ABSTRACT
The deployment of core health care service delivery applications such as Telemedicine presents various challenges in low income countries. The challenges range from technical problems to complex politico-economic, managerial, and behavioral issues. We conducted a case study (Yin, 2009) to understand the impact of various stakeholders on the current telemedicine projects at the Black Lion Teaching Hospital, Addis Ababa, Ethiopia. Preliminary findings reveal an absence of mechanisms for balancing varying interests of multiple stakeholders involved in the Telemedicine projects. The study has both practical and theoretical contributions. First, the study revealed practical implications for Telemedicine projects in the study area, and may be extended to other low income countries in Africa and elsewhere. Second, use of stakeholders’ theory was found to offer a robust and sound analysis and explanatory lens for explaining the varying interests among stakeholder groups and the effect of these phenomena on telemedicine use.

Keywords
Telemedicine, Stakeholders theory, Case study, Stakeholders Interest

INTRODUCTION
Access to basic health services is considered to be a fundamental human right by many (Alma-Ata, 1978). This notion is widely recognized at the global level. International organizations and governments throughout the world have been seeking strategies and methods so health care services can be within the reach of all people. Over the past couple of decades slogans such as “Health for all by the year 2000” have been voiced around the world (Mahler, 1981). Various projects aimed at expanding health care services to the majority of people around the world, particularly to underserved people in developing countries are in progress. Among these endeavors is the use of ICT for the provision of health care services. The use of ICT for provision of health care services appears to be a viable option for enhancing the capacity of low income developing countries struggling with shortage of qualified medical personnel (Hailemariam, Negash, and Musa, 2010). Among various ICT applications in the health care system, Telemedicine is prominent as a potential solution to increase the accessibility of healthcare and reduce the costs associated with specialty care in low income countries (Zhan, Lin, and Wang, 2011). This study focuses on the ongoing Telemedicine projects and Telemedicine systems use in Ethiopia. Telemedicine, which literally means “medicine at a distance”, encompasses all medical activities: diagnosis, treatment, prevention, education, and research (Craig, 1999). Telemedicine is further defined as the use of information technologies to exchange health information and provide health care services across geographical, time, social, and cultural barriers (Reid, 1996). The promising potential found in Telemedicine systems has attracted the attention of low income countries and donors. There is a growing belief that African countries can better address the shortage of qualified medical personnel and health facilities using telemedicine (ITU, 2002). Based on this belief, various telemedicine projects have been launched in various nations on the African continent. These include Mozambique, Senegal, Uganda, and Kenya (Asfaw, 2009). Efforts to introduce Telemedicine in Ethiopia started around June 1997 (Fikreyohannes et al., 2004). Since then, small and large scale telemedicine projects have been launched in some teaching and specialized hospitals in Ethiopia. This study focuses on a couple of telemedicine projects and systems at the Black Lion (BL) teaching hospital at Addis Ababa University, Ethiopia.

Three telemedicine systems had been implemented previously with mixed results. The three systems are: International Telecommunication Union (ITU) Telemedicine project in 2003, Ethio-Indian Telemedicine Program in 2005, and Johns Hopkins University HIV/AIDS telemedicine program, named JHU-TSEHAY launched in 2010. All three Telemedicine
projects were initiated by donors and involve various stakeholders. Despite the presence of adequate hardware and software facilities to conduct live video conference-based medical consultations as well as store and forward patient medical record and medical opinion exchange capabilities between two or more sites, the Telemedicine systems remain underutilized and failed to meet the intended purpose. For example, a study conducted by Asfaw (2009) showed that only 63 Tele-consultations and continuing medical education sessions were conducted between Black Lion Hospital, Ethiopia and Care Hospital at Hyderabad, India between December 2006 and December 2008. This underutilization may result in project failure and may lead to the loss of meagerly available resources. This study is motivated to address the following research questions: (1) What is or are the interests of stakeholders in the telemedicine projects? (2) How do differing interests of stakeholders affect telemedicine system use? To investigate these phenomena the study employed a case study research method.

THEORETICAL FOUNDATION

Organizations are entities through which numerous and diverse participants accomplish multiple, and not always entirely congruent purposes (Donaldson and Preston, 1995). A stakeholder is any group or individual who can affect or is affected by the achievement of the firm's objectives (Frooman, 1999). One central purpose of stakeholder theory has been to enable managers to understand stakeholders and strategically manage potential conflicts stemming from divergent interests (Frooman, 1999; Zhan, Lin, and Wang, 2011).

Stakeholders theory in conjunction with descriptive empirical data was used to identify the connections or lack thereof between stakeholder management and the achievement of traditional corporate objectives such as profitability and growth (Donaldson and Preston, 1995). Based on the analysis of the Fortune corporate reputation surveys, there is some evidence that the satisfaction of multiple stakeholders need not be a zero sum game. This implies that benefits to one stakeholder group need not come entirely at the expense of another (Preston and Sapienza, 1990).

There are three types of uses of stakeholder’s theory: descriptive/empirical, instrumental, and normative (Donaldson and Peterson, 1995). For example, stakeholder theory has been used to describe the nature of the firm (Brenner and Cochran, 1991); the way managers think about managing (Brenner and Molander, 1977); how board members think about the interests of corporate constituencies (Wang and Dewhirst, 1992), and how some corporations are actually managed (Clarkson, 1991; Halal, 1990; Kreiner and Bhambri, 1991).

The instrumental use of the theory is recommended in conjunction with descriptive/empirical data to identify the connections or lack of connections between stakeholder management and the achievement of traditional corporate objectives such as profitability and growth (Donaldson and Peterson, 1995). From normative perspective, stakeholder theory is used to interpret the function of the corporation, including the identification of moral or philosophical guidelines for operation and management.

The descriptive aspect of stakeholder theory reflects and explains the past, present, and future states of affairs of corporations and their stakeholders. Simple description is common and desirable in the exploration of new areas, and can usually be extended to generate explanatory and predictive propositions. This study used the descriptive application of stakeholder theory since the research questions focus on identifying the interests of stakeholders and their effect on the use of Telemedicine system.

THE RESEARCH METHODOLOGY

This study employed case study approach (Yin, 2009; Yin, 2003). Using structured interview questions (see Appendix 1), interview sessions were conducted with technical personnel and Telemedicine project coordinators at Ethio-Indian Telemedicine center and Johns Hopkins Telemedicine center, both of which are based at Black Lion teaching and referral Hospital, at Addis Ababa University. A series of four interview sessions were conducted over a period of time. Two sessions were with the technical person at the telemedicine center. The other two sessions were held with the coordinator of the e-health unit at Black Lion teaching hospital. On average, each interview session took about 55 minutes.

As a part of our data gathering, we observed resident physicians and telemedicine technical personnel as they get prepared for a live Telemedicine consultation session scheduled between Black Lion Hospital and Johns Hopkins University based in Baltimore, Maryland in the USA. However, the consultation scheduled for September 22, 2012 failed due to miscommunications. We were also able to have informal discussions with various telemedicine users on the spot. In addition to these, relevant documents relating to both Ethio-Indian and JHU-TSHAI telemedicine systems from the date of inception to the current state were gathered and reviewed. These documents clearly indicate the goals, objectives, and interests of both Telemedicine project initiators. Additional valuable information was gathered from Telemedicine and Tele-education sensitization workshop held at Ghion Hotel Addis Ababa, Ethiopia on December 22, 2011, which brought together key
stakeholders of the Telemedicine system, faculty members of the medical school and the Health Science College, students, technical personnel, and representatives of funding organizations.

This study focuses on stakeholders’ analysis and attempts to uncover the intents and interests of various stakeholders of the Telemedicine systems and projects. After identifying initiators and beneficiaries as the two categories of stakeholders, the study attempts to identify the vested interest of each stakeholders group regarding the telemedicine system.

CASE DESCRIPTIONS

This section provides summary of the health profile of Ethiopia and then describes the study area to outline the context of the case. We then present a broader account of two telemedicine projects at Black Lion Hospital.

Ethiopia is located in East Africa with a land area of approximately 1.1 million square kilometers and an estimated population of 80 million, more than 80% of which live in rural areas. The country is subdivided into 9 national regional states and 2 administrative states. As is the case of many low income countries, the health care system in Ethiopia has numerous problems. Physician-to-population ratio is one of the lowest in the world 1:25,958 (i.e., only one physician per almost 26,000 people). Most physicians live in the urban areas. As a result, significant health service disparities exist between urban and rural areas. The three prestigious medical schools are Addis Ababa, Gondar, and Jimma universities since their establishment in 1964, 1978, and 1984, respectively. Prior to 2006 Ethiopia graduated only 3,728 medical doctors in 42 years time (Berhanu, 2008). At this rate, it will take Ethiopia many years to improve the existing physician-to-population ratio.

Black lion hospital is the biggest hospital in the country. Located in the center of Addis Ababa, it delivers a tertiary level care to the entire country, and it is the highest-level referral hospital in Ethiopia. In addition to providing medical services, it is a university teaching hospital within Addis Ababa University (AAU) where different types of specialists and medical professionals are available.

Ethio-Indian Telemedicine Center

This Telemedicine center was established in November 2005. It was intended to be part of the envisioned Pan African Telemedicine and Tele-education program funded by the Indian government. The Indian Government committed to fund the telemedicine pilot project and appointed TCIL (Telecommunication Consultants India Limited) to be in charge of the implementation of the project, while the Ethiopian government was responsible for providing the necessary infrastructure and communication link in Ethiopia (Asfaw, 2009).

During its initial phase, this Telemedicine pilot project was designed to provide expert medical consultation services in the field of Radiology, Cardiology (for Adults), Cardiology (for Pediatrics), Pathology, and Dermatology from CARE Hospital based in Hyderabad, India. CARE was designated to be the “hub” hospital, while Black Lion Hospital, Addis Ababa and Nekemet Hospital, both in Ethiopia were designated to be the “spokes” hospitals. The infrastructure set up of the Telemedicine center is shown in Figure 1.

![Figure 1. Telemedicine infrastructure setup](image-url)
During the inception phase, the center was connected to the “Hub”, Care Hospital, through the Internet via Ethiopian Telecommunication Corporation, the only Internet Service Provider (ISP) in Ethiopia with 2 Mbs connectivity. Figure 2 shows Network connectivity architecture between Care Hospital, Hyderabad, India the “Hub” and Black Lion Hospital, Addis Ababa, Ethiopia, the “Spoke”.

**Network Diagram for CME in Ethiopia Pilot Project**

![Network Diagram](image)

Figure 2. Network Diagram for Continue Medical Education (CME)

The Medical School assigned a physician (a radiologist by profession) to oversee and coordinate the center. A telemedicine committee drawn from various units of the medical school was established. At the beginning of the operation of the center, a junior IT person was employed on a contractual basis. Figure 3 shows one of the Telemedicine sessions conducted at Ethio-Indian Telemedicine Center. As it can be seen from Figure 3, the Telemedicine center is housed in a small room; hence only a few participants can attend such sessions.

![Telemedicine Session](image)

Figure 3. Live Continuing Medical Education session (CME)
Respondents of the study stated that at the beginning of the project there were frequent network connectivity problems, causing many live consultation sessions to get interrupted. Moreover, physicians seeking consultation from the Black Lion location frequently failed to meet with high caliber senior physicians from the consulting end at Care Hospital, India. These incidents significantly reduced the interest of physicians at Black Lion Hospital for the telemedicine system. During one of our data collection visits, we met with an Indian national in charge of handling the operation of the center. However, during our frequent field visits we noted that the center was usually closed. The center is now part of the Pan African e-network project initiated by the government to connect all 53 African Union (AU) member countries with selected Indian educational and health institutions for expertise and knowledge sharing. With regards to the operation of the telemedicine center one of the respondents stated:

“The Ethio-Indian Telemedicine system is a closed system. Meaning, unlike the other system all communications, continuing medical education as well as medical consultancy is designed to be carried out only with Indian Institutions not with institutions based in other part of the world. It appears that the Pan African project targets Africa as a source of patient and trainees and Indian institutions as a source of expertise and outlets”

Scholars critical of the Pan-African e-Network have offered similar reflections. For example, Mawdsley and McCann (2010) points out that India focuses its development partnership with Africa on skills and trainings as it cannot afford to provide large grants and presents evidence that the $100 million fund committed to the Pan-African e-Network was aimed at using expertise to leverage India’s development cooperation strategy with Africa. From other perspectives, some scholars view Indian initiated Pan-African e-network project as Indian influence strategy in African political-economy arena, comparing it with Chinese-Africa economic cooperation and relationships. Although Africa-China and Africa-India trade relationships have a long history, today’s scale and pace of China and India’s trade and investment flow with Africa, however, are wholly unprecedented and marks the growing South-South relationships (Broadman, 2007). Undoubtedly, China’s influence in its various facets on the African continent is increasing (Gill, Huang, and Stephen, 2009). India will also bring its own challenges in its African commercial interactions, bilateral relations, and do its part in shaping the multilateral polity and global economy (Mawdsley and McCann, 2010).

It should be noted that the Ethio-Indian Telemedicine center operates under the umbrella of Pan-African e-Network. Yet technically and financially, the system gets some support from India. To be viable, this telemedicine system no longer operates for the sole interest of the staff, the students, and the decision makers at the university; it must also addresses the interest of the sponsors.

**JHU-TSHAI Telemedicine system**

JHU-TSEHAI Telemedicine center started operation around January 2010. The Telemedicine program is a part of Johns Hopkins University technical support for the Ethiopian HIV/AIDS initiatives aimed at minimizing co-morbidity and mortality among HIV/AIDS infected and affected individuals (http://jhutsehai.org/). The program currently operates in four regions of Ethiopia.

Facts gathered from the key informant and from the website of the JHU-TSEHAI reveal that from January 29, 2010 to June 1, 2012 eighteen live videoconference sessions have been conducted between Black Lion Hospital and JHU-Baltimore, Maryland on various medical topics ranging from HIV/AIDS to Pharmacy. Figure 4 shows one of the live video conference sessions conducted towards the beginning of this Telemedicine center’s operation.

![Figure 4. Live video conference session at JHU-TSHAI Telemedicine center](https://example.com/f4.png)
Unlike the Ethio-Indian Telemedicine Center discussed earlier, this Telemedicine center has no dedicated conference room. Instead, it uses a multipurpose meeting and lecture hall located on the first floor of Health Sciences College, a building just a few meters from the Ethio-Indian Telemedicine center. Except for the server and some routing and switching devices, the remaining video conferencing equipments are mounted in the multipurpose meeting rooms where students attend other courses as well.

The center has the capability of conducting live video streaming over the Internet so that anyone from anywhere can attend the session in a non-interactive manner. Physicians can attend sessions from their offices or from other places so long as they are connected to the Internet.

Figure 5 is a picture of the interactive video conferencing session conducted on February 19, 2010 between third-year medical science students at Addis Ababa University and second-year medical students at JHU. This is regarded to be a remarkable event that was made possible through the exchange of expertise and academic cultures among students on different continents.

Figure 5. Live video Conference between AAU and JHU students

PRELIMINARY ANALYSIS AND FINDINGS

The involvement of various parties, interest groups, and end users having special interests and perspectives about the telemedicine systems in this study resembles the theoretical underpinnings of stakeholders’ theory. The theory views the firm as a coalition of interest groups, with each group wanting to promote its own interest. Previous studies revealed the presence of numerous interest groups and diverse interests surrounding the telemedicine system (e.g., Asfaw, 2009). This section enlists and describes the stakeholders of the telemedicine system and attempts to point out the perceived interests and objectives of each stakeholder group.

Figure 6 shows key actor(s) involved in the telemedicine programs at the study area (Black Lion Hospital) as revealed by the analysis of our case data.
PAN African e-Network

The Pan African e-network project was initiated by Indian government to connect all 53 African Union (AU) member countries with selected Indian educational and health institutions for expertise and knowledge sharing. The Ethio-Indian telemedicine center is a pilot phase project of the Pan African e-Network project. To reflect the interest of the initiators, the Ethio-Indian Telemedicine center is linked only with Indian hospitals and teaching institutions. Standardized content for tele-education is prepared to be delivered across all linked teaching institutions throughout Africa. Medical consultations are also required to be carried out with only designated Indian health institutions. By and large, the network infrastructure is meant to be used as a vehicle for Indian teaching and health care institutions to provide expertise service across the African continent.

JHU-TSHAI

Johns Hopkins University Telemedicine program is a more focused program designed to provide support for the Ethiopian HIV/AIDS prevention initiative. Its main objective is to provide the infrastructure for intellectual services to minimize co-morbidity and mortality among HIV infected and affected individuals. In line with these objectives, JHU-TSEHAI provides full funding for establishing and operating a video conference-based telemedicine system between Johns Hopkins University and Black Lion Hospital.

Ministry of Health

The Ministry of health has a vested interest in Telemedicine in order to better reach the underserved rural population of the country by efficiently utilizing the clinical specialists, biomedical scientists, and public health professionals who are currently concentrated in bigger cities. The interests of the Ministry are clearly reflected by the support it rendered when both the Ethio-Indian and JHU-TSEHAI telemedicine projects were initiated. As a key stakeholder, the Ministry of Health is expected to set out appropriate policy that guides the establishment, operation, and use of Telemedicine systems in the country.

College of Health Sciences

The College of Health Sciences, where the two Telemedicine systems are located is expected to play key roles in the operation of the Telemedicine systems. Acknowledging the potential benefits of telemedicine, the college intends to optimally use the system in its current state and wants to diffuse it across all health science departments.

Clinical Departments

Clinical departments are also interested to use the telemedicine system in order to improve the patient care and to enhance the quality of medical education. Physicians in these departments are usually overwhelmed by high influx of referral patients from all regional hospitals throughout the country. Furthermore, they are expected to teach large numbers of medical science students at undergraduate and graduate levels. Therefore, we observed keen interest in the use of telemedicine to leverage the health services and teaching activities.

Students/Resident Physicians

Final year medical science students and resident physicians are among the beneficiaries of the telemedicine system. Some of them have attempted to use the system and have encountered some problems. During the Telemedicine and Tele-education
training workshop on December 22, 2011 participants raised questions as to why resident physicians and final year medical science students fail to use the Tele-consultation and Tele-education system when they are supposed to be the main beneficiary of the system. Representatives of each group of students stated thus:

“The quality of content being delivered through Tele-education program from the selected Indian institution is too elementary and the case selected for live consultations were not attractive and challenging enough to grab the attention and to arouse the interest of students”.

The quality issue students raised occurred because the educational contents prepared are meant to be delivered across all African teaching institutions and are not tailored to the specific needs of a particular institution. Students expect to get support from the telemedicine system to address their specific educational problems. Besides, sound coordination is needed to avoid the overlap between the content being delivered and the case discussed within the college and through the telemedicine system.

Patients

The telemedicine systems considered in this study modeled in such a way that patients will not have direct interface with the system. Physicians are expected to use the system in the course of delivering health care services to patients. Therefore, the interest of the doctors determines use of the system to reach out remote patients. Although patients are at early stage to understand, accept or reject the system, physician’s use of the telemedicine system determines the services they are presumed to get. At the end of the telemedicine workshop held on December 22, 2011, the coordinator of e-health unit at the Health Science College, Ababa University made the following remark:-

“Telemedicine system calls for health professional’s mindset change. In its current state the system can easily be used, at least, to deliver information, say for chronic care patients who regularly travel long distance from regions to Black Lion Hospital for follow up visits”.

PRACTICAL CONTRIBUTION

The finding of the study is of practical relevance for Africa and other low income countries. Firstly, the study denoted practical applicability of Telemedicine and a keen interest of users in the study area. Secondly, other African countries aspiring to introduce telemedicine in the health care system, may gain insights from challenges and success of Telemedicine projects at the Black Lion Hospital.

THEORETICAL CONTRIBUTION

In this study stakeholder’s theory has been used for analysis and description as well as for explaining the phenomena under study (Gregor, 2006; Zhan, Lin, and Wang, 2011). This theory proved to be helpful to describe and analyze divergent interests among stakeholder groups and their effects on telemedicine system use. One central purpose of stakeholder theory has been to enable managers to understand stakeholder’s and strategically manage potential conflicts stemming from divergent interests (Frooman, 1999; Zhan, Lin, and Wang, 2011).

CONCLUSION

This study revealed the roles and influence of stakeholders on the initiation and use of Telemedicine systems. The study revealed that the initiators of the Ethio-Indian telemedicine systems want the system to be used optimally as this is a pilot project to be scaled out to other African countries. The current underutilization of the system tends to dissatisfy them. On the other hand, faculty members and students of the medical school expect high level services from the telemedicine but they are not satisfied with the content and operational modalities. Therefore, this observed mismatch between the varying interests is found to be one of the reasons for the underutilization of the telemedicine system at the Ethio-Indian telemedicine center.

Although the JHU-TSHAI telemedicine system targets HIV/AIDS, during the study we learnt that unlike the Ethio-Indian, the telemedicine infrastructure in this center hasn’t remained totally idle. The telemedicine system is currently active as live tele-consultations and case discussions are being conducted, at least every two weeks. The medical school can use the infrastructure to connect to other institutions from around the world.

By and large, the management of the Health Science College, clinical departments, and project sponsors seem to have compatible missions as all want the telemedicine systems to be used as intended. A coordination mechanism for balancing the interests of various stakeholders needs to be worked out. For instance, tailored courses and prior agreed up on and selected cases may be presented for live tele-consultations to satisfy the interests of the faculty and the student body at Black Lion Hospital. During the study some respondents have suggested that the Live Tele-education needs to focus on skill transfer, as key medical skills acquisition problems are widely observed. Furthermore, clinical departments need to integrate
telemedicine to their educational system. In its current state, telemedicine system use is not considered to be mandatory for students as they are not evaluated for the content delivered and cases discussed through telemedicine. Table 1 summarizes the challenges and opportunities of telemedicine systems.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Success</th>
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<tbody>
<tr>
<td>Resolving collusions of varying interests</td>
<td>Good Acceptance of the technology</td>
</tr>
<tr>
<td>Absence of coordination mechanisms</td>
<td>Technical implementation success</td>
</tr>
<tr>
<td>Network connectivity problems</td>
<td>Resolving connectivity problems over time</td>
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<tr>
<td>Content problems</td>
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<td>Medical consultations case selection problems</td>
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<td>Tele consultation expertise assignment problems</td>
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Table 1. Challenge and success of Telemedicine system

Most of the challenges listed in Table 1 relate to Ethio-Indian telemedicine system. The management of the Health Science College needs to intervene, manage, and balance the concerns of interest groups.

REFERENCES


APPENDIX 1:- SAMPLE INTERVIEW QUESTIONS
1. How the various telemedicine projects are started or introduced at Black Lion Teaching Hospital?
2. Who initiated them?
3. What was/were the objectives?
4. How these systems currently operate?
5. What problems have been encountered in the course of operating the systems?
6. What hardware, software, operating procedures, and support services are available?
7. What is the reaction of end users to the use of Telemedicine systems?