appendix II) is a summary of the cases of selected diseases that have been registered at the health unit. These diseases include dysentery, malaria, measles, meningitis and guinea worm. The form also caters for deaths that have taken place during the week due to these diseases. The monthly form (105, see appendix III) is wider than the weekly one. It caters for notifiable, communicable and non communicable diseases recorded, both in children and adults; antenatal attendances; immunisation; family planning users; laboratory tests done, and also takes stock of drugs and supplies at the health unit and the unit's income.

In an interview, Dr. Okello said that UHIN knew HMIS data is very useful for better health service delivery, but the problem was that it came too late, due to the manual process of collecting it. Only 63% of the health units in the country were bringing in timely reports (UHIN Pilot Report, 2004: 9). However, there were more problems to solve than late HMIS results, as UHIN's pilot study revealed. The HMIS information was inaccurate and incomplete; analysis of the data was very slow because of the laborious manual process of entering and aggregating it and feedback to the health centres was limited, leading to poor, inaccurate, late and inconsistent decision-making.

Having identified the problems, UHIN looked around for the various options available and also practical for them to use to achieve their goal. Dr. Okello said they chose wireless technology because many areas of Uganda, especially the rural areas, do not have fixed telephone lines. The other reason was that much as wires are quite efficient, they are also very expensive. Avgerou and Walsham agree with this and also argue that wireless technology has certain advantages over fixed lines:

> The demand for communication and information services in developing countries is increasing, but conventional copper wire infrastructures are too expensive to install and maintain in rural, less developed areas. Wireless communication systems offer greater flexibility in network design and faster deployment, and are more suitable in difficult terrain and climates (Avgerou and Walsham, 2000:153).

Before the introduction of PDAs to Mbale and Rakai districts, the HMIS reporting was done manually, as is still done in the other districts in the country. The weekly and monthly forms would be filled in on paper and three or four copies made. These would then be delivered to the DDHS's office, where they would be analysed. The results would then be sent to the MoH in Kampala and to the health units so that they would be studied. However, as seen above, this manual system had problems.

With the PDAs, the system is now automatic. The health practitioners fill the forms on the PDA, and on finishing they just go and upload the information at the nearest jack. The jack makes a call to the server at the district health offices and, via Internet, transmits the information to the office. There the information is downloaded by the HMIS officer who no longer has to first enter it into the computer from the paper forms before analysing it. Writing back in 1988 about the information technology revolution, Compaine observed:

> Many of us are bypassing paper altogether. Compunications, the product of the meshing of computers with telecommunications, is allowing us to use our computers and terminals to access the information we think we want directly from other computers (Compaine, 1988: 4).

As Dr. Okello said, the PDAs have made the HMIS surveillance process more efficient. The PDA has not introduced a completely new idea for the health practitioners; it has just brought a newer and easier way of doing something they were doing before. This is proof of Rogers' (1983) observation that the compatibility of an innovation influences its adoption; the innovation must fit into already existing arrangements to be easily accepted.

According to Dr. Francis Abwaimo, the DDHS of Mbale, PDAs have improved the timeliness and completeness of the HMIS reports. He said that before, the health practitioners would deliver incomplete reports, claiming that they had too much work to do and so were not able to finish filling the forms. Dr. Abwaimo added that HMIS is important because it enables them, the people who make the decisions, to prioritise the health problems to be addressed. This is related to the fact that some of the data collected is of diseases that have the potential to become epidemics, so by monitoring them, the HMIS information serves as an early warning system regarding disease outbreaks. He

added that the monitoring of diseases such as cholera, HIV/AIDS and malaria also helps the health authorities to confine affected areas. Dr. Abwaimo said HMIS also helps in forecasting which drugs and resources are needed, and by whom, thereby guiding the health planning process.

Dr. Robert Mayanja, the DDHS Rakai, added that the technology has made the HMIS process cost-effective since they do not have to make copies of the forms anymore. Once entered into the PDA, the data can be shared among the different centres that are supposed to get it via the jack. The monthly form is about ten pages long. With the manual system, the health unit had to make three copies of this form after filling it, meaning that they had to pay for about 30 pages. This would cost 1,500 shillings (US$0.87), which is a lot of money for a rural health unit to spend each month.

This discussion shows that the PDAs have facilitated an improvement in health administration. Johnson Nkuuhe, the Vice-Chairman of the Science and Technology Committee in the Parliament of Uganda, was of the same view. He said he did not think a modern system could be run without the new ICTs.

5.4.2. Continuing Medical Education

Explaining why they chose CME as the other aspect through which UHIN would contribute to improving health service delivery, Dr. Okello said most of the health workers in Uganda are situated in isolated areas, which are hard to reach and which do not have access to medical literature. UHIN considered that the health education/information gap could be bridged by ICTs.

Dr. Julius Kalamya was UHIN's content manager at the time of doing the field work for this study, and this section greatly relies on information he provided in an interview. According to him, UHIN sends two kinds of information to the health practitioners using the PDAs. One is general information, which includes newspaper articles related to health or to the practitioners' districts or even not related to anything at all – just news that is considered interesting. The second kind, medical content, is made up of specifically

health information. This is information that UHIN considers relevant for the health practitioners. Kalamya is a medical doctor, and as the content manager he is in charge of the information that the health practitioners receive. The medical content is sent every Thursday, giving the practitioners time to read and analyse the information they have before they get new one. However, the news is sent daily.

The medical content sent includes treatment guidelines. The *National Guidelines on the Management of Common Conditions* are saved on every PDA. The treatment guidelines are available in book form/hard copy, but not every health practitioner has one or is able to get one. Their presence on the PDAs is like a guarantee that the practitioners have access to the guidelines, in case they need to use them. Medical content also includes material for CME. According to Dr. Kalamya, for a doctor to practice legally in Uganda, he has to be licensed by the country's medical councils. The councils require one to have 50 hours of medical education every year in order to be licensed. So the content sent out to the medical practitioners is a way of facilitating them to have CME. The information also enables them to keep themselves updated of medical developments.

Dr. Kalamya said UHIN carries out quarterly surveys to find out which information the health workers perceive relevant, and considers this when identifying what material to send. Going down to the people to find out what kind of information they feel they need is an example of the participatory/two-way turn that communication models are now taking. Servaes observes:

> One is no longer attempting to create a need for the information one is disseminating, but one is rather disseminating information for which there is a need. Experts and development workers rather respond than dictate; they choose what is relevant to the context in which they are working (in Richards et al., 2001: 19).

Apart from finding out the PDA users' needs, UHIN's surveys are also a way of evaluating the project. Evaluation enables the sender (of information) to get feedback from the receivers, which makes it possible to modify the information and any other aspects, if necessary. This is different from the modernisation paradigm's centralised,

one-way, top-down approach to communication, which failed to respond to realistically diverse needs (see Suriyasarn, 1998). Modernisation did not also pay attention to the quality of information the media deliver, misconstruing media exposure in itself as an indicator of development.

The information UHIN sends is in English. Dr. Kalamya said they have not yet had any complaints over the language, and this is partly because English is the official language in Uganda, introduced by the country's colonial rulers, the British. A large proportion of Ugandans can speak, read and write English. Education is also highly rated in the country, with the literacy rates over 70% (Uganda e-Readiness Assessment Report, 2004). The lowest educated health worker should have gone up to at least Ordinary Level. A few enter the system without an Ordinary Level pass, so their colleagues help them when they find difficulties with the language or anything else. Dr. Kalamya said the project has not considered using a local language and instead tries to communicate as simply and plainly as possible.

Illustrating the value of the CME material, Dr. Kalamya said:

> In developing countries anyone, even the unqualified health personnel, offers treatment because of the shortage of professionals. But the information we give the health practitioners helps them to accurately carry out tasks such as diagnosis, taking patients' history and treatment (Kalamya, personal interview: 01/12/2004)

Joyday Agatha Gloria, UHIN's project officer in Mbale, added:

> If it was not for the content that we send them, the health practitioners would be reading books (if they are lucky) written in the 1980s. People in rural areas are always left behind. The books stay in Kampala and even new research material comes up without the people upcountry ever getting the earlier research material (Joyday, personal interview: 17/11/2004).

Dr. Kalamya said the main reason that makes books unavailable to health practitioners, especially those upcountry, is their cost. He said medical books in Uganda are very

expensive – a book can cost about 100,000 shillings (about US$58). He added that the medical councils are pleased with the PDAs. It is the councils' responsibility (for example the Medical and Dental Health Practitioners' Council, Medical and Allied Health Practitioners' Council, Nurses' Council, etc.) to provide CME to health workers. These councils usually organise seminars or workshops for CME, but as Dr. Kalamya said, a seminar once or twice a year is not enough, and the information given in such a setting is very brief. Seminar attendance for health workers in rural areas is also usually poor due to transport difficulties. In contrast, PDAs avail detailed information regularly to the health workers.

In addition, Dr. Kalamya noted that from the UHIN surveys, the PDA users said their other sources of medical information are journals, newsletters and some books, but most of these are restricted to particular diseases. Since UHIN's medical content covers a wide variety of diseases and medical issues, over 70% of the users said their main source of information is the PDAs. Through small, palm-sized computers, an organisation is sending information to a small, specific group of people situated miles away. It is such happenings that give credence to the claims of the information society prophets – information technology has reversed the mass media revolution; instead of identical messages being disseminated to millions of people, electronic technology permits the adaptation of electronic messages to the specialised or unique needs of individuals (Pool, 1990: 8).

In light of the above discussion on the importance of the health information sent on the PDAs, the majority of the respondents said that the information had helped them deal with various diseases as they handled patients. The table below illustrates this:

Table 5.3. Table showing whether PDAs have helped deal with diseases

| PDA helped you to deal with diseases?	Mbale	Rakai	Percentage (%) of total respondents
Yes	25	20	70
No	08	11	30
Total	33	31	100

The diseases mentioned included Malaria, Dysentery, Pneumonia, HIV/AIDS, Measles, Diabetes, Sexually Transmitted Diseases, Tetanus and Cardiac problems. First Aid was also mentioned. For those who said the information had not helped them, the reason was that they either did not know that they could access medical information using the PDA or their PDAs did not have a browser, the application with which the information can be accessed. The browser has to be downloaded from the jack whenever one goes to download information, but some of the health workers forget this.

Through the two major functions (HMIS reporting and CME), UHIN is contributing to the achievement of the National Health Policy objectives discussed earlier. The organisation aids the early identification of epidemics and facilitates health professional development. Apart from HMIS and CME, the other main function that the respondents said they used the PDAs for was calculating. Each PDA has a calculator, and the health practitioners use it for calculating drug dosages for patients and when entering information about drugs into the HMIS forms. This is also important when it comes to planning and distributing drugs to the health units.

5.5. Health practitioners' appreciation of PDAs' roles

The discussion above has revealed how important UHIN, largely, considered the PDAs' contribution to the improvement of health service delivery in rural Uganda. It is also important to know whether the health workers themselves appreciated the PDAs. In response to questions on whether they thought the information they got and the communication they carried out using the PDAs had improved the quality of the medical services they offered, these were their responses:

Fig. 5.3. Responses to question of whether PDAs improved quality of medical services
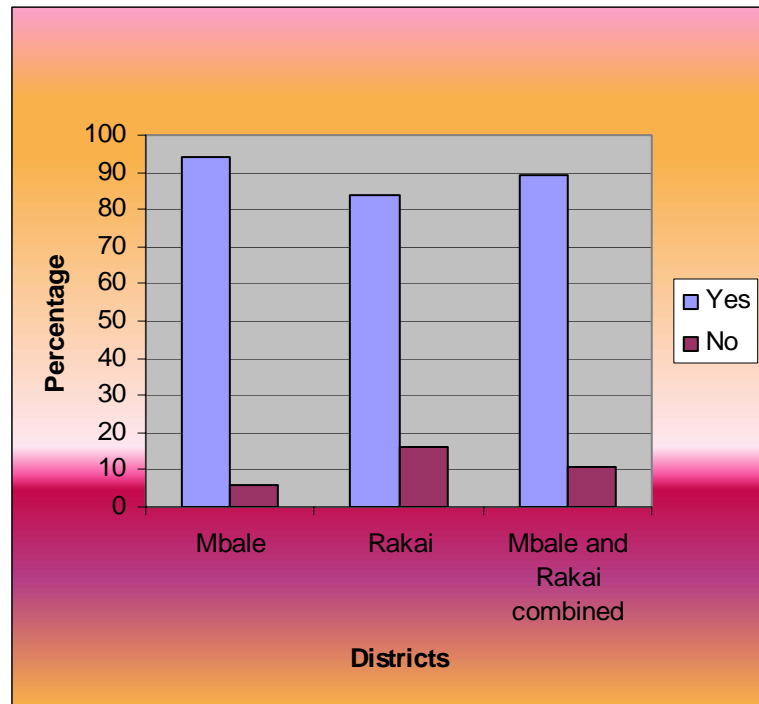
89% of the total number of health workers said the information and communication had made the services they offered better. The reasons they gave for this were related to the ease with which they were able to carry out the monthly and weekly HMIS reporting process and the information and CME they got from the PDAs. They said that with the PDAs, health information is easily sent to the relevant authorities and quick responses made without one necessarily leaving the health unit. This, they added, minimises transport costs and time wastage. On CME, the health workers said that the PDA has helped them to discover a lot of information, especially about diseases, their danger, causes and treatment. They said the information enlightens them and enables them to advise members of the community on how to lead healthy lives.

Without meeting needs or solving problems, it is difficult for technology to be appreciated just for its own sake. PDAs are being widely used in the two districts because the people have seen the contribution they are making to health service delivery. Hanson and Narula point out that:

The … value of technology depends on the appropriateness of the information being processed, developed, and transferred; its timeliness, quality, relevance … to actual users' needs (Hanson and Narula, 1990: 7).

The 11% whose answer to this question was 'No' said that they either did not know about the information or their PDAs did not have a browser. This is similar to the reasons given by the respondents who said that there were no diseases that the PDAs had particularly helped them to deal with. This is a weakness of the project, which shows that more support supervision is required from UHIN to see how the health practitioners are getting on with the technology. By so doing, problems will be easily identified and dealt with. It will also present an opportunity to encourage the health workers to keep using the PDAs. People often seek reinforcing information after they make a decision, so it is wise for communicators to extend their communication efforts to the period after implementation, encouraging the continued use of the innovation and assuring the adopters that they were wise to take on the new practice/idea. This is paralleled in what McGuire (in Windahl, 1992: 61) calls the post-behavioural consolidation phase of persuasion.

5.6. Frequency of PDA use

Knowing how often the practitioners use the PDAs would be a lead to knowing whether they had incorporated the tools into their day-to-day activities or not. It is for this reason therefore that they were required to say whether they used the PDAs everyday, once a week, twice a week, or even once in two weeks.

Fig. 5.4. How often the PDA is used
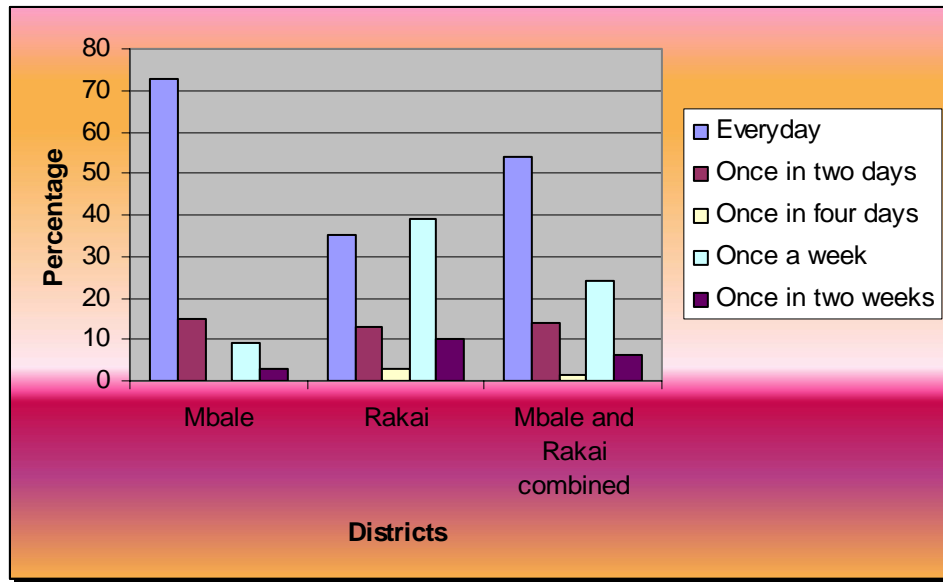
In Mbale, the majority of practitioners (73%) use the PDA everyday, a few once in two days (15%) and once a week (9%), while only 3% said they use the PDA once in two weeks. None use it once in four days. However, in Rakai it was different. 39% of the health workers said they use the PDA once a week, closely followed by those who use it everyday (35%). There was not a big difference between the numbers that gave these responses, but it is striking to see that quite a big number of people said they use the PDA only once a week. This is a big difference between Mbale and Rakai.

One of the factors that explain the poor usage of the PDAs on a daily basis in Rakai is the problem of electricity. Many of the respondents said they intentionally do not use the PDA frequently so as to preserve the battery charge. They said once the battery runs out they have to charge it, and yet they do not have electricity for charging, or the electricity is very unreliable. This means that they have to look for transport to go to the nearest town where there is electricity. This problem is compounded by the fact that most of the health centres are situated out of town, yet there is no established public transport system. One either asks for a lift from a passing vehicle or uses a bicycle/motorcycle to get to where they want to go. The trouble that all this puts the users to makes them decide that they would rather use the battery sparingly than be on the road frequently.

In Mbale the PDA is more appreciated for a number of reasons. Despite the fact that Rakai is closer to Kampala than Mbale, Mbale is more developed. Electricity is more available, and the roads are better. This is because Mbale is an important source of Uganda's leading export, coffee, and it is also situated between industrial towns – Tororo (where the cement industry is located) and Jinja (sugar and beer industries are found here). Much as they exist, the difficulties faced with electricity and poor transport systems are not as pressing in Mbale as they are in Rakai.

Discussing the electricity problem, the Uganda Telecommunications Sector Policy Review also agrees that a key factor in access to telecommunication services in the country is access to electricity. Uganda has a fairly extensive transmission grid reaching most of the 56 districts, but access is limited by the cost of stepping down from the transmission to the distribution voltage; carrying out internal house wiring, and paying for the connection. As a consequence, 97.7% of the rural and 59.9% of the urban populations have no access to electricity in their homes. Urban populations can however always find a place to charge a phone (or PDA) within a fairly short time. Rural populations end up completely cut off, or being required to undertake long journeys (of up to one hour) to charge phones or (PDAs).

The Energy for Rural Transformation programme of the Government of Uganda is trying to address this challenge, but progress is very slow. The current target is to connect at least 20,000 households to the grid each year for the next five years (2005-2010). However, the achievement of this target is not helped by the even bigger current challenge of a large energy deficit that has taken precedence over rural electrification (Uganda Telecommunications Sector Policy Review, 2005: 40). The challenge of electricity does not affect Uganda alone, but most of Africa. Appendix I shows images of the world at night, and much of Africa is unlit. The Panos Institute is concerned that this lack of electricity is excluding many African nations from the communications revolution (Panos, 2004), and as many critics of the information society have pointed out, technological enthusiasts are pushing for technology in developing countries with little, if

any, consideration for the obstacles that may hinder these countries' effective application of information technology.

However, the electricity problem notwithstanding, the general figures from the structured interviews show that the majority of the health practitioners in both districts use the PDAs everyday, an indicator that the technology is becoming part of their work and daily activities. The solar chargers UHIN provided often fill the gap left by lack of electricity, but they are also not enough. More solar chargers need to be provided since it will take years before these rural areas all have electricity.

5.7. Acquisition of PDA operation skills

In spite of the fact that the PDAs are gradually becoming part of the health practitioners' work, none of them knew how to use a PDA in the beginning. They stated two main channels through which they got to learn how to use the PDA. One was the training organised by UHIN to teach selected health workers how to use the PDAs, and the other where those who had been trained taught their colleagues who had not got a chance of attending the UHIN training. The following figure shows how this happened.

Fig. 5.5. How the respondents acquired PDA skills
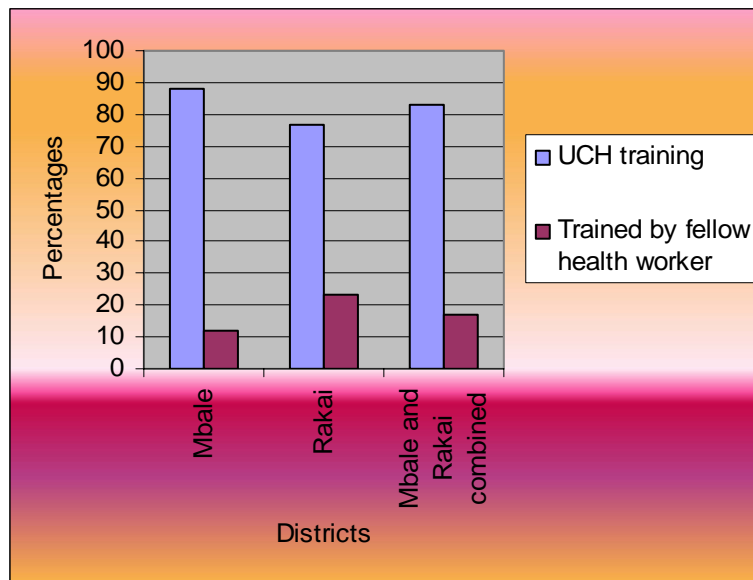
In both districts, the main channel through which the respondents got skills of operating the PDA was the UHIN training. In each of the districts, UHIN first talked to the Chief Administrative Officers and the Local Council officers. They approved the project, giving UHIN a go-ahead. UHIN trained the health practitioners for three days, during which they were introduced to the handheld computers, told why they were being given the computers, and then taught how to use them.

In this training, UHIN provided information about the PDAs and the new ideas they were coming with. The practitioners were told that the PDAs would basically be used for HMIS reporting and as a tool for CME. The information covered three issues, which, according to Rogers' diffusion model (in Windahl et al., 1992: 59), are what usually make up innovation knowledge. These are:

1. Software information, or awareness-knowledge information, which answers questions such as 'What is the innovation? What does it do?'
2. How-to knowledge, which helps the individual obtain and use the innovation as it should be used. The information answers questions such as 'How do I hook it up?'
3. Principles knowledge, which includes the general ideas behind the innovation. This information answers questions such as 'Is this really new, or does it essentially work the same way as its predecessors?'

Considering the fact that in both districts not every health practitioner got a PDA and therefore attended the training, it was the mandate of those who had been trained to share the PDAs with their fellow health workers in their health centres, and to teach them how to use the tools. That explains why some people were trained by the clinical officers, or records assistants, whoever it was that had attended the training. The practitioners who got the secondary training (through their colleagues) were helped to master the PDA by the UHIN project officers, who usually go out on supervisory visits to the health centres. The number of those trained by their colleagues is low, and this can be attributed to the fact that the project is still fairly new. However, UHIN is encouraging the practitioners to share their skills and knowledge. Much of the persuasion to take on an innovation occurs

through peers who already have some experience with the innovation. Their behaviour, then, is imitated (ibid.: 60).

It can be concluded that the PDA project used only interpersonal means of communication in order to make the health practitioners aware of the technology and persuade them to use it both for HMIS reporting and CME. In the diffusion of innovations, interpersonal channels of communication are more efficient than mass media channels (Rogers, 1983). An interpersonal source may better formulate a message to be relevant for a potential adopter than can a mass communication channel. Persuasion is even more guaranteed when expert sources use interpersonal channels, so UHIN made a good choice of communication channel.

5.8. Computer knowledge prior to using PDAs

Knowing whether the respondents had ever used a computer (for example personal computer, laptop, etc) before learning how to use the PDA would help put into perspective how easy or hard learning to use the PDA was. A PDA is related to a personal computer or laptop in several ways; the functions, properties, mode of operation are similar, and if someone had ever worked on a computer before, it would be very easy for the person to learn how to operate the PDA. That is why in relation to this question (of whether the respondents had ever used a computer before), the respondents were immediately afterwards asked whether it had been easy to learn how to use the PDAs.

Table 5.4. Prior use of computers

Ever used a computer before?	Mbale	Rakai	Percentage (%) of total respondents
Yes	06	11	27
No	27	20	73
TOTAL	33	31	100

The majority of the respondents (73%) had never used a computer before, which means that they had no computer skills at all. It is therefore interesting to look at the following results, which show that despite the fact that most of the health practitioners had never

used a computer before, the majority thought using a PDA was easy.

Fig. 5.6. Health workers' views on whether it is easy to use a PDA
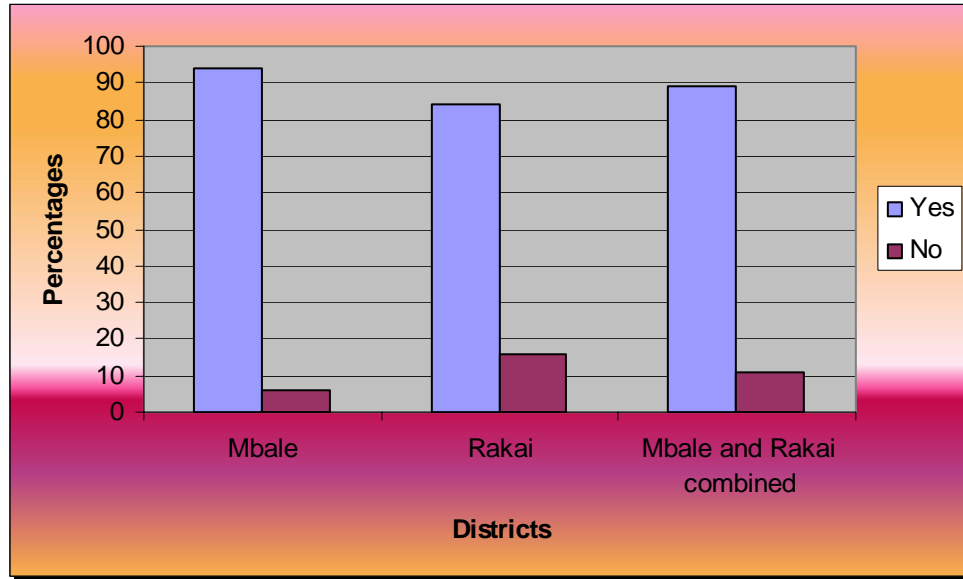
89% of the respondents said 'yes, it is easy to use a PDA' while 11% said it is not easy. Various reasons were given for these answers. Most of those who found it easy to use the PDA attributed it to the fact that it has clear instructions and therefore guides them on what to do next when they are working. One respondent from Mbale said, "The system guides you on what to do in case you have pressed a wrong button, and it does not take much time to learn."

Some said that the PDA was simply easy to learn; it took them only one day to learn how to use it. Others said that it is easy to learn on initial training, and then as one continues to use it and practice, one gets better. They said the PDA does not require one to be closely supervised. To cap all this off, a nursing assistant at Mutukula Health Centre III in Rakai said, "I had never used anything like it before but now I use it very comfortably."

Those who had used computers before said they found the PDA easy because of their familiarity with computers earlier on. The nature of an innovation is therefore not without importance. To be adopted, something about the innovation must make it worth

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considering, and in this case, the PDA is easy to operate, which explains the low resistance to it.

The simplicity of the PDA emphasised by these answers shows that developing countries do not need to adopt complex technology. Decisions about the kind of technology to use or adopt need to be made with the capabilities and skills of the target population (users) in consideration. Since most of the health practitioners had never used a computer before, UHIN saw it fit to start them off with the handheld computers which are relatively simple and easy to learn and use. As the diffusion of innovations theory says, new ideas that are simpler to understand are adopted more rapidly than complex ones (Rogers, 1983: 15-16).

Dr. Abwaimo added that the PDAs had actually demystified computers to the health practitioners in the two districts, and he thought that having got the PDA skills, the practitioners would find it easier to use personal computers or laptops in future. Hornik (1988) refers to this as the equalising potential of communication technologies. PDAs are bringing computer operation skills to people who have never operated computers before. Campaigning for the use of new ICTs in developing countries, Pool argues that when people are exposed to technology and encouraged to use it, they soon get to do things that they could otherwise not have done and develop expertise that they otherwise would not have had. He adds that telecomputing accelerates, rather than inhibits, the development of computing in a less developed country (Pool, 1990: 175).

Apart from the ease in acquiring operational skills, the other advantages of the PDAs which facilitated their adoption in Uganda are their versatility, meaning that they can be adapted to any situation; their portability; easy and cheap maintenance and low running costs, since they can use solar energy.

As with anything that requires learning, there are people who learn fast/easily, and those who take some time to learn. This was therefore one of the reasons given by those who said it is not easy to use the PDA. Some said they needed more training, and some that it

was simply difficult to learn. For others, the reason they gave was their unfamiliarity with the computer prior to being introduced to the PDA.

5.9. Problems users encounter with the PDAs

Technology is susceptible to problems, and the PDA is no exception. As the table below shows, 69% of all the respondents said they had faced problems with the PDAs, while 31% had not.

Table 5.5. Respondents who encountered problems with PDA

Encountered problem?	Number of respondents (Mbale)	Number of respondents (Rakai)	Percentage (%) of total number respondents
Yes	20	24	69
No	13	07	31
Total	33	31	100

The respondents were not restricted on how many problems to mention. The biggest problem faced was that of charging the battery of the PDA. Both districts face electricity problems, and travelling to the towns to charge PDA batteries is quite expensive. The project has tried to go round this problem by giving some health centres solar panels to use to charge the PDAs, but due to cost issues, a number of health centres have not got the solar power.

Operational skills came second. Much as the health workers learnt how to use the PDAs, there are some particular things that they forgot or did not grasp in the training. This implies that one has to practice in order to master the PDA, and that there is need for more training. Some respondents actually complained that the initial training was too brief. Rogers cautions that in many cases, insufficient how-to information results in the innovation not being used or practiced properly which, in turn, may lead to its being abandoned (in Windahl et al., 1992: 59). The operational problems that the health workers mentioned included failure to locate the HMIS forms; information getting deleted without the users knowing how to retrieve it; failure to upload/download information to/from the jack; not knowing how to back up files and the PDA 'blacking

out' suddenly for no apparent reason.

Compaine referred to these (operational) skills as the New Literacy. He said the changes taking place in information technology were creating the need for a new bundle of skills and processes that would define 'the New Literacy'[26] (Compaine, 1988: 145). Because these skills for operating the new ICTs take longer to learn and in many cases need education, Melvin Webber (in Compaine, 1988: 181) warns of the danger of a gap being created between those members of society who can acquire the skills and those who cannot.

The other major problem that the health workers mentioned was technical. This category included problems such as the PDA going off yet the battery had just been charged; the PDA writing area losing sensitivity because of different people using it, each with their own writing style, and the PDA getting locked. Other technical issues included programmes disappearing; the PDA failing to start, and the jacks and district servers going down. The technical problems are compounded by the fact that there is not even one technical person in each of the districts to handle the problems. Most of the time technicians have to be called from Kampala, or the users have to wait for the project officers to come by on their supervision visits and rectify the problems, if they can.

Because the jacks are only situated at the Health Centre IVs, they are far from most of the other health centres. Therefore the health practitioners have to move to go to upload or download information. Due to costs and the difficulty of travelling, some of them do without the information from the jack, especially the news and medical content, and only go there to upload their weekly and monthly HMIS reports. Filling HMIS forms is part of the health workers' duties, so they do not have a choice, unlike reading medical content which is subject to their individual decisions. This issue is similar to that of the PDA users having to travel to other places in order to charge the batteries. The transport problems have therefore affected the use of the technology, and in relation to this, Brown

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[26] The New Literacy is the bundle of information skills that may be required to function in society, skills that may evolve from the capabilities made possible by the increasingly widespread use of computer and

observes:

> Certain innovations result in or constitute a product that must be transported some distance, and this transportation cost may be a significant consideration in the adoption process. This is generally the case in Third World settings where transportation networks are not well developed and the associated costs are therefore high (Brown, 1981: 217-8).

The other problems were that the PDAs are still few, so one PDA in most cases has to be shared among three or four users. This presents a problem since the tools are portable, for once someone goes away with it, the rest cannot use it. On the content problems, one respondent said the information sometimes comes late, and another said it is difficult for her to understand the language (English). Only one respondent pointed out this problem, while all the others said that on the whole, they have no problems with reading and understanding the information they are sent, all of which is in English.

The other problem mentioned was that some of the health practitioners are not interested in using or learning to use the PDA. So if their colleagues want to teach them, they either do not turn up for the appointment or they simply refuse to learn. These people say they are more comfortable with the manual system of HMIS reporting. Such people are the 'laggards' referred to in Rogers' diffusion of innovations model. They are characterised as socially isolated, locally oriented, without opinion leadership, firmly attached to the traditions of their social system and suspicious of new things (Rogers, 1983; Singletary and Stone, 1988; Windahl et al., 1992), which characteristics explain their reaction to new ideas.

The last problem was that of poor telephone network coverage. Being rural, not every area in Mbale and Rakai has network, and for those that have, it is quite unreliable. In Mbale, for example, people staying in the Mountain Elgon ranges have to climb high up in order to pick a telephone signal. Since the jacks communicate with the server via telephone connections, the poor network means that they usually go on and off, making it difficult to transmit information.

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communications technology (Compaine, 1988: 145).

The respondents in the 31% category are those whose health centres are close to the town or work at the Health Centre IVs where the jacks are located and which also have solar chargers.

It is such problems that ICT critics point out when saying that the technology is not very appropriate for developing countries. Melkote and Steeves' (2001) view is that there are many constraints that inhibit the use of ICT-based information in Third World countries. They observe that:

> Technological enthusiasts are pushing ICTs vigorously under the guise that technology per se is development. But there is need to separate the technology from the information it produces and examine people's capacities to receive, process, use and transmit information. The rural poor … face constraints like a telecommunications infrastructure to make the ICTs work, a skills infrastructure to keep the technology working and money to buy/access the ICTs (Melkote and Steeves, 2001: 262-3).

I acknowledge that there are obstacles to developing countries' exploitation of the new ICTs, but there are also ways of going around such problems so that these countries benefit from what the technology can offer. These countries took on radio, television, video cassette recorders and so many other media when they were invented, so the new ICTs should not be an exception. The following section discusses the health workers' views on how the problems they mentioned can be dealt with, without giving up the PDAs.

5.10. Ways of dealing with the problems

Having pointed out various problems faced when working with the PDAs, the respondents also had suggestions on how the problems could be solved. These suggestions were grouped into categories.

To the biggest problem, which is lack of electricity to re-charge the PDA batteries, the respondents said they should be availed with electricity or provided with more solar

chargers. However, it is not the project's duty to connect the health centres onto the electricity grid, so this leaves the most practical solution as the provision of more solar chargers.

The second suggestion was for more frequent refresher training sessions in PDA user skills, along with support supervision from the project staff. Related to this was the suggestion that more health practitioners should be trained, and those who have learnt how to use the PDA encouraged to train their colleagues who have not.

Another solution was capacity-building on a local level. This involves teaching a local person how to handle technical problems with the PDAs and jacks, so that the problems are handled fast instead of relying on a technician who comes *all the way* from Kampala, a journey that takes about four hours for Mbale and three for Rakai. The respondents also said that they should be given more jacks to reduce the distances they have to move. They also asked for more PDAs so that more health practitioners could be involved. This suggestion has become a reality, for the project is actually training more health workers (April 2005) in the two districts and distributing more PDAs.

The other suggestions included connecting the PDAs to the Internet, which would give the health workers access to more information. They also suggested that they should develop a pattern of consulting each other in case of a problem because there are people among them who can help solve the technical and operational problems encountered. Others said they should make use of the PDA manuals in case of a problem. The respondents also said that people who do not want to learn how to use the PDA should be given more information about it, or more interesting things should be put on the PDA to entice users. They also suggested that in each health centre there should be a person in charge of the PDAs to facilitate the sharing of the tools since some people regard them as their personal property. In relation to this, some respondents fronted the idea that they should be given desktops instead, for it is easier to use them communally than PDAs. The other suggestions included encouraging daily use of the PDA, and UHIN using a telephone service provider with a wide network coverage (for example MTN).

There was also a suggestion that the medical information sent should be made specific to user needs. At the moment, all the practitioners receive the same information, irrespective of the kind of work they actually do, so some of the information ends up not being relevant to them. And yet for ICTs to play a role in rural development, they must communicate information that contains content relevant to the users' livelihoods (Pott, 2003).

5.11. Challenges faced by the project

The biggest challenge the project faces is winning the MoH's support. The project funders' plan was for it to eventually be accepted by the MoH and integrated into its national health plan and activities. However, the MoH is treading carefully and has not yet decided whether it wants to have the PDAs as part of its activities and ways of doing things. This is why the project has not yet expanded to eight other districts as planned before, since it needs the ministry's approval. Instead, it has decided to expand within the two districts where it has been operating. This means more health practitioners are being trained, and more PDAs are being given out. The MoH's attitude partly stems from fears about the cost of running the project. Sarah Asiimwe from the ministry's HMIS department said the PDA project requires a lot of resources which Uganda may not be able to afford at the moment. She said taking the new system on would mean equipping all or most of the health workers with PDAs, and since donor support naturally ends at one point, the burden would be borne by the MoH.

The MoH's attitude can be explained by a modification that Rogers made in his diffusion model. He noted that often organisations are entities that do not behave as individuals do. They can be very resistant to change induced from the outside, or they may cope with innovative approaches in ways that seem peculiar to the planner (Rogers, 1986 in Windahl et al., 1992: 68). In the face of such a situation, the innovator/planner may have to redesign the innovation, since it (innovation) is not fixed or static, but a 'flexible and adaptable idea that is consecutively defined and redefined as the innovation process gradually unfolds' (ibid.). UHIN is doing this. Anxious to get the MoH to back them, the

project is considering expanding the use of PDAs to cover telemedicine/teleconsultation between medical personnel situated in different places. Currently (April 2005) the project's heads are visiting the two districts to see how possible such a venture is.

I think part of the problem is that the policies made, which recommend the use of ICTs in different sectors, are not being implemented. The national ICT policy was drafted in 2001 and is still waiting to be ratified by the Parliament. Mr. Nkuuhe's words capture this situation. He said 'like many other things, we write documents and because they're not well integrated into the overall plan, action is not taken'. The suggestion here is that policy resolutions should not be neglected but every effort made to put them into action, for example by the government providing enough money for all the initiatives it has planned.

The challenge of acceptance of the PDAs and the new ideas they came with is not restricted to the MoH but is also faced with the health practitioners. Joyday Agatha Gloria said she has encountered health practitioners who know how to use the PDA but say they are comfortable with the old manual HMIS reporting system. As Dr. Okello said:

> Everybody fears change. With innovative ideas, there will always be difficulties when trying to get people to adopt them. You have to go through a lot to teach them about the project and persuade them to use the PDAs (Okello, personal interview: 09/12/2004).

Mr. Nkuuhe added that the elderly people simply say that computers (and other new ICTs) are for the youth, and then distance themselves from any efforts to teach them how to use the ICTs.

The other challenge is related to finances. The project requires money to run, and in the face of hesitation by the MoH and donor support ending anytime, this is a pressing need. When asked whether the project is sustainable, Dr. Okello said that it will not be sustainable if local resources are not harnessed. He said PDAs are affordable, and so are jacks. A simple PDA costs US$100, while a jack costs around US$1,300. The cost of the

jack is shared, since the jacks are also shared. Dr. Okello said the project should be involved in the mainstream – sectorally and nationally. He noted:

> As a project, it's not sustainable. Nothing succeeds when it's looked at as simply a project. A project is just a seed, which will sprout and grow into something else. The PDA project is a seed. When regarded that way, it can be sustainable (Okello, personal interview: 09/12/2004).

Money is also needed to connect the PDAs to the Internet, a venture believed by UHIN to give the health practitioners unlimited access to medical information and resources. Some of the medical content sent to the health workers is got from journals on the Internet, so access to the Internet would give them access to the source. Internet connection and usage is generally low in Uganda, the main reason being the prohibitive cost of getting and keeping connected. The Telecommunications Sector Policy Review (2005) says 'it is economic suicide to permit this situation to continue in the global knowledge society'. It adds that the country needs to be connected, via optical fibre, to the global Internet backbone. And if this is not done, Ugandans will generally be locked out of the global knowledge society. This attitude is similar to the attitude guiding attempts to integrate technology in all or most of the sectors of developing countries. Technology is believed to facilitate and accelerate development, moreso in the present 'third revolution' (the Information Society), and many nations, Uganda inclusive, do not want to miss this opportunity.

The challenge of resources leads to the debate over new ICTs for developing countries. As seen in the discussion of the three theories that form the backbone of this study (modernisation, information society and diffusion of innovations), ICT diffusion in developing countries is constrained by questions of affordability. This has led to arguments that the new ICTs' promises for these countries are being over-hyped, since the countries can hardly get access to the technology. However, Dr. Okello strongly opposed such a view. He said ICT usage involves a continuum with high cost on one extreme and low cost on the other. Therefore the question should be 'What ICTs can developing countries afford?' This means that there is both expensive and cheap technology, and if Third World countries cannot afford the expensive technology, they

should buy the cheap one for the moment because in the end it will still be beneficial.

Jeffrey James (2003) also makes a case for low-cost technology. He says if the digital divide is to be diminished to any significant degree, the countervailing policy package will need to incorporate low-cost versions of information technology, rather than products designed for the higher average incomes prevailing in the developed countries (James, 2003: 45). Hanson and Narula conclude that the important task before developing countries is to assess technological options in terms of public needs, characteristics and actual performance, cost effectiveness and available country resources (Hanson and Narula, 1990: 6).

Faced with the risk of 'being crushed by the information revolution if it doesn't take advantage of it' (see World Bank in Dralega, 2002), Uganda has resolved to pick its way through the many choices on offer and select those affordable ones that also promise to meet its needs most closely (White Paper, 1999: 5). The country is moving beyond what modernists did (taking information technology just as technology), and instead adopting it for the contribution it can make.

The other issue is related to opportunity cost. Critics claim that the high interest in the new ICTs has diverted attention and resources from what people in the Third World really need (that is food, shelter, medicine and peace). They ask questions such as:

> What use are satellites, computers, television and telephones to countries where loads are still carried on porters' heads and water is drawn at wells? Are they a luxury for a small elite in the capital cities and for the convenience of foreign businessmen, or do they contribute to the needs of the people? Is investment in communication a priority use for a poor country's resources (Pool, 1990: 170)?

Countering such arguments, Mr. Nkuuhe said the new ICTs are not competing with people's basic necessities. He said governments have put aside resources for basic needs, and resources for things such as ICTs. He argued that in Uganda, for instance, the investment in the fight against malaria is greater than that in the new ICTs. According to

him, countries should not distance themselves from ICTs but integrate them into every sector, for each of these sectors – agriculture, education and health – will need ICTs to improve efficiency and enable the optimum utilisation of resources.

Some of the other challenges that the project has to grapple with included dealing with technical problems of the technology, electricity and the poor network coverage, which were discussed earlier.

5.12. Importance of PDA to respondents' work

The presentation and discussion of the findings illustrates that the information technology introduced by UHIN has contributed to an improvement in health service delivery in the rural districts of Mbale and Rakai in Uganda. The graph below proves this more. It shows how useful to their work the health practitioners perceive the PDA to be.

Fig. 5.7. How useful PDA is to health practitioners' work
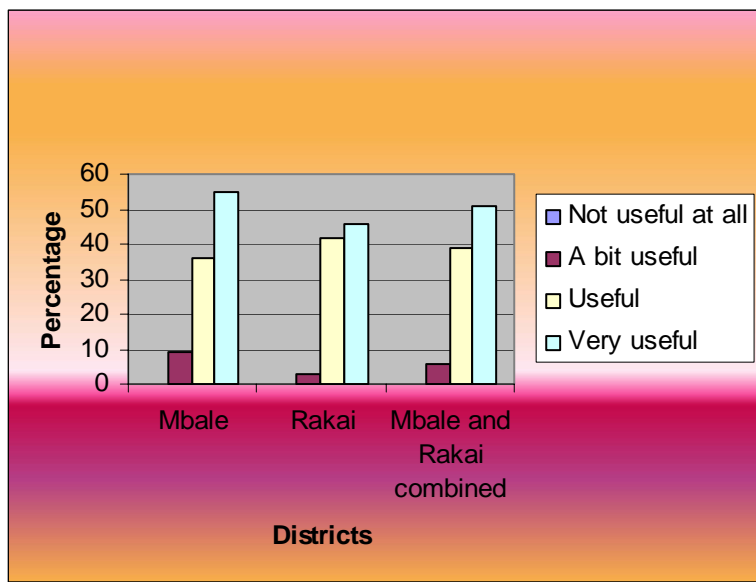
None of the health workers said the PDA was not useful at all to them, and only 6% of the total number of respondents said it was a bit useful. 39% of the total said it was useful while the majority, 51%, found it very useful. Despite this, did the health workers think the PDA was the best tool that could have been used to extend health services to their

areas?

Table 5.6. Views on whether there could have been a better method

Could there have been a better method?	No. of respondents from Mbale	No. of respondents from Rakai	Percentage (%) of total respondents
Yes	11	06	27
No	22	25	73
Total	33	31	100

27% of the respondents said there could have been a better way than using the PDA while 73% said the PDA was the best. Some of the 73% pointed out the disadvantages of the old system. One respondent said that 'a country like Uganda cannot buy other expensive technology for all the health centres other than the PDA which is not expensive'.

The PDAs' portability also scored high among the respondents, and one said that other forms of communication like radio calls need some staff to be on station all the time as opposed to the PDA which one can move with. The respondent added that the PDA is multipurpose, when compared with radio, for example. One can use it to send information and also create databases where to save downloaded information to study later. As the diffusion of innovations theory argues, people adopt innovations basing on the benefits they (innovations) bring.

The reasons given by those who said there could have been a better way included the issues of lack of (reliable) electricity and the few jacks. Some also said that they preferred the old system of carrying out HMIS surveillance (filling paper forms manually) to the new system of using PDAs. Others said that they should have been given radios, telephones, fax machines or even laptops and personal computers, which are more communal and do not have to be taken care of as much as the PDAs which can easily get lost. One respondent said that equipping the health centres with medical equipment instead of communication technology would have served better. However, as the discussion of the opportunity cost challenge in the preceding section revealed, developing nations are attempting to balance investments in the new ICTs and providing for people's

basic necessities. According to Mr. Nkuuhe, necessities such as food, good health and shelter are not being sacrificed in attempts to acquire the latest technology.

The other issues mentioned bordered on preference for CME workshops as opposed to getting CME material through PDAs. The respondents said the workshops would be more interactive and easier than handling a PDA, and it is possible to ask questions and get clarification. Workshops would entail interpersonal or two-way communication, which, as mentioned earlier, is persuasive and stands a higher chance of disseminating a relevant message for the receiver (Windahl et al., 1992).

Furthermore, two-way processes contain the promise of more balanced power relationships. Through dialogue and mutual understanding, the parties in the process potentially can influence each other (ibid.: 8). Dr. Kalamya said UHIN can only hope that the health workers read and actually make use of the CME material they are sent, since the project staff are not always around when the material is downloaded. This is one of the disadvantages of the new ICTs. The receiver has control over the tool and the information, so s/he is the one who decides if and/or when to read the information. However, workshops stand a higher chance of ensuring that participants listen and learn something, which they will most likely use when the need arises.

A health worker from Rakai worked out a compromise between PDAs and CME workshops, and said:

> I do not think there would have been a better way at the moment, but the use of PDAs should be accompanied by CME workshops because in workshops there is a chance for one to express one's ideas, thoughts and feelings and also a chance for health workers to share different views.

What emerges in the face of such a compromise is the fact that on their own, the new ICTs may not be able to meet all the needs of the people in developing countries. This may be due to reasons such as the people's limited skills, or the selected new ICTs' limited capabilities. This calls for backup from other technology and communication methods, for example radio or seminars. Seminars have an advantage in that instant

feedback is given, making it possible for explanations and clarifications to be made where needed.

Often new ICTs are looked at as if they exist in a communications vacuum or are direct substitutes for existing communication methods. This is what the modernisation paradigm did, advocating for a linear move from traditional to modern, thereby failing to comprehend that the dichotomy of modern versus traditional was not inevitable. Many times the new ICTs cannot be used alone, and this is the basis of the multi-tiered approach to communication. In the case of the health workers in Mbale and Rakai, I think it would be good if they get information through the PDAs and then also attend CME workshops where they can discuss the information they receive and also get more detailed information.

5.13. Modernisation, Information Society theories and the study

This study perceives PDAs as a (health) developmental tool, which is a reflection of both the modernisation and information society theories. The modernisation paradigm viewed development as a type of social change resulting from new ideas being introduced into a social system, while the information society theory regarded technology as the basis of increased productivity. Both theories are of the conviction that technology can enhance development, and that developing countries in particular should grab this opportunity and use technology for their benefit. Similarly, PDAs have been introduced to bring about positive change in the quality of health services received by people in Uganda's rural areas.

The modernisation paradigm's thrust on bridging gaps between traditional and modern societies also applies to the bridging of gaps between rural and urban areas. A comparison between the urban and rural areas in Uganda shows that the urban are relatively developed, and actually that is where the bulk of the country's ICTs are found. UHIN's taking its project to rural areas where most of the people have never used a personal computer, let alone a telephone is symbolic of attempts to diffuse technology in the rural areas, thereby reducing the disparity between them and the urban. The theory of

the information society also emphasises bridging gaps between the developed and underdeveloped regions (see WSIS).

It is for this reason that information society enthusiasts say that developing countries should take the leap and partake of the benefits that technology has to offer or else they will stay even further behind while the rest of the nations forge ahead. Castells prophesies that 'new "milieu of innovation" will determine how particular places prosper or decline' (in Webster, 2002:107). This assumed potential of information technology is the basic component of many governments' communication policy rhetoric, Uganda included. Both the country's communication and ICT policies point out how the technology can bring transformation, a factor responsible for many ICT projects in the country. Therefore, despite the fact that Uganda is still working to spread electricity in the country, and the fact that it has just a few thousand computers for its millions of people, it is doing its best to integrate information technology in all its sectors. As the communication White Paper (1999) says, Uganda 'cannot afford to be driven further to the margin'.

The findings reveal that one of the major obstacles to developing countries' embracing of ICTs is the question of costs. Technology is expensive, and newer versions keep coming up, so many developing countries cannot afford to keep up-to-date with the latest technology, let alone procure enough technology for their populations. Information society proponents say that these countries should not give up yet; a compromise can be worked out, which is that the developing countries should get hold of cheaper technology. This is what UHIN is doing with its handheld computer project.

The modernisation paradigm was criticised for emphasising technology without paying attention to the content carried or the needs of the people that the technology was supposed to meet. The discussion of this study's findings has highlighted a move to a more participatory-oriented model of communication, which engages two-way communication and research in order to know what the people's needs/problems are and thus come up with relevant solutions to them. Similarly, the information society theory is

said not to hold water because it assumes that since information technology and information have become defining factors of society, then we are in an information society. Scholars argue that one can only say an information society has developed basing on the extent to which the technologies have become an integral part of the everyday life of the citizen and the uses to which they are put (Martin, 1995: 8). Evidence shows that even in the developed countries there are wide gaps between the technology haves and have-nots (Hughes et al., 2002; Richards et al., 2001).

5.14. Conclusion

This chapter has presented the health practitioners' and other interviewees' responses, and also discussed them in view of the topic at hand. The findings have been interpreted along the lines of the three selected theories. The findings have also attempted to answer the research questions highlighted in Chapter One, particularly the major question of how ICTs are being applied in a developing country to improve the delivery of health services.

CHAPTER 6

CONCLUDING DISCUSSION AND RECOMMENDATIONS

6.0. Concluding discussion

This chapter presents the conclusions drawn from the study. The study set out to investigate the contribution of new ICTs, particularly handheld computers/PDAs, to health service delivery in rural Uganda. I tackled it by answering the following research questions: Do new ICTs have the potential to contribute to an improvement in the health of people in developing countries? How are new ICTs being used to improve health service delivery in Uganda? What constraints and/or challenges do new ICT users face? What strategies can be taken to fully exploit the potential that new ICTs have for improving health in Uganda? To answer these questions, the study zeroed in on two health aspects – the ICTs' ability to facilitate better health management information reporting and continuing medical education for rural health practitioners.

It noted that information has historically had a central place in bringing about development, and so have the various media that carry this information. Media information is regarded as an all-powerful panacea for problems of human and socio-economic development (Richards et al., 2001). This is the basis of the modernisation theory of development, the main theory on which this study was hinged. Subsequently, the new ICTs have also assumed an important position as vehicles of development.

The study pointed out that these ICTs can contribute to social change, not only in the health sector but even in other sectors. This potential comes from their features; they are interactive, asynchronous and have the ability to send messages to small, specified audiences. Out of interviews with key people in UHIN and the health workers using the PDAs, and analysis of various documents, the study has shown that the PDAs have played a significant role. This stems from the fact that prior to their introduction in Mbale and Rakai the HMIS data reporting was being done manually, which made the process slow and the data inaccurate and late. The process is now being automatised. In addition,

they have made it possible for health information to be availed to health workers with little or no access to libraries. Through these two functions UHIN is contributing to the achievement of the MoH's objectives and the NEPAD's strategies of how ICTs can be used to improve health service delivery in African countries.

The study observed that a number of factors are responsible for the PDA project's relative success in Mbale and Rakai districts. The most important factor is that UHIN is addressing deeply felt needs, and having seen the difference the project is making the health workers want even more of their colleagues to be involved. The other factor is UHIN's use of interpersonal communication to introduce the new ideas to the health workers, which played an important role in persuading them to take on the PDAs. As seen in chapter four, it is difficult to get people to accept innovations, so the more persuasive strategies have to be used. UHIN also considered it important to involve the health workers in the project by gathering their views about the kind of information they want to receive. This means that they do not look at the project as something completely coming from 'outside' or something being imposed on them. Furthermore, their involvement means that the information they get will be relevant to them. As Servaes says:

> Development efforts should be anchored in faith in the people's capacity to discern what is best to be done … to participate actively in the task of transforming society. The people are intelligent and have centuries of experience. Draw out their strength. Listen to them (Servaes, 1990: 89).

The fact that the PDAs are basically simple tools was another factor responsible for their fast adoption by most of the health workers. This implies that if ICT usage is to be encouraged among populations that do not have a lot of experience with the tools, it is wiser to start them off with non-complex, easy to learn tools. Otherwise they would easily be discouraged, abandoning the technology.

The study noted several obstacles to developing countries' application of ICTs, which obstacles are the main factors pointed out by the critics, who think that the new ICTs are inappropriate for these countries. Inability to afford the technology was the leading

obstacle, followed by lack of electricity and poor transport and communication infrastructure. Although seemingly insurmountable for a poor nation, the thesis shows that these obstacles can be overcome. The solutions lie in low-cost technology, solar power and opting for reliable telephone networks. In Uganda, UHIN has turned to the telephone service provider MTN as opposed to Uganda Telecom, which has not yet expanded its reach to all the rural areas. UHIN also needs to bring in more jacks so that the health workers do not have to travel long distances to upload and download information. As Chapter Four showed, the long distances discourage them from going to get the medical information, for this is not compulsory for them. They therefore only go when they have to – to send the HMIS results.

The fact that currently there is no local person with the technical skill to repair and correct problems on the PDAs and jacks is a setback for the project and it calls for a technician either to be stationed in the district or a local person trained in handling the problems. It has also been seen that it is not enough to introduce an innovation and then leave the users to their own devices. Knowledge and skills easily get rusty once there are no 'refreshing' facilities. Some of the PDA users forgot how to operate the PDA and therefore did not make use of its functions. This calls for more training and supervisory visits from UHIN if the project wants automated HMIS and studying of medical literature to become an integral part of the health workers' activities.

Chapter Four shows that there is a good policy environment for new ICT initiatives to blossom in Uganda. However, in Chapter Five we see that the fact that the national ICT policy has not yet been implemented and that often such sectoral policies are not given credit by other sectors is a hindrance to Uganda's attempts at developing the information technology sector. New ICTs are not mentioned clearly in any of the MoH's policies; their incorporation is merely implied. Such successful small projects are worth extending to other areas of the country, but this cannot happen unless they are fully backed by the government and the different bodies that impact on them.

The chapter also reveals that some of the health workers use the PDAs for non-primary

activities such as playing games and storing their personal addresses at the expense of studying medical information. The games were placed in the PDAs partly as an enticement for the health workers and also for them to play in their free time. However, this is working against the project. The health workers need to know the importance of the medical information they receive. All ICT users need to know that these tools are not essentially for chatting, e-mail, surfing or playing computer games but for more important purposes such as data entry and transmission, research, long-distance education and online transactions.

This study also set out to explore the debate surrounding claims that advances in the new ICTs have led to an information revolution (the third revolution), which is transforming the developed countries into information societies. By positing the different information society views against each other, the study has shown that the information society is an illusion, for even the developed countries cannot empirically say that information technology is accessible to everyone in their societies, or that this technology is the defining factor of life. As Winston (1998) concludes, 'what is hyperbolised as a revolutionary train of events can be seen as a far more evolutionary and less transforming process'.

6.1. Recommendations for developing countries

To harness the new technology and take advantage of it in the health sector and even other sectors, developing countries need to realise and subsequently effect a number of actions. The most important thing is for the governments to open up the education system to accommodate the teaching of information technology skills. There is little to be gained from access to digital information resources if the skills to select, interpret, and apply the information are absent or very poorly developed throughout the population. As the UNDP Human Development Report (2001) says,

> Technological change dramatically raises the premium every country should place on investing in
> the education and training of its people. And in the network age, concentrating on primary education
> will not suffice – the advanced skills developed in secondary and tertiary schools are increasingly

important.

A number of African countries have introduced Universal Primary Education as a way of ensuring literacy for the majority of the population. However, as Uganda's experience has shown, this does not ensure education for all since many children drop out of school after primary education. Therefore it is important for governments to endeavour to promote higher education, for that is when people are able to get advanced skills that can help them master the new technology. And training courses in information technology need to go beyond being introductory to comprehensively covering all the necessary aspects.

The issue of language also needs to be addressed. This problem did not come up strongly for the health workers in Rakai and Mbale, but it is a problem faced by many new ICT users in Third World countries. Most of the programmes and content on computers is in English, which means that people who do not understand the language are excluded from using the technology. Having low literacy levels, many people in developing countries fall in this category. This means that to include these societies in the so-called information revolution there is need for software and content that are in their local languages. Last year (2004), a web browser in Luganda was launched at the Uganda I-Network monthly seminar in Kampala.[27] Luganda is one of the widely spoken languages in Uganda. The 'kayungirizi' web browser is meant to enable people who communicate in Luganda to surf the Internet. The browser's innovators have also initiated a Luganda word processor which will be used with the browser. These are small beginnings but they signal a move that will expand, given the public's enthusiasm over the Internet, which has created demand for local content.

New ICTs cannot bridge communication gaps on their own, more so in the developing countries where they are not accessible to everyone. Much as the conventional ICTs have their limitations, they have certain strengths over the new ICTs. This is why the health workers in this study said they should be given radios, and others CME workshops and

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[27] *Luganda Web Browser Set*, The New Vision, 15th September, 2004

seminars. Servaes explains:

> …developing countries need an appropriate mix of technologies … Such a mix may include modern foreign-produced and traditional indigenous technology - it may blend the 'latest and the best' with 'primitive technology' (Servaes, 1990: 179-180).

Using both kinds of ICTs together would increase the targeted population's access to the information being disseminated and make it more relevant to them.

Another strategy is for developing countries to create technology partnerships with other key stakeholders. This can be done through establishing regional bodies through which they can share the costs of some of the communication infrastructure. They can also create and strengthen links with the developed countries, which can contribute to educating the people and also such partnerships can result in the developing countries getting new ICTs at lower costs. With the support of the Norwegian government, for instance, an Institute of Computer Science has been constructed at Makerere University, Kampala, where teaching and research in various areas regarding information and communication technology takes place. Something else developing countries' governments can do is to embark on initiatives that encourage the ordinary people to acquire and use the new ICTs. Uganda has scrapped taxes on computers, making them cheaper, and created a fund that supports ICT projects in places regarded as unfeasible or unprofitable, such as the rural areas.

In conclusion, much as new ICT usage in the health sectors of developing countries can improve health services, it can also be used as a 'development vehicle' to boost the development of the countries' general ICT infrastructure. This is because the health sector extends to the most peripheral levels of the society. Furthermore, technology-supported advances in health are not just one-time gains. They have a multiplier effect – creating a virtuous cycle, increasing people's knowledge, health and productivity, and raising incomes and building capacity for future innovation – all of which feed back into human development. Therefore endeavouring to fully exploit the capacity that new ICTs have for developing countries' health sectors is a worthwhile and productive attempt.

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APPENDIX II

HMIS 033 b: HU WEEKLY EPIDEMIC SURVEILLANCE REPORT/FORM

Getting Started.

Date of Report	
Week Ending Date	
Health Unit	
Code	
Sub-county	

HSD. Health Sub District

◉

District.

◯

Please provide the information concerning the various diseases:

Diseases.

	Cases This Week	Deaths This Week	Cases Last Week	Deaths Last Week
Acute Flaccid Paralysis				
Animal Bites (suspected)				
Cholera				
Dysentry				
Guinea worm				
Malaria				
Measles				
Meningitis				
Neonatal tetanus				
Plague				
Viral Haemorrhagic Fevers				
Yellow Fever				
Others				

[Submit Survey]

	Cases This Week	Deaths This Week	Cases Last Week	Deaths Last Week

APPENDIX III

HMIS 105: HEALTH UNIT MONTHLY REPORT

HealthUnit.

Health Unit

Level.

⬚ District Hospital

⬚ Health Center IV

⬚ Health Center III

⬚ Health Center II

⬚ Other

Code.

Code

District.

⬚

Month.

⬚ January

⬚ February

⬚ March

⬚ April

⬚ May

- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December

Year.
- ☐ 2002
- ☐ 2003
- ☐ 2004
- ☐ 2005

OPD ATTENDANCE AND LABORATORY TESTS TOTALS FOR THE MONTH

Outpatient Attendance.

	Children 0-4 years old	**Children 5 years old and over**
New attendance		
Re-attendance		
Total Attendance		
Referrals to unit (all ages)		
Referrals from unit (all ages)		

Laboratory Tests.

	Number of Tests Done	**Number of Positive Cases**
Malaria Blood Smear		
TB sputum		
HIV serology		
Syphilis screening		
Pap smear		

OUTPATIENT DIAGNOSES

Notifiable Diseases.

	Children 0-4 years old	Children 5 years old and over
Acute Flaccid Paralysis		
Cholera		
Diarrhea-Dysentry		
Guinea Worm		
Measles		
Meningitis		
Neonatal Tetanus		
Plague		
Rabies		
Viral Haemorrhagic Fever		
Yellow Fever		

Other Communicable Diseases.

	Children 0-4 years old	Children 5 years old and over
AIDS		
Diarrhoea-Not Bloody		
Diarrhea-Persistent		
Ear Infection		
Eye Infection		
Genital Inf.-Urethral discharge		
Genital Inf.-Vaginal discharge		
Genital Inf.-Ulcerative		
Intestinal Worms		
Leprosy		
Malaria		
No pneumonia-cold or cough		
Onchocerciasis		

	Children 0-4 years old	Children 5 years old and over
Pneumonia		
Skin Diseases		
Tuberculosis (suspected)		
Tuberculosis (confirmed)		
Typhoid Fever		
Urinary Tract Infections (non sexually transmitted)		
Others (non specified)		

Other Diseases. All Other Diseases (please specify)

Non CommunicableDiseases.

	Children 0-4 years old	Children 5 years old and over
Anemia		
Dental diseases and conditions		
Diabetes Mellitus		
Gastro-Intestinal Diseases		
Hypertension		
Mental Illness		
Epilepsy		
Other Cardio-vascular Diseases		
Sev. Malnutrition(W/A<3SD)		
Trauma-Domestic Violence		
Trauma-Other Intentional		
Trauma-Road Traffic Accidents		
Trauma-Other non-intentional		

Maternal Diseases.

Children 5 years old and over

Abortions [   ]

Other complications of pregnacy [   ]

Perinatal Diseases.

Children 0-4 years old

Perinatal conditions [   ]

MCH and FP Activities

AntenatalPostnatal Clinic.

Please state the Numbers for:

New ANC attendance [   ]

ANC re-attendance [   ]

Referrals from unit [   ]

First dose with S-P (IPT 1) [   ]

Second dose with S-P (IPT 2) [   ]

Postnatal visits [   ]

Vit A supplementation (postnatal) [   ]

Maternity.

Please state the Numbers for:

Admissions [   ]

Referrals to unit [   ]

Deliveries in unit [   ]

Live births in unit [   ]

Still births in unit [   ]

Newborn deaths [   ]

Maternal deaths [   ]

Deliveries with TBA [   ]

Tetanus Immunisation.

Pregnant Women TT Vaccine Non-pregnant women TT Vaccine

Dose 1 [   ] [   ]

	Pregnant Women TT Vaccine	**Non-pregnant women TT Vaccine**
Dose 2		
Dose 3		
Dose 4		
Dose 5		
Total Doses (2-5)		

Child Immunisation.

	Children Under 1 year	**Children 1-4 years**
BCG		
Polio 0		
Polio 1		
Polio 2		
Polio 3		
DPT 1		
DPT 2		
DPT 3		
Measles		

VitA Supplement. Please State Number for:

CHILD HEALTH

Vit A Supplementation (less than 2 years)

Measles Immunisation. Collected At Measles Immunisation (State Number:)

CHILD HEALTH

Weight below bottom line (less than 2 SD)	
Total Weighed	

FamilyPlanningUsers.

	New Users	**Revisits**
Oral : Lo-Femenal		

	New Users	Revisits
Oral : Microgynon		
Oral : Ovrette		
Oral : Others		
Condoms		
Foam tablets		
IUDs (Copper T)		
Injectable		
Natural		
Others		
Total		

Contraceptives.

	Number Dispensed at Unit	Number Dispensed by CBDA
Oral : Lo-Femenal		
Oral : Microgynon		
Oral : Ovrette		
Oral : Others		
Condoms		
Foam tablets		
IUDs (Copper T)		
Injectable		
Others		

From Operating Theater.

	Please State Numbers for:
Female Sterilisation (tubal ligation)	
Male Sterilisation (vasectomy)	
Norplant new users	
Norplant revisits	

Please State Numbers for:

Norplant removals ☐

Essential Drugs, Vaccines And Contraceptives

Out Of Stock. Tick if drug, vaccine or contraceptive was out of stock at health unit, at any time during previous month. Out of stock means there was NONE left anywhere in your health unit.

☐ Chloroquine tabs

☐ Cotrimoxazole tabs

☐ ORS sachets

☐ Measles Vaccine

☐ Fansidar

☐ Depo-Provera

Other Drugs. Add the name of other drugs, vaccines, contraceptives or supplies that suffered a stock out during the month:

1 [   ]
2 [   ]
3 [   ]
4 [   ]
5 [   ]

Outreach Activities.

Please state the Number of:

Outreach activities planned for the month [   ]

Outreach activities actually conducted in the month [   ]

Financial Summary

Income Categories. Please state the Category and Amount in the form: Category-Amount

   Income Category and Amount

1 [   ]
2 [   ]
3 [   ]

Income Category and Amount

4	[____]
5	[____]

Income Summary. Please state the Total Income for this month:

INCOME CATEGORIES

Amount:

TOTAL INCOME   [____]

Expenditure Categories. Please state the Category and Amount in the form: Category-Amount

Expenditure Category and Amount

1	[____]
2	[____]
3	[____]
4	[____]
5	[____]

Month Expenditure Summary. Please state the Total Expenditure for this month:

EXPENDITURE CATEGORIES

Amount:

TOTAL EXPENDITURE   [____]

Balance Summary.

Please state the Appropriate Information for:

Balance of the month	[____]
Previous month overall balance	[____]
Overall balance	[____]
Cash Balance	[____]
Bank Balance	[____]
Debt Accepted	[____]
Estimate of unrecovered debts	[____]
Number of exemptions	[____]

Comments

Comments.

	For Last Month	Planned This Month
Date(s) of senior staff meeting		
Date(s) of meeting of Health Unit Management Committee		
Parish name(s) and date(s) of Village Health Committees meetings attended by representatives of the health unit		
Date(s) of LC III or LC V committe meetings attended.		
Date of Support Supervision visits of District Health Team		

Staff. Please give a list of staff members who are not receiving salary and/or allowance for last month.

1

2

3

4

5

6

Conclusion Date. Please give the Date of the Report in the format: (day-month-year) Eg:30-10-2003

Conclusion Name. Name of Incharge

Conclusion Witness. Witness Name

```
[text area]
```

[Submit Survey]

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APPENDIX IV

List of interviewees

1.	Dr. Patrick Okello	Project Director	UHIN
2.	Dr. Julius Kalamya	Content Manager	UHIN
3.	Jude A. Okiria	Project Officer, Rakai	UHIN
4.	Joyday A. Gloria	Project Officer, Mbale	UHIN
5.	Dr. Francis Abwaimo	DDHS	Mbale
6.	Dr. Robert Mayanja	DDHS	Rakai
7.	Sarah Asiimwe	HMIS Section	MoH
8.	Johnson Nkuuhe	Vice-Chairman, Science and Technology Committee, Parliament of Uganda	

APPENDIX V

Structured Interview for Health Practitioners in Mbale and Rakai

ICTs and Health

A Study of How ICTs (Information and Communication Technology) Affect Health Service Delivery in Rural Uganda: The Case of the Personal Digital Assistants (PDAs) Project in Mbale and Rakai Districts

Dear Respondent, this questionnaire is part of an academic research that aims at studying the way ICTs are affecting health service delivery in rural Uganda. The PDA project in Mbale and Rakai has been chosen as the case study of this research.
All the information provided is for academic purposes and will be handled with confidentiality. Thank you for your cooperation.

NAME (optional): …………………………………………………………………..
SEX: ………………………………………………………………………………….
MEDICAL CENTRE WHERE YOU WORK: …………………………………………
DESIGNATION/POSITION: …………………………………………………………

1. What is your definition of a Personal Digital Assistant (PDA)?
……………………………………………………………………………………………

2. In which year did you start using a PDA?
……………………………………………………………………………………………

3. Did you know how to use the PDA the moment you got it? **(Tick the appropriate answer)**

Yes …………

No ………….

- If your answer to **Question 3** was **Yes**, where did you learn how to use the PDA?
……………………………………………………………………………………………

- If your answer to **Question 3** was **No**, how did you learn to use the PDA?
....

4. How useful is the PDA to your work? **(Tick only one)**

- Not useful at all ………………

- A bit useful …………………...

- Useful …………………………

- Very useful ……………………

5. How often do you use the PDA? **(Tick only one)**

- Everyday …………………………….

- Once in two days …………………….

- Once in four days …………………….

- Once a week ………………………….

- Once in two weeks ……………………

- Other………………………………………………………………………………….

6. Had you ever used a computer before using the PDA?

Yes …………….

No ……………...

7. Is it easy to use a PDA?

Yes ………………

No ……………….

- Give reasons for the answer you gave to **Question 7**.
…………………………………………………………………………………………

8. List all the various things that you use the PDA for.

………………………………………………………………………………

9. What is/are the most important function(s), which is/are related to your work, that the PDA serves?

…………………………………………………………………………………………

10. Are there any diseases that the PDAs have particularly helped you to deal with?

Yes ……………..

No ………………

- If your answer to **Question 10** was **Yes**, please state the diseases.
………………………………………………………………………………………………

11. Do you think the information you get, and the communication you carry out using the PDA have improved the quality of the medical services you offer to the people?

Yes …………….

No ……………...

- If your answer to **Question 11** was **Yes**, please say how.
………………………………………………………………………………………………

- If your answer to **Question 11** was **No**, please say why.
………………………………………………………………………………………………

12. Do you think the PDA is an effective tool for extending good medical services to people in rural areas in Uganda?

Yes ……………….

No ………………..

- Please give reasons for the answer you gave to **Question 12**.
………………………………………………………………………………………………

13. Have you encountered any problems when working with the PDA?

Yes ……………..

No ………………

- If your answer to **Question13** was **Yes**, please state the kind of problems you have encountered.
……………………………………………………………………………………………

- If your answer to **Question 13** was **Yes**, please suggest some solutions to the problems you have encountered with the PDA.

…………………………………………………………………………………………………

14. Do you think there could have been a better way of extending health services to this area instead of using PDAs?

Yes ………………..

No …………………

- Please give reasons for your answer to **Question 14**.
…………………………………………………………………………………………………

15. Do you think the PDA project is sustainable (that is, do you think it will go on for many more years to come)?

Yes ………………….

No …………………..

- Please give reasons for your answer to **Question 15**.
…………………………………………………………………………………………………

16. What challenges, if any, does the PDA project face?

…………………………………………………………………………………………

17. Please make some recommendations that would make the PDA project better and more beneficial to you, as a health practitioner, and to the people you serve.

…………………………………………………………………………………………

THANK YOU

APPENDIX VI

Interview Guide for UHIN Project Director, Project Officers, and the DDHS'

1. Why does the project use PDAs, and not any other new ICTs (for example personal computers, laptops, CD-ROMs, etc.) **OR** What are the advantages of using PDAs over other new ICTs in healthcare?

2. Do you think the PDAs have made a contribution to the medical sector?
   Give reasons for answer.

3. What constraints (problems) does the project face, in terms of the communication/information facilitation roles it is supposed to play?

4. Suggest possible solutions to the constraints (if any constraints were mentioned).

5. What challenges does the project face?

6. How can the challenges be dealt with?

7. Is ICT really important in healthcare in developing countries? (Isn't talk about ICTs' importance in developing countries just 'hot air'?)

8. Do you think the project is sustainable?

9. Some people argue that ICTs are simply imposed on people in developing countries and that they cannot really work, given our conditions. What do you have to say about that?

10. Was the project easy to start?

11. Would you recommend for it (project) to be spread to other districts?

12. Why distribute PDAs in Mbale and Rakai districts in the beginning, out of all the other districts in the country?

THANK YOU

APPENDIX VII

<u>Interview Guide for Dr. Julius Kalamya, UHIN content manager</u>

1. What kind of information do you give the health practitioners?

2. Do you think the PDAs are an effective tool for information dissemination and exchange? Give reasons for your answer.

3. Are you confident/satisfied that the practitioners use the information as you expect them to?

4. How do you take care of factors like different education levels/literacy, knowledge of English, etc?

5. Would you recommend for the project to be spread to other districts?

6. You are planning to connect the PDAs to the Internet. What benefits do you think will come with this?

7. Any there any problems as far as the Internet is concerned?

8. Some people argue that ICTs are simply imposed on people in developing countries and that they cannot really work, given our conditions. What do you have to say about that?

9. What challenges does the project face?

THANK YOU

APPENDIX VIII

Interview Guide for Dr. Sara Asiimwe, HMIS Department, MoH

1. What is the importance/the whole point of doing the health surveys (weekly, monthly)?

2. Is there a difference between the way the surveys in Rakai and Mbale were being done before (using paper) and now (with PDAs)?

3. Do you think the handheld computers (PDAs) are an effective way of data collection (HMIS information)? Explain your answer.

4. Would you advocate for this system to be spread to the other districts in the country?

5. What problems/obstacles/challenges do you see with this project?

6. What is the MoH's position concerning the project?

7. Do you think using this technology would be sustainable?

8. Do you think ICTs can contribute to the improvement of health service delivery in Uganda, and maybe developing countries as a whole? Give reasons for your answer.

THANK YOU

APPENDIX IX

<u>Interview Guide for Member of Parliament Johnson Nkuuhe</u>

1. What is the place of new ICTs in development? What is their place in health, specifically?

2. Why advocate for new ICTs and not any other media of communication, such as radio, newspapers, etc?

3. Do you think Uganda and Ugandans have the ability to incorporate the ICTs in the different sectors and in their lives? Why?

4. What obstacles do new ICT users in Uganda face?

5. How are these obstacles being solved, or how do you think they should be solved?

6. Is talk about ICTs facilitating socio-economic development in developing countries mere exaggerations?

7. What do you think about the fact that we are planning, or are actually diverting, money for essentials like drugs, food and electricity to buying ICT technology? Food and drugs are what people need, not machines (Opportunity cost).

8. When will Uganda's ICT policy be implemented?

9. What is needed for it to be implemented?

THANK YOU