



# Critical Success Factors for Telemedicine in Ethiopia

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## ABSTRACT

*Information and communication technology (ICT) has seen exceptional growth in the last decade in Ethiopia and Africa. Delivery of health care services is an issue for governments in most developing countries. However, service and quality depend on the availability of financial and human resources along with the organizational and management capability to transform the resources to meet national needs. This paper discusses three important enablers of telemedicine: government in the role of policy maker and facilitator; higher institutions as providers of resources and training; and foreign alliances for infusion of finances and expertise. This paper specifically discusses Ethiopia as a case study, describing the effect of these enablers in Ethiopian telemedicine.*

## INTRODUCTION

In the last decade, health care service providers and governments in Africa have been investigating information and communication technologies (ICTs) for health care. In this period, Ethiopia has been planning a longterm national health care strategy to reduce costs and to increase the number of citizens receiving care. However, health problems like HIV/AIDS and malaria, combined with high population growth rates, have increased the demand for health services and for more expensive treatments. Because of slow economic growth and rising health costs, most developing countries, particularly in Sub-Saharan Africa, have not been able to adequately fund their health sectors. In many developing countries a shortage of medical specialists has led to the high mortality of patients suffering from various diseases. Current practice for medical treatment requires patients to consult specialists for further diagnosis and treatments by traveling to where the specialists are located. However, the waiting time for treatments normally takes weeks or even months. The scarcity of medical specialists will not be overturned anytime soon.

Specifically in the case of Ethiopia, inadequate transportation infrastructure makes it even more difficult to provide health care in remote and rural areas where 85% of the population lives. Where clinics and hospitals do exist, they are often poorly equipped and are below the standards set by the World Health Organization (WHO); this is particularly the case for clinics outside urban areas. The situation in this country has deteriorated due to extended drought and famine, civil war, and the resultant shortage of food and low socio-economic conditions.

Governments, nongovernmental organizations, and private health care providers must complement existing human, infrastructure and financial resources with modern technology (Basher, Armstrong and Youssef 1975; Della Mea 1999). Telemedicine offers patients and health care providers much broader and more flexible access to specialists. There are also potential economic and social benefits.

There are several factors that contribute to the success of telemedicine projects. Some of the critical success factors previously identified are technically feasibility, cost reduction, health care improvement, and satisfaction of patients and health care service providers (Weaver and Spence 2000). In this paper we extend this list with three further critical success factors: the government as a policy maker and facilitator of technical infrastructure; active involvement of higher institution as instruments of knowledge; and foreign alliances for providing finances and expertise. We discuss Ethiopia as a case study and examine the efforts of the Ethiopian government and international organizations to solve the health care problems using telemedicine (ESRDF 2002; World Bank 1988).

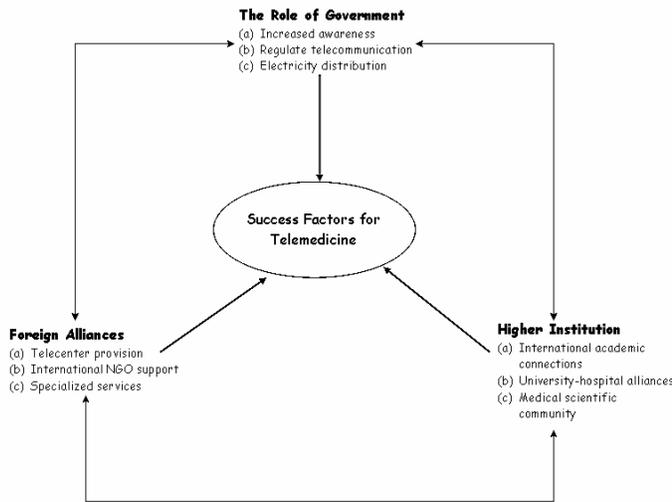
## TELEMEDICINE AND ITS CHALLENGES

Telemedicine is defined as health services provided via telecommunications that enable medical personnel working in hospitals and clinics to transmit medical laboratory or other investigation results and patient data from distant locations. It enables medical practitioners working remotely to call upon locally unavailable specialist skills at centers of medical excellence, even worldwide (Bashshur, Sanders and Shannon 1997).

Although telemedicine has made a real contribution to health care services all over the world, the implementation of a telemedicine nonetheless faces many challenges. There are many barriers—cultural, social, economic, organizational and technical—that health care organizations must overcome before the full benefits of a telemedicine can be implemented in day-to-day activities. Particularly in developing countries, telemedicine has not always delivered the anticipated level of success due to a number of factors. These include a lack of reliable and affordable telecommunications and electric power infrastructure; monopoly and high cost of Internet services; lack of government awareness; problems sustaining the telemedicine implementations; poor organizational design; and user dissatisfaction with low band-width and delayed responses (DOI 2001).

Furthermore, many decision-makers, health care professionals and patients lack basic information on telemedicine services and their potential for health care. This has resulted in misconceptions, resistance to telemedicine, and a relative lack of progress in project initiation. Another challenge is that telemedicine is still not recognized as a technical program within many national ministries of health, in spite of the recommendation of the World Health Organization that telemedicine be included in national health policies and receive separate budget allocations. Rather, many ministries of health do not go beyond pilot or

Figure 1. Critical Success Factors



demonstration implementations of telemedicine, even though similar projects are fully functional and operational in other parts of the world.

In spite of these barriers, a number of critical success factors have been identified by different organizations that have successfully implemented telemedicine. As we have mentioned, other research highlights the importance of technology, organization, cost containment, accessibility, and patient and health care service provider satisfaction (DOI 2001; Weaver and Spence 2000). However, in addition to these, developing countries have additional critical success factors, which we present and discuss in this paper as we propose a model for successful telemedicine in developing countries.

### CRITICAL SUCCESS FACTORS FOR TELEMEDICINE IN DEVELOPING COUNTRIES

The critical success factors for telemedicine projects in developing countries are shown in Figure 1. The factors to be considered for successful telemedicine projects are government, higher institutions, and foreign alliances. The level of the cooperation between each element and how the work is harmonized is very important.

#### Governments

A mature telemedicine project involves actors from various sectors at the national and international level. Among the most prominent are the ministry of health, the telecommunication authority, telemedicine equipment suppliers, service providers and hospitals. The telecommunication services, electricity and other major infrastructures of most developing countries are owned and operated by government monopolies. Therefore, the government has a crucial role in regulating and

#### Higher Institutions

By providing human resources and knowledge, higher institutions are playing a major role in the success of telemedicine. This is the case in developed countries, and probably more so in developing countries, where academic medical institutions are major centers of health knowledge, resources, and innovation, compared to hospitals with no explicit academic affiliation. To achieve success in a telemedicine project, physicians and medical personnel should be provided full briefing, training and education. They need to be brought to realize that telemedicine is not a new branch of medicine they have to learn, but rather a new way of delivering medical care to patients. The acceptance and commitment of health personnel to telemedicine is crucial to its success.

#### Foreign Alliances

A number of international and non-government organizations are concerned and experienced with telemedicine. Telemedicine is globally

popular, and experiences have been reported from many countries for the past 10 years. The lessons from the USA and Europe show that there are standard practices for successful telemedicine. Developing countries should seek advice from more experienced institutions in other countries at all stages of telemedicine implementation. This way, the standard critical success factors that we do not cover in this paper can be incorporated into a telemedicine project (DOI 2001; Weaver and Spence 2000).

### THE EXPERIENCES IN ETHIOPIA

The success of telemedicine may have a strong impact on health care services, especially in under-developed countries (Edworthy 2001). Developing countries suffer the lack of technical infrastructure, knowledge and financial resources. The model we proposed shows the telemedicine requirements that are particularly critical in developing countries, though these factors might not be quite as essential in developed countries. To demonstrate the effects of these factors in a developing country, we conduct a case study of the telemedicine situation in Ethiopia.

Located in Eastern Africa, Ethiopia has an area of 1.11 million square kilometers. The population of Ethiopia is about 63,494,707 (2000 estimate), yielding an overall density of about 56.7 people per square kilometer. The rural population is about 85%. The male-to-female ratio is 1.007 and the life expectancy at birth is 49.7 years for males and 52.4 years for females. The population of Ethiopia is relatively young with an average age of 17 years (PHNIP 2002). The present health care facility and manpower available in the sector is far from satisfactory. For example, the ratio of health centers to citizens is 1:222,850 (compared to the Ministry of Health standard of 1:25,000), and the ratio of physicians to citizens is 1:38,619 (compared to the World Health Organization standard of 1:10,000). The government, foreign alliances and universities have to contribute to improving the existing facilities and personnel (Asefa and Lemi 2002; DSE 2001; UNECA 1999).

#### The Role of the Government

The Ethiopian government has recognized the need to strengthen national capacities to address telemedicine issues. The government has worked on policy and strategy, capacity building, and education in the health sector (DSE 2001). All concerned stakeholders—universities, the telecommunication authority, the ministry of health, and other institutions and policy makers—have committed themselves to support telemedicine implementations. This is very important because most of the existing health care institutions and other infrastructure (such as telecommunications and electricity) are owned and controlled by the government, and their use requires the permission and co-operation of concerned authorities. Such co-operation facilitates the implementation of telemedicine projects as part of the overall health care infrastructure, rather than merely an auxiliary service added to the other components. The government remains a major facilitator of social change. We describe this change below in terms of awareness, infrastructure development, and online education.

#### Increased Awareness

The Ethiopian government has shown its readiness to consider the development of ICT policies and programs of action that address socio-economic development challenges. An earlier resistance against supporting telemedicine has changed remarkably. The government is now willing to invest in information and communication technology programs that meet their development plan goals as part of the overall efforts to alleviate poverty in the country. The minister of transport and communications said in a June 2001 conference, "The least developed countries like Ethiopia can either positively respond to the alarm bell and exploit the opportunities of the development in ICTs or get dangerously marginalized from the global wealth like many other least developed countries" (Edeger 2000).

### Telecommunications Regulation

According to the Ethiopian Telecommunication Cooperation (ETC), there are only about 6 telephone mainlines for each 1,000 persons. Addis Ababa accounts for about 57.2% of the total installed lines, and other large towns account for another 32.5%. 85% of the population lives in rural areas where only 10.5% of the telephones are installed. However, in conformity with the government's policy of Agricultural Development-Led Industrialization (ADLI), ETC is working on eighth development program covering the period 2002-2005. During this period, the telecommunication development strategy is to provide telephone and data services to about 300 woreda towns across the nation (Asefa and Lemi 2002) (a woreda is a district in Ethiopia).

### Electricity Distribution

One of the key factors in implementing telemedicine is the distribution of electricity. Ethiopian Electricity Power Corporation plans to electrify 164 woredas to provide customer access to electricity. The percentage of electrified woreda towns in each regional government is expected to reach 73% by the end of the project in 2005. The project will meet the demand for electricity for the agricultural, commercial, residential, education and health sectors.

### Higher Institutions

Universities and other academic institutions reinforce the development of telemedicine. Educational institutions are the main backbone of telemedicine project all over the world because of their capacities, their involvement in teaching and research, and their keenness for new technology. Moreover, research can be more cost effective when carried out with universities, and it is in such environments that capacity can most successfully be built. We will discuss the higher institution contributions—all related to Addis Ababa University (AAU)—regarding HealthNet, the university network, and the medical faculty computer center.

### HealthNet

SATELLIFE is an international nongovernmental organization that supports ICTs in healthcare. SATELLIFE established HealthNet Ethiopia in 1994 in collaboration with Addis Ababa University Medical School, which hosts the network. Initially, departments and units within the faculty of medicine were connected. Today, there are more than 60 points connected all over the country that use HealthNet's telemedicine services (SATELLIFE 2003). These institutions include hospitals, medical schools, non-profit organizations, clinics, health research centers and individual health practitioners.

### Addis Ababa University (AAU) Network

AAU has launched a university-wide networking initiative that interconnects six campuses in Addis Ababa, including the Medical School (Kinde 2002). AAUNet will contribute to the overall growth, expansion and improvement of learning and research activities.

### Medical Faculty Computer Center

The success of telemedicine will depend not so much on the performance of the tools, as on the buy-in of the medical scientific community (Kinde 2002). The medical community of Addis Ababa University understands the need of ICT to enhance and optimize existing human resources. The university communities are clear that telemedicine is not a reinvention of medicine, but rather a new way of practicing it based on the latest technology (Wootton 1996).

### Foreign Alliances

Like most countries in Sub-Saharan Africa, telemedicine projects which required qualified human resources, policies, funds and reliable infrastructure (telecommunications, power, etc) are too expensive for the Ethiopian government or other local agencies to implement without external assistance. Investing in new technology requires financial and human resources that many developing countries do not have (UNECA 1999). As a result, foreign alliances are essential for the development of telemedicine in Ethiopia. International institutions such as UN

agencies have close links to top national policy and decisions makers. In addition to providing funding, these international organizations draw on the experience of more developed countries to help implement telemedicine in local environments (Soltane 2002).

### British Council Telecenter

The very limited information and communication technologies available in Ethiopia are concentrated mainly in the capital city. The British Council in Ethiopia has initiated a project to establish telecenters in two public libraries 105 and 130 kms from Addis Ababa (in Wolliso and Debre Berhan, respectively) (WMCT 2000). This initiative, in line with the Ethiopian government's policy for the development of modern information facilities in various regions, also responds to the call of the African Information Society Initiative to nongovernmental organizations and donors to support integrated rural development through the use of ICTs.

### International Organizations

Many international organizations support telemedicine, especially United Nations organizations like the World Bank, the International Telecommunication Union (ITU), and the World Health Organization (WHO). Various nations have actively supported the development of telemedicine as a means for their people to share the use and advantages of ICT. In Ethiopia, WHO, ITU and the Ethiopian government are major players in many telemedicine projects. Their working together in a coordinated fashion will enhance telemedicine in the country.

### ORBIS

The ORBIS Telemedicine Project in Ethiopia will provide continuity and connectivity to the already established ORBIS airplane-based and country programs in their work to preserve and restore sight worldwide. Ongoing consultation on diagnosis and treatment will be provided for individual ophthalmologists, clinic groups, and ophthalmology departments in the developing world via digital images and the Internet.

### CONCLUSION

Ethiopia has historically made only low investments in health care. However, this paper shows that steps are being taken to struggle against the vast health care problems by adopting telemedicine. We described a framework that illustrates that the involvement of government, higher institutions, and foreign alliances is critical for the successful implementation of telemedicine in Ethiopia. The increased availability of personal computers and the Internet, the reduced cost of hardware, and the availability of powerful yet user-friendly tools, have enabled health care providers to use telemedicine. However, simply adopting telemedicine for health care does not so easily solve existing health problems. Social, cultural, behavioral and other factors are also important, which affect the balance of investment and health services in developing countries.

### REFERENCES

- Asefa, Sisay and Adugna Lemi (2002). Eradicating rural poverty and food insecurity in Ethiopia: The quest for sustainable institutions and technologies. *Proceedings of Ethio-Forum 2002 Conference*. Addis Ababa, January 16-19, 2002. Ethiopian Social Rehabilitation and Development Fund.
- Basher, R.L., P.A. Armstrong and Z.I. Youssef (1975). *Telemedicine: Explorations in the use of telecommunications in health care*. Springfield, Illinois: Charles C. Thomas.
- Bashshur, Rashid, Jay H. Sanders and Gary William Shannon, Eds. (1997). *Telemedicine: Theory and practice*. Springfield, Illinois: Charles C. Thomas.
- Della Mea, V. (1999). Pre-recorded telemedicine: Introduction to telemedicine. R. Wootton and J. Craig, eds. London: Royal Society of Medicine Press, pp. 39-51.
- DOI (2001). ICT for health. Digital Opportunity Initiative. <http://www.opt-init.org/framework/pages/2.2.1.html> (as of January 2004).

DSE (2001). Digital inclusion: Impact and challenges of the networked economy for developing countries. Development Policy Forum of the German Foundation for International Development, Berlin.

Edeger, T. (2000). Disseminating health information in developing countries: The role of the Internet. *British Medical Journal* (321), pp. 797-800.

Edworthy, Steven M. (2001). Editorials: Telemedicine in developing countries may have more impact than in developed countries. *British Medical Journal* (323), pp. 524-525.

ESRDF (2002). A novel approach to poverty eradication and restorative development in Ethiopia. Ethiopian Social Rehabilitation and Development Fund, Addis Ababa.

Kinde, Samuel (2002). Ethiopia: Infrastructure roll-out gathers pace but monopoly remains. *Balancing Act News Update* (2002:108).

PHNIP (2002). PHNIP country health statistical report: Ethiopia. Population, Health and Nutrition Information Project, Washington, D.C.

SATELLIFE (2003). HealthNet Ethiopia. SATELLIFE. <http://www.healthnet.org/hnethiopia.php> (as of January 2004).

Soltane, Karima Bounemra Ben (2002). Regional ICT developments: The AISI perspective. *Proceedings of Third meeting of the UN-ICT Task Force*. New York, September 30 to October 1, 2002. United Nations Information and Communication Technologies (ICT) Task Force.

UNECA (1999). Information and communication technology for health sector. United Nations Economic Commission for Africa. <http://www.uneca.org/adf99/adf99health.htm> (as of January 2004).

Weaver, Linda and Dorothy Spence (2000). Application of business case analysis in planning a province-wide telehealth network in Alberta. *Journal of Telemedicine and Telecare* (6:1 Supplement 1), pp. 87-89.

WMCT (2000). Wolisso multipurpose community telecentre (WMCT). Wolisso Multipurpose Community Telecentre. <http://www.telecom.net.et/~wolisso/> (as of January 2004).

Wootton, R. (1996). Telemedicine: A cautious welcome. *British Medical Journal* (313), pp. 1375-1377.

World Bank (1988). Project appraisal document, Report 18366-ET. World Bank, Washington, D.C.

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