SCOPE AND CHALLENGES OF TELEMEDICINE IN NEPAL: *A LOOK TOWARDS FUTURE*

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[A Case Study at OM Hospital & Research Centre, Kathmandu, Nepal]

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ABSTRACT

Telemedicine is not a new technology today, but it is a novel approach for many developing countries, and in fact, it may have more profound impact on these countries than developed nations due to unmet demands for health and unprecedented health related challenges. In the health context of Nepal, telemedicine is rising and currently being implemented, though on a pilot scale – most of them by private health institutions. The main purpose of this study is to explore the practicability of telemedicine application in Nepal, with particular reference to challenges and scope regarding its implementation and use.

In this study, a qualitative research method was used. As such, interpretive research approach was employed in order to explain the phenomenon of interest. Multiple data collection tools were used to investigate and find possible explanations to the research questions considered. The empirical data gathered from the study were analyzed using the theories of Information Infrastructures (II) and Actor-Network Theory (ANT) from the information systems field. The notion of II is used to establish telemedicine as an infrastructural tool while ANT is used to describe the interaction and negotiation processes among diverse actors identified during the study.

From the empirical findings, issues related to funding, sustainability, technical acquisition, low resources and underdeveloped infrastructures were found to be major challenges to ICT growth. Important findings related ICT infrastructure and its sustainable development are discuses and implications are given with particular reference to telemedicine. Finally, it is concluded that funding and sustainability are the core issues, including other sociological and political issues, for telemedicine development in the context of Nepal, and hence calls for more research in this area.

Key words: *Actor-Network Theory, Challenges, Developing Countries, ICT, Information Infrastructures, Nepal, Sustainability, Telemedicine*

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LIST OF ABBREVIATIONS

ANT	Actor-Network Theory
CT	Computed Tomography
EHTEL	European Health Telematics Association
EPR	Electronic Patient Record
HIS	Hospital Information System
HDI	Human Development Index
HIS	Hospital Information System
HPI	Human Poverty Index
II	Information Infrastructure
IATV	Interactive Television
ICT	Information and Communication Technology
IS	Information Systems
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunications Union
MoH	Ministry of Health, Nepal
MRI	Magnetic Resonance Imaging
NHP	Nepal Health Policy
NPC	Nepal Planning Commission
NST	Norwegian Centre for Telemedicine
NTA	Nepal Telecommunication Authority
OMHRC	OM Hospital & Research Centre
RCT	Randomised Controlled Trial
TSC	Telemedicine Specialty Centre
UPS	Uninterruptible Power Supply (Source)
VDC	Village Development Committee
WHO	World Health Organization

‘SECTION-1’

“INTRODUCTION”

[This section provides a basic introduction to the subject matter. It gives an insight into research problems regarding telemedicine and its use, as well as major setbacks to technological development in Nepal. It also focuses on why telemedicine might be an important approach to deliver health service. Further, this section gives an account of the research objectives and research questions guiding this thesis to investigate and find possible answers to the questions under considerations. It also provides a brief introduction to the study context and methodology, which gives information about where the case study was conducted and the type of research method used. Also included in this section are the expected contribution of the study and the motive for undertaking thesis, which is then followed by the thesis’s outline and structure.]

1. INTRODUCTION

The need for new ways to providing more efficient health care services, coupled with major advancements in information and communications technology (ICT) have resulted in the increased use of the ICT applications over the past decade (WHO, 2009). Integrating the use of ICTs into existing health systems has helped to improve the delivery of health care in a number of ways. These include the use of telemedicine to improve diagnosis and enhance patient care, improvements in the continuing professional development of health workers and better sharing of research findings, and efforts to extend the reach and coverage of healthcare to make an impact on specific conditions (*ibid.*).

In any country, its economical condition has a direct impact on the implementation of new technologies, which in turn are affected by the geography, transportation and communication systems, people and socio-cultural factors, and political drive of that country. In addition, the technological development depends upon pre-existing or old infrastructures (*installed bases*) into which new infrastructures are designed and developed. Information Technology (IT) has emerged as a new technology in Nepal and has been mostly used in banking and finance, administration, education, communication and aviation but has equal advantages on other fields and health is no exceptional (Pradhan, 2002). With flow of IT in health field, and emerging technologies, comes telemedicine. Telemedicine is a rising and new technology in the health context of Nepal. At present, very few health organizations have implemented telemedicine and many others are on the verge of deploying this technology, though in a pilot scale. While some are limited to urban centers, others are targeting rural and remote areas of the country.

Telemedicine is a new way of delivering healthcare allowing a change from a centralized service to one which is patient-centered, resource efficient and where decisions are made at a local level close to the patient, which is brought about by use of ICT applications to medicine (NST, 2009a). Telemedicine, in particular, can be useful technology to deliver health care to remote and rural areas when backed-up by ICT infrastructure. It will allow integration of technology and information sharing, enhances accessibility to health service to people and to health providers, increases efficiency of treatment, lowers health related costs, and improves patient care (WHO, 2009). Caring patient at a distant, to needy people

in the sense, is utmost important to level the unbalanced health system. Telemedicine could prove vital in delivering care even in urban centers and to nearby vicinities, especially in emergencies. This is possible only if technology reinforces with the existing health systems, and this is why telemedicine becomes more important. Since telemedicine uses information and communication technologies to deliver health care, it cannot be overseen without the development of ICT infrastructure. Both the information and communication technologies share in common – information sharing, and they can be used as installed bases to develop ICT infrastructure such as telemedicine. As such, the growth and development of telemedicine is possible only when ICT infrastructure is well developed.

Development of information and telecommunication technologies, and their expansion and proper mobilization are vital for the overall development of the country. Despite the increasing role and importance of ICT in health, developing such infrastructures in Nepal is challenging. Some of the major problems that Nepal faces as hindrance to technological development are remote and inaccessible geographic terrain of the country, non-uniformity (and inequality) in the construction of infrastructure over all the regions of the country, lack of skilled human resources capable of using and applying newer technology, lack of timely supply of required human resources to particularly underserved areas, lack of motivation in the available human resources (lack of training, etc.), and, disturbances and damages in developmental works due to the political conflicts (Pradhan, 2002). There is huge gap between city and the remote areas in terms of health, education, and other basic needs. In addition, Nepal lacks effective monitoring and evaluation system, policy reformation, plan formulation and their implementation (*ibid.*).

Developing a ICT infrastructure is thus more challenging in rural and remote communities, but at the same time is necessary – to bridge these gaps; to manage and improve the existing technologies, to support people and organizations, and to build necessary foundation for future developments. Therefore, Nepal needs to build a strong ICT infrastructure to develop its health system and it is a very necessary tool to achieve overall health policy goals. All these factors can be implicated as obstacles to the development and diffusion of ICT applications such as telemedicine in the country.

1.1 Research Objectives and Research Questions

The overall objective of the thesis is to explore the practicability of telemedicine application in Nepal, with particular reference to challenges and scope regarding its implementation and use. It will also try to focus on various aspects that may be influential in developing such infrastructure, and sustainable development thereof. This thesis is therefore based on the following research questions:

- Why is it necessary for Nepal to adopt telemedicine technology?
- What are the challenges to its implementation and how are they being addressed?
- What are the influencing factors for the sustainability of telemedicine program?
- How can a telemedicine program be made sustainable in the context of Nepal?

1.2 Study Context and Methodology

The case study was carried out at OM Hospital & Research Centre (OMHRC), Kathmandu, Nepal. The aim of this study is to explore the possibilities of telemedicine in Nepal and to understand what it takes to implement a new technology like telemedicine and its role in existing system or processes. In order to understand the contextual nature of telemedicine technology and how it is being practiced in the given setting, it is necessary to adopt an appropriate research methodology. Since this study tries to investigate the role of technology in social perspectives, a qualitative research method has been chosen. It is because qualitative tradition has long been considered a well established research method which provides deep understandings of the phenomena under study (Klien and Myers, 1999). In other words, it provides deep insights about socio-technical interaction in a social and cultural setting in an organization. Therefore, this study makes use of qualitative research design and undertakes case study and interpretive research approach, and multiple data collection tools, to get possible answers and explanation of the research questions that have been aforementioned above.

[More detailed presentation of this issue is given in section-3 of this thesis.]

1.3 Motivation for Thesis

My background as a health professional (Pharmacist) and exposure to the course Master's Degree in Telemedicine and E-health' at the University of Tromsø have influenced me to pursue the thesis in my home country – Nepal. Moreover, it is an encouragement from my supervisor who guided me throughout the course and motivated me to do thesis in Nepal. Also, telemedicine is a very new concept in Nepal and very few health organizations are using telemedicine, though in a small scale, to deliver health service to people. Accordingly, I find it obsession to know more about this technology and how it is being used in developing countries like Nepal.

1.4 Expected Contribution

This thesis is a reflection to the current scenario of how ICT is being incorporated in health sector in Nepal and thus describes telemedicine application as promoter for better health in the context sought. Nevertheless, the study does not show how telemedicine is better, but it implicates that, through its use, a better and coordinated health service can be delivered to most communities and population, still not met by current health demands and services. Thus, this study is more general in nature as it tries to grasp the opportunities and challenges of telemedicine in the country by taking into an account of a case study. Given this fact, the study may well contribute to build new conception and knowledge, and may be equally important to all other organizations involved in telemedicine projects in the country.

The study may contribute to the stakeholders in general – at the organizational and governmental level – to define telemedicine at their level of interests and supplement favorable environment for its development and deployment as well as its sustainability. It may also contribute to realization of the potential of technology in changing human behavior and knowledge which will eventually becomes a reward for the society and to the people – for instance – telemedicine would be the highest priority to deliver healthcare in rural population due to its remoteness and unavailability of human and other resources. Moreover, it may enable the researchers to carry out further detailed study on the subject matter and for students to carryout similar task related to this study.

1.5 Thesis's Structure and Outline

The thesis is structured into eight sections, including the bibliography and appendix. The sections and its outline are presented in a sequential manner. Detailed descriptions and explanations are provided in their respective sections as depicted here.

Section 1 is the introduction to the thesis matter. This section gives an insight into research problems regarding telemedicine and its use, as well as major hindrances to technological development in Nepal. It is followed by research objectives and research questions guiding this thesis, and also provides a brief introduction to the study context and methodology, which gives information about where the case study was conducted and the type of research method used. It then provides an account on expected contribution of the study. This section also includes the motive for undertaking thesis. It is then followed by the structure of the thesis outlining the contents within it.

Section 2 is the theory part in which this thesis is built upon. It gives a brief account on concepts and definition of telemedicine and its types and applications. Furthermore, this section focuses on importance of telemedicine in developing countries, and some major issues which are of high significant in these countries during telemedicine use and implementation. It is then followed by two theories in information systems, namely, Information Infrastructures (II) and Actor Network Theory (ANT). They are used to describe the telemedicine as infrastructure for better health service in Nepal and various human and non-human components to reflect the relationship between them and their alignment for building such infrastructure.

Section 3 deals with research methodology, which will reflect on the purpose of the research and gives an account of the research design and research approach followed throughout the study. It will also give an account of the methods used in data collection, strategy and tools, followed by reflections on method which will provide an insight of my role during the study period and thesis writing.

Section 4 provides details of the case study and thus deals with context of study and research setting. It starts with the brief introduction of the country – Nepal, including the population health status and an account of provision of health services in the country. It is followed by description of research setting where the case study was carried out. This will provide an insight into the telemedicine center as well as its objective. Later in this section are the findings from the research giving empirical evidences gathered from the case study.

Section 5 aims to discuss various issues related to implementation and use of telemedicine, and therefore focuses on sustainability issues and roles of diverse actors for developing telemedicine infrastructure.

Section 6 is the concluding section that provides recommendations and conclusion thereafter drawn from the issues discussed in earlier section.

Section 7 follows references of list of literatures and websites used for writing the thesis.

Section 8 provides list of appendices.

‘SECTION-2’

“THEORY”

[This section gives a brief account on concepts and definition of telemedicine and its types and applications. Furthermore, this section focuses on importance of telemedicine in developing countries, and some major issues which are of high significant in these countries during telemedicine implementation and use. It is then followed by two theories in information systems, namely, Information Infrastructures (II) and Actor Network Theory (ANT). They are used to describe the telemedicine as an infrastructural tool for delivering better health service in Nepal and to reflect the socio-technical relationship among diverse actors and their alignment for building such infrastructure.]

2. THEORY

This section aims to highlight on the concept and definitions of telemedicine, and provides an account of telemedicine in developing countries, with particular reference to Nepal. This will be followed by two theories in information systems: Information Infrastructures (II) and Actor-Network Theory (ANT). They are related in one way or other in the sense that both the theories highlight socio-technological approach and heterogeneity in common. In addition, ANT takes into account diverse group of actors that influence the socio-technological integrity of information infrastructures through negotiation processes.

2.1 Telemedicine – Concepts and Definitions

The word 'Telemedicine' has often been used interchangeably with other terms such as 'telehealth', 'telecare' and sometimes 'e-health' (Norris, 2002). It has also been synonymously used with the terms like 'Health Telematics', 'Medical Informatics', or simply 'ICT in Health' (NST, 2009b). Telemedicine, in fact, differ from the above terms in terms of specificity and range it covers and the use of information and functioning. For instance, telehealth includes telemedicine and refers to administrative work as well. On the other hand, telecare refers to the use of telemedicine to take care of patients at their homes. The most influencing term today is e-health; it's an emerging concept that is evolving rapidly with the increasing use of internet and encompasses all the above terms (Yellowlees, 2003).

Telemedicine did not arise as a separate and well-defined discipline with specialized instrumentation, standards and protocols (Norris, 2002), rather it developed as continuous efforts of people (clinicians) trying to use technologies into medical practice, and as information and communication technologies advanced to new heights. Telemedicine has pioneered the use of communication technologies within healthcare, and has been principally available for decades (EHTEL, 2008). Often termed as '*distant medicine*', telemedicine initially developed to provide health service to remote and rural or underserved communities in primary and secondary care, and in emergency conditions and locations such as in military services and natural disasters (Norris, 2002). It has come a long

way from telegraphy and telephony to radio and television to digital technologies, and is still in continuous process of development. It involves use of telecommunications such as a simple telephone line or a mobile phones and PDAs (personal digital assistants), fax, internet, email, web or a combination of these and dedicated computerized devices, hardware and software applications, for instances, videoconferencing, electronic patient records (EPRs), robotics, etc.

Most telemedicine applications used today make use of two different types of technology, namely, Store and Forward Technology and Two-Way Interactive Television (IATV) Technology (Brown, 2005; Norris, 2002). The store and forward technology is used for transferring digital images from one location to another for diagnosis or consultation. Teleradiology, telepathology and teledermatology are the most common telemedical applications using store and forward technology, where they are used for sending of x-rays, Computed Tomography (CT) scans, or Magnetic Resonance Imaging (MRI) images, images of pathology slides, and images of skin conditions respectively. This type of technology is mostly suitable for non-emergent situations (Brown, 2005). The IATV technology is used when a 'real-time' or 'face-to-face' consultation is necessary. Telemedicine consultation is then carried out between the two parties through videoconferencing. The patient and their provider (usually a doctor or a nurse) or telemedicine coordinator (or any combination of the three), are at the originating site (the client station) while the specialist is at the referral site, most often at an urban medical center. Almost all specialties of medicine have been found to be conducive to this kind of consultation, including psychiatry, internal medicine, rehabilitation, cardiology, pediatrics, obstetrics and gynecology and neurology (*ibid.*).

> "*Telemedicine has reached around the world, and now health professionals can communicate faster, more widely, and more directly with clients and colleagues, no matter where they are*," – Edworthy S.M. (2001).

Telemedicine has been defined in many ways and there is no any universally accepted definition of telemedicine. To put it simple, telemedicine is basically '*care at a distance*.' Most definitions of telemedicine intersect at some point or other. For instance, these definitions do have elements of distance, isolation, ICT, and information exchange.

Some **definitions** of telemedicine are presented here:

Definition 1: According to Norris (2002),

> *"Telemedicine is the use of information and communication technologies to transfer medical information for the delivery of clinical and educational services."*

Definition 2: The World Health Organization (WHO, 2009) has defined telemedicine as,

> "*the delivery of health care services, where distance is a critical factor, by health care professionals using ICTs for the exchange of vital information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interest of advancing the health of individuals and their communities."*

Definition 3: The Norwegian Center for Integrated Care and Telemedicine (NST) has been using the following definition:

> "*Telemedicine is the investigation, monitoring and management of patients and the education of patients and staff using systems which allow ready access to expert advice and patient information no matter where the patient or relevant information is located,*" – (NST, 2009b).

Definition 4: European Health Telematics Association (EHTEL) describes telemedicine as:

> *"Services that provide means to improve accessibility to high quality care in case of shortage of appropriate health professionals or the necessary medical expertise or skills at the site of the patient,"* – (EHTEL, 2008).

Nonetheless, whatever the definitions are and the terms used, the core theme is essentially, more or less, the same – healthcare delivery using ICT tools irrespective of location. But the essentials of telemedicine applications may differ among regions and countries, owing to different socio-economic and socio-cultural perspectives where telemedicine will be taking its roots, as explained in the following section (2.2).

2.2 Telemedicine in Developing Countries

> *"Today, depending on one's location and socio-economic status, the amount and quality of health care available ranges from non-existent to intensive and close monitored…*" – (Cetingaya, 2009).

Health care is one of the determining factors when categorizing different countries on development scale (Cetingaya, 2009). The degree to which health care is delivered and its scope varies among different regions of the world. For instance, the quality and reach of health care varies greatly from one country to another, and this depends upon the availability of health professionals, education system, infrastructure capabilities and finally available government funding (*ibid.*).

Information and communication technologies have tremendous potential for improving healthcare. Telemedicine holds a unique promise to help isolated or scattered populations gain access to health services. It has proven to be a valuable tool for enabling access to knowledge and allowing information exchange, and has shown to deliver quality health care to isolated communities (Martinez *et al.*, 2003). For any country, establishing reliable communications is one of the most important priorities for improving health care because it not only provides effective communication medium among health professionals, it also provides updated information which is very essential in modern healthcare systems (Edworthy, 2001).

With the technological integration in the health, such as the ICT, the perspectives of health is quite different in developed and developing nations. While developed countries are well equipped with technological infrastructures and have enjoyed the benefits of technological advancement in health, many developing nations are on the verge of ripping health benefits by incorporating technology to deliver better health service to their population (Cetingaya, 2009). In the developed world, telemedicine has gained tremendous success in delivering health technologies and promotes health and well-being, and with the ever decreasing cost of technology, it has potential for developing countries as well (*ibid.*). Several studies have shown that the proportion of telemedicine is increasing in these countries and may, in fact, have more profound effect than in developed ones (Edworthy, 2001).

Developing countries face numerous challenges regarding health sector development. Most notable challenges are due to acute shortage of doctors (both general practitioners and specialists) and other health professionals such as nurses, pharmacists, public health workers, and other health-related human resources, including availability of health providers and their services. Geography and infrastructure related challenges such as transportation and telecommunication services, and water and electricity, are also well documented requirement for technological growth. All these are then related to socioeconomic status of the country such as economical growth, political stability, and socio-cultural settings (Pradhan, 2002). Moreover, implementing technology into practice is related to issues of affordability, cost effectiveness, and sustainability (*ibid.*). These need to be addressed more vividly because it is culture specific and depends to a very large extent on the social context within which the technology is going to play a part.

The role of ICT in health is indispensable and cannot be ignored. Telemedicine can provide developing countries with ample opportunities to improve their quality of health care, with particularly more importance for delivering healthcare to remote areas (Martinez *et al.*, 2003). Rural and remote communities are often isolated from basic development structures such as transportation and access to health services. Doctors are usually absent or in very less supply in these areas, and therefore these communities have little or no chance to see a doctor (*ibid.*). In these circumstances, telemedicine provides unique opportunity to link health professionals irrespective of where they are (Edworthy, 2001). Thus, it enables specialist support to isolated communities, increases ability and confidence among doctors and health workers working there, and also allow continuing medical education for health workers in remote locations and promotes networking both nationally as well as internationally. In this sense, telemedicine may in fact have a more profound impact on developing countries than on developed ones (*ibid.*), owing to health challenges faced by developing countries. Therefore, its potential is particularly significant in countries where doctors/specialists are few, and where distances and the quality of the infrastructure hinder the movement of physicians or patients.

Developing countries have less access to technology and this is a key factor for their inability to take advantage of advances in information and communication technology in health sector (Cetingaya, 2009). Also, access to the components of the infrastructure varies

hugely between regions and geographic areas, resulting in inequities and uneven development of the infrastructure (Braa *et al*., 2007). This is even true for remote communities where basic infrastructures are already inadequate, for instance – access to telephone lines, reach to computers, etc. Cost is one of the major determining factors. Most developing countries spend less on health care as they cannot afford the cost of technologies themselves owing to low economic status and prioritization to other development goals as well (*ibid.*). Thus, technological growth is limited. Most technological programs in developing countries have been in the form of pilot projects with subsidized funding from the government or external funding (Pradhan, 2002). The evidence of the cost-effectiveness and sustainability is very less when comparing the number of commercially running telemedicine programs in these countries. According to Pradhan (2004), failure to sustainable development is also due to the temptation to introduce western technology into health systems that are naive with respect to local settings. He also points out that without considering the sustainability aspect, telemedicine could have a negative impact on the continuity of the system. Therefore, it is necessary, on the first hand, to understand the technological and cultural readiness of the context. Nonetheless, with the rapidly declining cost in hardware, software and telecommunications, the level of interest and the corresponding activity in telemedicine is rising rapidly (Wright, 1998). These, in turn, will always be implicated to sustainability and future growth. It is because technology that fits exactly on one culture may be quite irrelevant on other communities (Pradhan, 2002). Thus, it has to be adjusted locally to meet the existing demands instead of just putting it into practice.

2.3 Information Infrastructures (II)

The term "information infrastructure" (II) has been increasingly used to refer to integrated solutions based on the now ongoing fusion of information and communication technologies (Hanseth and Monteiro, 1998). It involves the communications networks and associated software that support interaction among people and organizations, and thus, brings together information processing applications, communications networks and services, physical and software elements in networks, and end systems, and all these different elements are integrated through standardized interfaces (*ibid.*).

> "*Information infrastructure covers all kinds of technologies, all kinds of use and use areas…and involves lots of political, social, organization, human aspects and issues – all these issues interact, they are interdependent and intertwined*," – (Hanseth and Monteiro, 1998).

An information infrastructure can be described as an information system except that it is shared by a large user community across large geographical areas such that it might more appropriately be seen as an infrastructure than as a system (*ibid.*). Information systems are used to solve specific problems and work tasks, often with a special function or purpose in mind (Coiera, 2003). Traditional approaches to information systems development are implicitly based on assumptions where the information systems are closed, stand-alone systems used within closed organizational limits, and usually a top down approach (Hanseth and Monteiro, 1998). But, information infrastructure is tricky thing to analyze. It is open, complex and follows a bottom up approach. Information infrastructures are never transparent to everyone and their work-ability becomes increasingly complex as they scale up (Bowker and Star, 1999). The integration of the information infrastructure grows as the number of systems grows (Hanseth, 2004). The interests of the connections between different systems are the fundamental basis of information infrastructures. Since, information infrastructures refer to the ongoing fusion between information systems and communication technologies; they are more opened compared to the traditional way of looking at information systems which were defined as being isolated, local and unique (*ibid.*).

Information infrastructures can be seen as steps in the development of information and infrastructure technologies (Hanseth, 2004). An infrastructure has no limitation and will contribute to better collaboration between different parts or systems within their same network. It includes human beings as well as machines (Hanseth and Monteiro, 1998).

2.3.1 Aspects of Information Infrastructures

Information infrastructures share a number of aspects with other kinds of infrastructures such as telecommunication networks, railways and road networks, electricity supply, water supply, etc. According to Hanseth and Monteiro (1998), information infrastructure includes several key aspects. These aspects are: *enabling, shared, open, socio-technical, heterogeneous and installed base.*

Infrastructure has an ***enabling function***, that is, it is designed to support a wide range of activities that already exist and also providing basis for opening up a field of new activities. For instance, the convergence of ICT has opened up for a vast array of new uses of technologies. The "informatization" of telecommunication has opened up for lots of new enhanced telecommunication services, and similarly, the "telecommunicatization" of information systems has opened up for an equally large range of new information systems supporting information sharing and integrating processes at a global level (Hanseth and Monteiro, 1998). The range of new solutions that seems useful and that may be developed and installed may be equally large as the number of traditional information systems developed.

An infrastructure is ***shared*** by the members of a community as a shared resource or a foundation, and yet, it is irreducible. It is irreducible in the sense that all the users use the same infrastructure (although in a different way) and it cannot be split into separate parts being used by different groups independently (Hanseth and Monteiro, 1998). However, it may be decomposed into separate units for analytical or design purposes, and still, their parts are linked and they are defined as shared standards. This means that the technology and services developed are serving as a shared infrastructure, for instance, e-health can be viewed as a shared resource owing to information exchange, communication and

technological support in the health sector. In fact, an infrastructure can also be shared globally (*ibid.*), such as, the internet and associated applications such as telemedicine.

Infrastructures are characterized by ***openness*** referring to lack of borders. There are no limits for number of users, stakeholders, vendors involved, nodes in the network and other technological components, applications areas or network operators in information infrastructures (Hanseth and Monteiro, 1998). Its development has no beginning or ending, it's an ongoing process (Hanseth, 2004). One cannot draw a borderline within an infrastructure because it can always incorporate or integrate new 'things' as they happen and make new connections. An existing infrastructure is always linked to another system or infrastructure; therefore it is not limited to a particular group of people, technology or organizations. In other words, openness implies heterogeneity – an infrastructure grows by adding new layers or sub-infrastructures and over time, they all are linked together making infrastructures heterogeneous as being composed of different kinds of components (*ibid.*). Also, infrastructures are open in the sense that they are dynamic and changing. So infrastructures also need to be flexible to some degree to gain stability over time.

An infrastructure is more than the individual components (Hanseth and Monteiro, 1998). Infrastructures are ***socio-technical networks***. Technology in itself is useless and cannot work unless it is supported by people who are going to use it. Stable networks and hence infrastructure is due to both human and non-human components. That is why an infrastructure should not be viewed as being 'pure' technological; rather the development of an information infrastructure should be viewed as ongoing socio-technical negotiation (*ibid.*). These issues of socio-technical phenomenon will be dealt more on the ANT section below.

Infrastructure is also ***heterogeneous*** along many different dimensions, has technological as well as non-technological components, standards and functionality. It is also heterogeneous in the sense that the seemingly same function might be implemented in several different ways (Hanseth and Monteiro, 1998). Heterogeneity is also due to socio-technical network of technological components, humans, institutions and organizations that are one way or other connected and interrelated forming ecologies of network. In other words, they are layered

upon each other (Hanseth, 2004), each layer being composed of different kinds of components.

Infrastructure is developed through the cultivation of the ***installed base***. It entails that it is never developed from scratch; rather it is considered as always already existing and continuously evolving (Hanseth and Monteiro, 1998). Infrastructure develops through extending and improving the old or existing base, developing over a long period of time, and thus influences how the new infrastructures are designed and developed. In other words, these installed bases can be considered as the backbone of any infrastructures, where new ideas, technical components and other infrastructures are integrated or partly replaced to build a new one. It is like developing and adapting ideas from ideas, therefore infrastructures are always evolving. However, it takes time to change, to implement new ideas (and technologies) and to develop as a new infrastructure. This implies that when designing a 'new' infrastructure, it will always be integrated into and thereby extending others or it will replace one part of another infrastructure. Therefore, infrastructures evolve as the "cultivation" of a shared, open, socio-technical, heterogeneous installed base.

2.4 Actor-Network Theory (ANT)

ANT, pioneered by Michel Callon and Bruno Latour, was initially developed and applied to the sociological science (Walsham, 1997). It is concerned with social and technical elements and their relationships, and thus can be defined as a sociological theory that is used to create and maintain coextensive networks of human and non-human elements (*ibid.*). ANT is a combination of both a theory and methodology, that is, it provides theoretical concepts to visualize elements in the real world as well as to embrace and trace these elements in empirical work (*ibid.*).

Within extremes of ANT lies technology (IT and computers, etc.) and society (people and organizations). Whilst ANT is the interplay between socio-technical phenomena, there exist two extremes – technological determinism and social reductionism or constructionism. Technological determinism believes that the development of technology follows its own logic and that the technology determines its use. In contrast, social reductionism or

constructionism believes that society and its actors develop the technology it "wants" and use it as they want; implying that technology in itself plays no role. ANT finds itself as an intermediary between these two extremes to explain a more detailed understanding of the relationships between information system and its use, and complex organizational changes (Hanseth and Monteiro, 1998). ANT provides means to recognize the "enabling and constraining" abilities of information systems on the social process of interpretation and judgment, and is more about the heterogeneous nature of actor networks (*ibid.*).

> "*ANT offers a language for describing the many small, concrete technical and non-technical mechanisms which go into the building and use of information infrastructures*," – (Hanseth and Monteiro, 1998)

There are several ways to see objects in actor network theory. When any actor acts, this very actor is always such a network, not a single element (Aanestad and Hanseth, 2000). According to Callon and Law (1995), an actor is always a *hybrid collectif*, that is, it constitutes a collective of humans and non-humans. These human and non-human elements in ANT are collectively known as actors or actants and include people, organizations, and technologies (Walsham, 1997; Aanestad and Hanseth, 2000). Similarly, elements in a network are defined by their relationships to other elements as a network and not only by their internal aspects. An actor network is thus a heterogeneous network of aligned interests, including people, organizations, standards and technological components. These networks are created and maintained to form stable networks having common interests. Braa *et al.* (2007) describes socio-technical networks as:

> *"networks containing elements of various kinds (technologies, humans, institutions, etc.) and which are translated (i.e., modified or reinterpreted) and enrolled into aligned actor-networks."*

As such, an actor network is the act linked together with all of its influencing factors, which again are linked, producing a network. Hence, a network consists of and links together both technical and non-technical elements, and that they are equally influencing (Hanseth and Monteiro, 1998). Technological and social elements are considered to be tied together into

networks, which is based on the assumption that technologies are always defined to work in an environment including non-technological elements (Aanestad and Hanseth, 2000).

> "*Successful networks are created through enrollment of sufficient body of allies, and their translation of their interests such that they participate in particular ways and in common ground of thinking and acting in order to maintaining such networks*."

2.4.1 Concepts from Actor-Network Theory

There are two important concepts from ANT, namely inscription and translation.

Inscription refers to different manuals, descriptions of work routines, training, legal documents, etc. and is also deeply involved in the control over the distance (Law, 1986). It defines the roles to be played by users and the system. Latour (1991) points out that:

> *"Inscriptions include programs of actions for the users, and it delegates roles and competencies to the users as well as the components of the system."*

The notion of inscription refers to the way technical artifacts embody patterns of use and it may be used to describe how concrete anticipations and restrictions of future patterns of use are involved in the development and use of a technology (Hanseth and Monteiro, 1998; Monteiro, 2000). By inscribing programs of actions into a piece of technology, the technology becomes an actor imposing its inscribed program of action on its users (*ibid*.).

Information infrastructure becomes irreversible as it grows due to relations between the actors, organizations and institutions involved. The strength of inscriptions depends on the *irreversibility* of the actor-network they are inscribed into (Hanseth and Monteiro, 1998). ***Irreversibility*** is the difficulty of making changes which appears when aligned network has gained some inertia (Monteiro, 2000). Accordingly, in longer run, infrastructure reaches momentum (Hughes, 1994). ANT also uses a concept of "black box" to explain the state after the network has gained irreversibility and become relatively stable. It is hard to see the

network after it reaches black box state and it becomes visible only when something breaks down in the network and the black box has to be "opened". Latour (1991) suggests that all the actors are contributing to the black box and it changes over the time.

Translation is another important concept in ANT, which is done by an actor with some particular interests with a purpose of making others interested in reaching some particular goals. It is important to make attractive ideas for others, explain it in various acceptable ways, enroll and mobilize different actors with different interests for reaching the same goal (Callon, 1986). Callon (1986) suggests four moments of translation, namely:

"*problematization, interessement, enrolment and mobilisation*"

During *problematization* phase, a focal (central) actor is defined and other actors are identified that have goals and interests consistent with its own, and are established itself as an obligatory passage point. *Interessement* involves the process of convincing other actors to accept the definitions initially provided by the focal actor. *Enrolment* refers to acceptance of the focal actor's interests by the other actors in the network. *Mobilisation* is the final moment of translation which is often done by spokesman who is representing a particular network and its intentions. All these four moments of translation can overlap in the real life situation. Translation can be seen as a process of aligning interests, negotiating the social order and providing stability to the network (*ibid.*).

‘SECTION-3’

“METHODS”

[The methodology section deals with the research method and approach used in the study, including data collection methods and reflections thereof. First, a highlight to the purpose of the research is given, followed by a brief comparison of two widely used research tradition: Quantitative and Qualitative. It then provides an account on the research design and research approach followed throughout the study. Subsequently, in this section, details of the methods used in data collection are provided. It is then followed by reflections on method which will also provide an insight and justification of my role during the study period and thesis writing. Finally, a note on ethical consideration and limitations of the study are presented here.]

3. METHODS

This section provides methodological approach to case study. It aims to deliver some insight into quantitative and qualitative research tradition, followed by the research design and approach used during the case study. It also reflects on methods of data collection used throughout the study, and provides an account on reflections on methods to describe various aspects of data collection and analysis (interpretation) thereof.

3.1 Purpose of the Research

The main purpose of the research is to carry out a case study to explore the practicability of telemedicine in Nepal, and to present the challenges and scope regarding its implementation and use. Thus, the study aims to answer the following research questions:

- Why is it necessary for Nepal to adopt telemedicine technology?
- What are the challenges to its implementation and how are they being addressed?
- What are the influencing factors for the sustainability of telemedicine program?
- How can a telemedicine program be made sustainable in the context of Nepal?

3.2 Quantitative and Qualitative Research Paradigms

Research has been classically defined as, –

> "*Systematic and objective analysis and recording of controlled observations that may lead to the development of generalizations, principles, or theories, resulting in prediction and possibly ultimate control of events,"* – (Best and Kahn, 1998)

Thus, research is not only a job or a task; it is a process having a specific type of outcome.

In its real sense, a research is an orderly investigative process for the purpose of creating new knowledge (Swanson, 2009), and not just a problem-solving method.

In information systems (IS) research, research can be broadly classified into two types: ***Quantitative*** and ***Qualitative*** (Robson, 2002). Each method is a class in itself; they are subsequently discussed and compared thereof in the following paragraphs.

Quantitative research relies on methods based on "*cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories*" (Creswell, 2003). It makes use of mathematical models, statistical measurement of the variables and their analysis of casual relationship. It is pre-structured and often starts with a well-defined hypothesis, i.e. the phenomena of interest are typically quantified and that such designs are theory driven (Robson, 2002). For these reasons, quantitative methods are also called fixed design approach (*ibid*.). Based on the findings, the hypothetical parameter is either falsified or verified (Orlikowski and Baroudi, 1991).

As put forward by Orlikowski and Baroudi, (1991):

> *"Quantitative methods follows positivist approach, the studies are grounded on a pre-specified fixed relationship, to serve primarily to test theory, within the phenomena which are studied with structured instrumentation."*

Thus, quantitative methods are fixed designs that rely on quantitative data and statistical generalization and the design of the study is preset before the main stage of data collection takes place. Within this conceptual framework, it is required that the variables are specified and that exact procedures are followed through a reasonably well articulated theory of the phenomenon which is being researched (Robson, 2002). The purpose of quantitative research methods is to explain, predict, or control phenomena through focused collection of numerical data, therefore it is deductive, value-free, focused and outcome oriented (Howard and Borland, 1999). Therefore, quantitative research methods are most suitable for establishing size, extent or duration of certain phenomena or to establish that a specific cause or intervention results in a pre-specified effect. A range of different measurement techniques such as questionnaires, time studies or tracking of outcomes, and a broad range

of more or less rigorous designs such a randomized controlled trials (RCT), meta-analysis, cohort, case control and observational studies are available to establish a casual relationship (Stoop and Berg, 2003). The method is decided at an early stage, so is usually fixed in the type and numbers of methods to be used (Robson, 2002). The data so gathered are then forced to undergo numeric conversion to fit into the statistics (Howard and Borland, 1990).

A key feature of quantitative research is that it allows the researcher to generalize his findings to a more wide level (Robson, 2002). In other words, the advantages of fixed designs lie in their ability to excel individual differences and identify patterns and processes which can be linked to social structures and group or organizational features. However, the relative weakness of quantitative method is that "*they cannot capture the subtleties and complexities of individual human behavior*," (*ibid.*) In addition, there are only a limited number of factors that can be studied under closed conditions and applying values to variables often leads to the elimination of factors that are difficult to value because real world scenarios are much more complex and messy involving variations in human behavior and organizational patterns (Galliers and Land, 1987). Thus it is difficult to reproduce a "real world" environment in these circumstances.

On the other hand, qualitative research relies on methods based on "*multiple meanings of individual experiences, meanings socially and historically constructed, and with the intent of developing a theory or pattern*" (Creswell, 2003). It views reality as socially constructed phenomena that provide detailed insight into the concepts and premises, what people think and do and their underlying principles, and what they are often unaware of (Forsythe, 1999; Robson, 2002). It does not predefine dependent and independent variables, but focuses on the complexity of human sense making as the situation emerges through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts (Klien and Myers, 1999). Qualitative research methods are optimally suited to understand a phenomenon 'from the points of view of the participants and its particular social and institutional context,' and makes use of methods such as interviews, observations and document analysis involving case studies, ethnographies and grounded theory studies to explain the what, why and how of a social phenomenon (Stoop and Berg, 2003). Though it is also required to initially decide what type of data collection method will be used in qualitative research, the nature and the number of methods to be employed can change as

data collection continues. Hence, qualitative research designs are also known as flexible designs since there is much less pre-specification and the design *evolves, develops and 'unfolds'* as the research proceeds (Robson, 2002). That is why flexible research designs are much more difficult to pin down than fixed designs. It is also flexible in the sense that such design can make use of methods which results in data in the form of numbers as well as in the form of words.

Qualitative research is limited in terms of inferential power (generalizability), i.e. the conclusions derived from one study may not be generalized to other study (Borland, 2001). However, he also argues that when conducted with appropriate level of structures and a balance of objectivity and subjectivity to increase certainty, it provides theories, models, and descriptions of human experiences and perceptions within the particular contexts (*ibid.*). With respect to generalizations, Walsham (1995) states that there are four types of generalizations from interpretive research. They are:

> *"the development of concepts, the generation of theory, the drawing of specific implications, and the contribution of rich insight."*

Therefore, it should be carried out in such a way as to provide rich-thick description.

While quantitative and qualitative strategies are the two most commonly used approaches for research in information systems, only one research strategy can be chosen at a time unless mixed* approach is desired. A mixed design is another approach of research in which both quantitative and qualitative methods are used, and where both methods complement each other. The process is often termed as *triangulation* (Robson, 2002). Generally in mixed design, initially a qualitative method is used to produce a theory or hypothesis, which is then tested upon using quantitative methods. However, choosing the right research approach is not an easy task, and this requires thorough understandings of the research orientation, the research questions or problems and the use of different methodologies, type of data to be collected and methods of collection, including the purpose and the desired outcomes of the study, as explained below.

[*A ***mixed*** method is a research method that utilizes both quantitative and qualitative research methods and therefore also called "*consequence-oriented, problem-centered, and pluralistic*" design (Creswell, 2003)].

A fundamental distinction between the quantitative and qualitative research is that the former assumes an objective physical and social world that exists independently of humans, and whose nature are less complex to apprehend, characterize, and measure while the latter primarily presumes the value of social constructionism and that the social world are not 'given', and thus emphasizes that reality, and the knowledge that are gained, are

> "*social products and hence cannot be understood independently of the social actors (including the researchers) that construct and make sense of that reality*" (Orlikowski and Baroudi, 1991).

In quantitative design, the study can be controlled to a degree possible as it offers the researcher to solely design or redesign the environment of study. In contrast, a qualitative study explicitly follows a nondeterministic perspective and attempts to explore the phenomena of interests in its natural setting and the researcher has no control over the study environment (Howard and Borland, 1999; Orlikowski and Baroudi, 1991). To put it simple, the quantitative study is performed in a so called closed, artificially created environment (sometimes called laboratory design), whereas interpretive study is carried out in an open, natural or 'real' environment (Robson, 2002). The quantitative method and the outcomes can be replicable and reproducible given that similar setting exists, but such parameters are impossible in interpretive research due to dynamic nature of the real world setting.

A quantitative research calls for a tight pre-specification before the main data collection stage is reached. Therefore, if the design cannot be pre-specified, a quantitative approach cannot be used (Robson, 2002). In addition, the research design is influenced by the type of data. If numbers or quantifiable variables are desired, a quantitative strategy is initiated. On the other hand, if data are to be in the form of words, then qualitative strategy is initiated. The selection of research strategy also depends upon the specific purpose of evaluation such as establishing the worth or value of something (Howard and Borland, 1999). If the focus is on outcomes, usually a quantitative approach is approached and if the focus is on processes, an interpretive approach is applicable (Robson, 2002). Similarly, the types of research study or methods also influence the selection process. If it is an experimental or a non-experimental study, then a quantitative research is called for and if it is a case study, or an ethnography study or a grounded theory study, then a qualitative approach is used (*ibid.*).

Usually, the *research questions* give the direct explanation of the likelihood of a research strategy. For instance, 'what' questions, including 'how many', 'how much', 'who' and 'where', usually go for a non-experimental design like survey. In contrast, 'how' and 'why' questions often indicate qualitative designs because they are more difficult to pin down (Robson, 2002). However, it depends upon the researchers how they handle the research questions and for what purpose or objective they are looking for. Similarly, the methods of investigation or "*tactics of enquiry"* are often linked to particular research strategy. For instance, in quantitative research strategy, surveys using structured questionnaires are used for non-experimental studies, and experiments and observation using dedicated measuring instruments are used for experimental studies. In qualitative research strategy, grounded theory studies are often interview-based, ethnographic studies are entirely based on participant observations, and case studies may involve use of interviews, observations and document analysis. However, these methods of enquiry are not limited to one kind of research methods (*ibid.*).

Another important difference between the two research methods is the sampling plan. Generally, quantitative methods make use of probability sampling and qualitative methods make use of non-probability sampling (Robson, 2002). Principally, in quantitative research, *random* sampling is done so as to ensure that each object has an equal chance of being selected. This also ensures that the sample selected will be representing the whole population under study and hence this design usually results in generalization. Whereas qualitative research usually relies on *purposeful* sampling, i.e. the subjects are intentionally selected, and such study normally results in generation of insights into particular case or process, building a theory or hypothesis (*ibid.*). The other unique feature that characterizes quantitative and qualitative methods is the way the data are interpreted and analyzed. In quantitative research, the raw data are numbers. The analysis of the data makes use of the application of standardized statistical procedures, which is performed at the end of the study after all the data have been safely gathered (Howard and Borland, 1999; Robson, 2002). The interpretation is primarily the results obtained from the data whereby conclusions and generalizations are formulated with predetermined degree of certainty. The quantitative data are usually straightforward; however, they may require conversion to numerical forms before they can be statistically measured. Conversely, in qualitative research, the raw data are words and their analysis is essentially an ongoing process. The analysis of qualitative

data may or may not involve computer software, but the primary interpreter of the data is the researcher. The data are systematically organized based on the findings that researcher finds it worthy. Data are interpreted as part of the process and reviewed on an ongoing basis, thus generalizations are rather tentative or absent (Howard and Borland, 1999). However, unlike quantitative data, qualitative data are not straightforward; they are mostly hidden most of the time which needs careful analysis and interpretation (Robson, 2002).

3.3 Research Design and Approach Used

This thesis is built upon qualitative research method, which I attempted to follow in relation to the case and the research questions, and to describe the phenomenon of interest. In this case study, I have followed interpretive research approach to know more about the possibilities and challenges of telemedicine in Nepal, and to understand what it takes to implement a new technology like telemedicine and its role in existing system or processes, including its sustainable future.

Traditionally, research in information systems (IS) has been considered mostly as a province of technology, and the dominant research methodology was quantitative (Galliers and Land, 1987). The present scenario rules out the traditional approach and view technology as one component of IS. Benbasat *et al.,* (1987) argues that the information systems area is characterized by constant technological change and innovation.

> *"The IS field has also seen a shift from technological to managerial and organizational questions, and consequently more interest in how context and innovations interact,"* – (*ibid.*).

This clearly implicates for extending IS to include human behaviors and organizations, and not only technologies, thus, referring to the need of qualitative strategies, to improve the effectiveness of IS implementations in organizations and to assess that impact on individuals or organizations (Walsham, 1995). It's because the IS research field is broad, and its relation with the organizations and the people represents more complexity, greater imprecision, and different possible interpretations of the same phenomena. Qualitative

methods guide researchers to understand human thought and action in social and organizational contexts and have the potential to produce deep insights into information systems phenomena (*ibid.*). A pragmatic approach for selection of quantitative or qualitative research methods have already been given in earlier section. In this section, I have tried to focus on the reasons behind choosing the qualitative aspects in relation to the design (Case Study) and approach (Interpretive) used. Also, a brief account on evaluation of interpretive work is presented here.

3.3.1 Case Study and Interpretive Research Approach

Robson (2002) describes three main approaches or research traditions in qualitative research, namely - case studies, ethnography and grounded theory. Since, the research design used in this study involves case study, only the important aspects of the same are highlighted here.

Case study is one of the rich qualitative traditions that have long been considered a well established research method which provides deep understandings of the phenomena under study (Klien and Myers, 1999). Benbasat *et al.*, (1987) illustrates several key aspects of a case study as shown below:

1. Phenomenon is examined in a natural setting.
2. Data are collected by multiple means.
3. One or few entities (person, group, or organization) are examined.
4. The complexity of the unit is studied intensively.
5. Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have a receptive attitude towards exploration.
6. No experimental controls or manipulation are involved.
7. The investigator may not specify the set of independent and dependent variables in advance.
8. The results derived depend heavily on the integrative powers of the investigator.
9. Changes in site selection and data collection methods could take place as the investigator develops new hypotheses.
10. Case research is useful in the study of "why" and "how" questions because these deal with operational links to be traced over time rather than with frequency or incidence.
11. The focus is on contemporary events.

Figure 1: Key Aspects of a Case Study (from Benbasat *et al.*, 1987)

Case study is extensively used in social science research and is one of the most widely used qualitative research method in information systems research (Orlikowski and Baroudi, 1991; Yin, 2003), owing to its ability to understand us the interaction between information technology and organizational contexts in a thorough manner. Case study, as defined by Yin (2003), is –

> "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*; *and in which multiple sources of evidence are used."*

As a research design, a case study is a highly flexible research method because it examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities such as people, groups, or organizations (Benbasat *et al.,* 1987). It aims to offer a richness and depth of information by attempting to capture as many variables as possible. The output from case study research, with respect to theory as a final product of the research, may be concepts, a conceptual framework, propositions or mid-range theory (Eisenhardt, 1989; Walsham, 1995).

Qualitative research may or may not be interpretive and this depends upon the underlying philosophical assumption of the researcher (Klein and Myers, 1999). Therefore, a case study can be carried out in either way: with a positivist approach or interpretive approach (*ibid.*). Since this study is about the socio-technical phenomenon, an interpretive research approach has been adopted because I wanted to inspect the social reality and inter-subjective meanings held by subjects in a natural setting. Moreover, interpretive research provides more freedom for conducting a case study in terms of choice of methods, use of theories and prioritization of research questions according to the data gathered and their relevancy.

Of the various theoretical perspectives, positivism and interpretivism have been more influential in research (Gray, 2004; Robson 2002). Quantitative research is grounded on objectivist epistemology and assumes that reality exists independently of consciousness of human meanings and research is about discovering this objective truth. A theoretical stance

closely linked to objectivism is *positivism* (Orlikowski and Baroudi 1991). In contrast, interpretive research has its roots on constructivism and rejects the positivist's view of human knowledge and confronts that truth and meaning are created by the subject's interactions with the world. It emphasizes that meaning is constructed not discovered and subjects construct their own meaning in different ways, even in relation to the same phenomenon. A theoretical stance closely linked to constructivism is *interpretivism* (*ibid.*). Thus, IS research can be classified as positivist if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from a representative sample to a stated population and as interpretive if it is assumed that our knowledge of reality is gained only through social constructions such a language, consciousness, shared meanings, documents, tools, and other artifacts (Klien and Myers, 1999).

Interpretive research has emerged as an important strand in information systems research, and are "aimed at producing an understanding of the *context* of the information system, and the *process* whereby the information system influences and is influenced by the context," (Walsham, 1995). The interpretive perspective attempts –

> "…*to understand the intersubjective meanings embedded in social life ... [and] to explain why people act the way they do*," (Gibbons, 1987 cited on Orlikowski and Baroudi, 1991).

The main aim of interpretive research is to understand issues or particular situations by investigating the perspectives and behaviour of the people in these circumstances and the perspective within which they act and hence presents the reality as a social phenomenon of multiple facets (Stoop and Berg, 2003). That is why interpretive approach has the potential to produce deep insights into information systems phenomena including the management of information systems and information systems development (Klein and Myers, 1999).

In interpretive research, researchers are viewed as a 'key instrument' one which is "calibrated" first through training in theory and methodology and then through experience (Forsythe, 1999). They are the primary instruments for research design, data collection and management, data analysis, and interpretation and reporting processes (Borland, 2001). The

method is highly dependent on the researcher as interviewer, observer, facilitator, and interpreter of data, and that the researcher can never assume a value-neutral stance, and is always implicated in the phenomena being studied (Orlikowski and Baroudi, 1991). According to Kaplan and Duchon (1988),

> *"Immersion in context is a hallmark of qualitative research methods and the interpretive perspective on the conduct of research. Interpretive researchers attempt to understand the way others construe, conceptualize, and understand events, concepts, and categories, in part because these are assumed to influence individuals' behavior."*

Researchers could and often do influence every aspect of the research and trustworthiness may be at risk. Therefore, the researchers should be able to design structure that increases levels of certainty about relative truth and to decrease subjectivity while increasing objectivity (Borland, 2001). According to Benbasat *et al.,* (1987), researchers develop categories and meanings from the data through an iterative process that starts by developing an initial understanding of the perspectives of those being studied and uses data to both pose and re-solve research. It is one of the most important aspects in interpretive research and hence it requires flexible researcher for its execution, who can integrate rigor into all aspects of research methodology to enhance credibility and trustworthiness of the findings (Robson, 2002).

The interpretative tradition has been criticized for its lack of focus on validation (Klein and Myers, 1999; Walsham, 2006). A number of criteria had been proposed for evaluating interpretive field of studies in different literatures (Walsham, 2006). While there is no any formal or standard method for evaluation, however, I have in this case, find relevant to follow the "*a set of principles of conducting and evaluating interpretive field studies in information systems*," proposed by Klein and Myers (1999). In their paper, a set of seven principles from phenomenology and hermeneutic stance has been introduced which essentially are the 'markers' or guidelines for anyone who wish to conduct interpretive study and with due quality and efforts in order to make the result more compelling and worthy.

A summary of these principles are presented here (*excerpted from Klein and Myers, 1999*):

- The first principle is the fundamental principle of the hermeneutic circle which suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.

- The second principle is the principle of contextualization which states that the interpretive research requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.

- The third principle is the principle of interaction between the researchers and the subjects which requires critical reflection on how the research materials (or "data") were socially constructed through the interaction process.

- The fourth principle is the principle of abstraction and generalization which requires relating the idiographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action.

- The fifth principle is the principle of dialogical reasoning which requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings with subsequent cycles of revision.

- The sixth principle is the principle of multiple interpretations that requires sensitivity to possible differences in interpretations among the participants.

- The seventh principle is the principle of suspicion which requires sensitivity to possible "biases" and systematic "distortions" in the narratives collected from the participants.

However, it is not required that all principles must be followed and irrespective of their order and relevancy, the principles can be used to assess the credibility of the study. More on the principles and how are they valued in this study is presented in section 3.5.

3.4 Data Collection

In interpretive research, data are collected through observations (participant and non-participant), interviews (unstructured or semi-structured, formal or informal), questionnaires (open-ended), case studies, and document review and reports (Howard and Borland, 1990; Robson, 2002). The selection of data collection method usually depends upon the research problems, the sources to seek information, including the context. In interpretive research, the nature and the number of methods to be employed can change as data collection continues and due to dynamic nature of the real world setting (Robson, 2002). Generally, interpretive approaches to data collection involve direct interaction with individuals or focus groups. Though the methods of data collection are time consuming and data are gathered from fewer resources, yet, they provide richness of data and deeper insight into the phenomena under study (*ibid.*). The interpretive research methods tries to explain and gain insight and understanding of phenomena through intensive collection of narrative data, thus it is inductive, value laden, holistic and process oriented (Howard and Borland, 1999). As such, data collection and analysis is an integral component of interpretive research (Braa *et al.*, 2007).

Before data collection, it is necessary to adopt strategy for data collection. It depends upon how familiar is the researcher with the environment or the setting, the subjects under study and the quality of information that is being sought. Also, a strategy is essential for tracking small pieces of details and getting access into data source. Moreover, it can also provide some boost to develop new plans. For instance, I was able to indentify key actors, know more about the work practice, and prepare interview guide.

In this case study, first, I made a strategic plan to collect data. Based on this plan, I used the following tools for data collection:

- Survey with open-ended questionnaires,
- Semi-structured interviews,
- Non-participant observations,
- Document and literature analysis, including
- Emails and telephone.

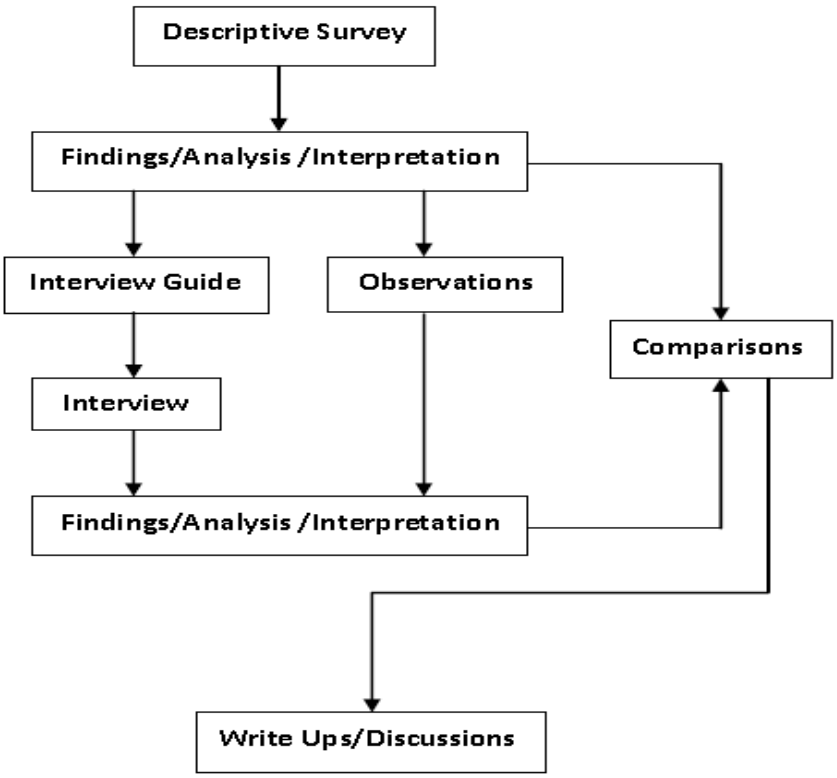

Figure 2: Data Collection Strategy

3.4.1 Data Collection Strategy

After getting access to the study field, I felt myself that I had to know more about what I was going to study. Without being known about the current situation and with the people I would be dealing with, it would be difficult for me to know the starting point. So, I opted for survey that would be more descriptive in nature, followed by interview and observations.

For this purpose, a descriptive survey consisting of open-ended questionnaire was carried out to get familiar with the research setting and subjects under study. Questionnaires are important data gathering tools which are used as part of many of the research methodologies. They are one of the most widely used primary data gathering techniques, and valuable research tools through which people are asked to respond to the same set of questions in a predetermined order (Gray, 2004). The survey was done to gather

information about the subject matter as well as to know the participants. In addition, it would allow me peek into to the current situation and to know what had happened before. This would also help me guide to undertake study in an efficient manner because it not only presents me to the subjects as a person who really knows something about the matter but also that it would create a new bond among ourselves, and it would be helpful in latter stage such as the interviews. The survey was also necessary, in this case, in order to prepare an interview guide.

3.4.2 Methods Used for Data Collection

A survey consisting of 50 questions was prepared (*Appendix 1*). The questionnaires were all open ended in nature. Since, it was too long, I decided to divide the questions into three phases. The first phase had 15 questions, the second phase had 20 questions and the last phase had 15 questions. Thus, the survey was carried out in three phases to the same respondents. First, I gave them the questionnaires and ask them to read once if there was confusion about the questions. Then, they were allowed to take enough time to answer the questions. It was because I did not want to take any chances of getting unanswered questionnaire back, and because of their busy daily schedules. It took me almost a week to collect all the questionnaires back. Of the total of eight respondents, only six of them responded back (*See Table 1*). They were subsequently analyzed, and based on the findings, an interview guide was prepared.

Interviews can be highly structured, semi structured or unstructured (Robson, 2002). In this case study, I opted for semi-structured interviews. It's because it helps researcher to undertake a series of open-ended questions based on the topic of interest. Also, it is flexible and provides opportunities for both interviewer and interviewee to discuss some topics in more detail. For instance, if the interviewee has some confusion in the question or any difficulty answering a question if there is only a brief response, the interviewer can provide some clues to persuade the interviewee to provide more answer in the given topic. Furthermore, a semi structured interview enables the interviewer to ask the interviewee detailed explanation or to probe the interviewee to elaborate on the original response.

A list of informants along with their positions in the organization and codes are presented in the following table. These codes are used in the text to denote the informants and to preserve their anonymity, respectively.

Table 1: Lists of Informants, their respective positions and coding

Informants	Position in the Organization	Coding
Key Informant	Officer (IT)	A
Key Informant	Assistant Officer (IT)	B
Key Informant	Consultant (Medical)	C
Informant	Doctor (Medical)	D
Informant	Officer (Administration)	E
Informant	Member (Administration)	F

An interview guide was prepared consisting of 59 questions and were open ended in nature (*Appendix 2*). For simplicity, the interview was carried out in several phases, and according to time limit. All the interviewees were asked the same set of questions and at different interval of time and days. Before conducting interviews, prior permissions were taken and appointment was sought. A total of four interviews were conducted each lasting 15 to 45 minutes per session. All interviews were tape-recorded (with prior permissions from interviewees) while important remarks were also note taken. In total, 375 minutes of interviews were taken and were subsequently transcribed and analyzed. Several attempts were made to transcribe the facts in details and possible interpretations thereof.

Observations were also a key part of the study. In this study, I was a non-participant observer, more specifically an outsider who do not have personal stake on the process or what people are doing. During observation, important notes were taken that I felt valuable for the study and writing up the thesis. Still photos were also taken of important events and places. As a part of the study, a demo was carried out to show how a telemedicine consultation was carried out. In addition to the telemedicine department and equipments there in, I also observed the Information Technology (IT) department. The IT department was responsible for all IT related work in the hospital, including conducting telemedicine

consultation. I was told that the IT infrastructure of the hospital was being upgraded and I could see many departments, including the library, in the hospital were installed with computers and internet connection. They were centrally controlled via IT department and connection had to be made only through IT department. I had also participated in informal as well as group discussions and took field notes that were very helpful for making interview guide. More crucial findings were made during informal discussions, such as how they manage to work, their satisfaction levels, and so on.

Likewise documents and literatures were also studied. Documents and literatures artefacts are keys to study as they provide written evidence about the subject concerned. They give basis to know in more details about various issues about the matter and provides data and to view the same phenomenon in different perceptions or opinions (Robson, 2002). Various documents and literatures were searched in the internet databases that are useful and relevant for the study, including information booklets and publications from hospital and official government policies documents. Moreover, communication channels were also used in this process such as emails and telephone. Emails and telephones are one of the important sources of communication. These sources were used to get in with connection with the key personnel and to discuss matters or issues related to the study, more often when more information is needed or at times of confusion. In addition, telephone was used to make direct contact and taking appointments for interviews.

Following instruments were used for data collection:

- a diary for note taking, keeping details of appointment schedules and telephone number, visiting hours, and observations details.
- a tape-recorder (SONY) for interviewing.
- a laptop (HP) for writing down my daily activities in a chronological manner as possible and as detailed as possible (through memorization, notes, and tapes) such as daily activities, and information gathered from meetings and observations.

The case study was carried out at OMHRC, Kathmandu Nepal. The data collection was carried out in the month of July and August, 2009.
[Details on research setting is presented on Section-4.]

3.5 Reflections on Methods

The thesis topic was not decided randomly or all of sudden. It was well discussed with my supervisor since first year of my study in 'Master's in Telemedicine and E-health.' Initially, I was not sure whether I would collect data for my thesis in Nepal, even though I was interested. It was because of my belief that without knowing what is happening in the subject matter, and without knowing the right people, it was worthless to carry out the thesis. So, I went on seeking information about telemedicine in Nepal.

Though I had preconceptions about the information I was searching for, my supervisor was very positive from the very beginning. This was one good reason for initiating search and to identify people and organization where I might be interested in. However, to my disbelief, my initial phase was somewhat frustrating as I did not get what I was looking for – I '*googled*' (searched) the internet, but valid outcomes were not found (*still, there is scarce information on telemedicine in Nepal on the internet*). On the first place, there was lack of detailed information about telemedicine being practiced in Nepal. Secondly, the limited information that I found in the internet were not sufficient as they were either old or outdated (*most Nepali websites are either not working or not updated*). Thirdly, I did not receive any responses of my email which I had sent to the organizations having stake in telemedicine (*most organizational email addresses do not reply back*).

I discussed these problems with my supervisor; nonetheless, he encouraged me to continue my effort to find something from Nepal as it would be interesting to know about telemedicine in the perspective of developing countries. Finally, I thought that there is need of some research and in real sense, it's something what motivated me. However, I realized by that time that it would be a challenging task ahead as I had no adequate information regarding people or organization involved in telemedicine, and also that I had to approach them personally after reach Nepal. This was equally inspiring as well as challenging, and I decided to move on regardless of prior permission for field access. Accordingly, I planned to go to Nepal, and in the mean time, I also asked help from my friend in Nepal to provide me some information about the organization who had implemented or going to initiate telemedicine related projects.

3.5.1 Getting 'Access'

Before going to Nepal for the fieldwork, I made some rough plans about where to apply for conducting the study. Due to limited time period and political situation at that time, I had to choose organizations around Kathmandu Valley. The Kathmandu Valley consists of 3 districts: Kathmandu (the Capital City), Bhaktapur and Lalitpur. Most of the hospitals (government and private) are concentrated at this region. I got three names of the organizations relevant for my thesis from my friend, one of which was where I collected the data. Accordingly, I asked my supervisor to prepare an approach (recommendation) letter seeking permission to make a study in any of these organizations. So an open letter was made for this purpose (*Appendix 3*), 'open' in the sense that the letter was not meant for a particular organization but for all in general, and five copies were made.

In every research, the main and the most important issue is the 'accessibility'.

> *"Access may refer to gaining entry to the field, gaining acceptability, being able to 'hang around', and more,"…"the process of gaining access also involves strong elements of chance, luck and serendipity,"* – (Randall *et al.*, 2008).

When I reached Nepal for the study, I was aware of this situation and equally I had enough doubt if I would get access. I was stressed from the very beginning while choosing the thesis topic – *what if I am not able to conduct study*? However, I had a great support from my supervisor as he always motivated me that there is always a way out and alternatives are always there. So, I worth trying my luck in the sense that it all depend upon me, my approach and commitment, and the right time. I made rough plans about visiting the hospital. Nevertheless, I was still unaware of what will happen, whom to contact, and how to proceed. So, I tried with the nearest hospital first, from the place where I was staying as this would save time and money for traveling. It was OMHRC.

> "…I started my journey with a scratch. First of all, I went to the information desk at the hospital. There was a lady at the reception and I made her understand why I was there for. I told her that I came there for my thesis work

and I needed some assistance from the hospital administration regarding the subject matter. *"Sorry! We can't help you. You have to talk with the administrative officer,"* the lady replied. Then I went to the Administration Section located at the 3rd floor of the same building. There was no one there but I met a clerk and told my story. He told that I was at the right place but I had to wait a while as they (officers) were in a meeting. But in the mean time, he suggested me to meet the Managing Director. He showed me the way, but unfortunately, he was also in the meeting. I decided to wait and it was more than two hours and no one had showed up. Finally I decided to go around the hospital to avoid boredom. Just in front and to the right of the administration section, I saw the 'OM Telemedicine Center' and I decided to enter so that I could find somebody inside there. I knocked but there was no response. I was very excited and asked the clerk about it. He told that I had to wait until the officers were back. He also said that the Telemedicine Center is headed by IT department and the IT officers will be back only after lunch time. I had to restlessly wait until they were back at their respective department."

Getting access to the research site is difficult, troublesome and time consuming. It depends upon individual approaches to the right person or gatekeepers and at the right time, and this is where luck or chance plays a role. Moreover, it requires good social skills. As Robson (2002) puts it -

> *"Interpretive researchers need to gain and maintain good access to appropriate organizations for their fieldwork. In order to get access, they need good social skills."*

I have to admit that I am a novice researcher and that I may not have all the qualities of a good researcher, however, I had tried on my part to be as efficient as possible and acknowledge the fact that these qualities often got improved when dealing with consequences – *knowing and learning from doing*. According to Walsham (2006):

> *"One cannot acquire social skills, they have to be learned, practiced and improved through self-reflection and with input from others such as friends, colleagues and supervisors."*

Being new to the field put me into actual practical dimensions from theoretical parameters that I had achieved during my Masters course, and efforts from my supervisor, and experiences of senior colleagues and my friends – and truly these were my only ultimate weapons that I trusted upon and which I had used during the study.

> "…Then, I went to the IT department, introduced myself to the Head of Department and described my purpose and objective of the visit. I could already feel the energy in his face and positive attitude from his side. I handed him the recommendation letter from my supervisor which specified my purpose of being in Nepal. After some personal questions and answers, he said that it was okay for him but in addition I had to take permission from the Managing Director. In the mean time he asked me if I want to see the Telemedicine Center. I said it would be great and we went to the Center. I could see the television screen, web camera, microphone, computer, and other equipments. There was a flag of India and Nepal in the table with six chairs, a fan at the ceiling, one server machine. He gave a brief description about the department. I thanked him for his vigorous enthusiasm. Then I described him about my thesis, the work plan and what I wanted from them. I asked him if I could visit them daily. He agreed, however, he also warned me that he could be busy sometimes and not to mind if he could not help when I was there. Then he suggested me to submit an application for permission for the study referring to the Managing Director along with the letter from the supervisor. I could not meet the Managing Director that day as he was very busy in the meeting. So I visited him the next day and handed him the application for permission. After waiting some while, he gave me the permission for conducting the study, however, he asked me to come back the next day to get the permission letter (*Appendix 4*) and start working thereafter as agreed upon."

While getting access, I had gone through several channels – receptionist, security guard, clerk, officers and director – run from here to there and waited longer hours and days. I had read somewhere that these are also the fate of researcher to which he has no control over it. Thus the only thing I could do at that point of time was to 'wait and see.' When I finally got

permission, I was very glad and I felt like I had achieved a kind of success. I shared my feelings with my supervisor via email indicating that I had done it – "I am in". However, there was still a long way to go. As Randall *et al.* (2008) puts it:

> *"Getting permission for the research and getting accepted in the research site are two different approaches to access."*

The former is obtaining a permit from official channels or higher authorities while the latter is being accepted by the subjects at the field or at the site of the study and gatekeepers at different hierarchical level (*ibid.*). I had been partially successful at this moment. In other words, I had to get direct access so as to minimize any intermediaries in order to reduce the risks of misinterpretation that might occur if I went through several channels or gatekeepers. Thankfully, the IT officer cleared my way out. He introduced me to different stakeholders – IT personnel, consultants and doctors, administrative staffs and officers, and members of the hospital organization. He was the main channel for me I was known to other gatekeepers through him. This had been a key to getting access at all levels and the most important aspect during the study period as well as after the study was over. Despite these facts, the most important challenge for me was to extract as much information as I could on the subject matter. It was a challenging task for me because some of the key actors never showed a piece of interest at all, regardless of my approach with them, and though several attempts were made.

3.5.2 Being an 'Outsider'

Interpretive researchers are hard bound to the study and with the subjects while building up the relationship with the outside world (Robson, 2002). Based on the relationship with the subjects, there are two important roles of a researcher, as an outsider and an insider (Walsham, 1995). The 'insider' researcher is more attached with the subjects by being a member though for a short period of time. The advantage of an insider is that the researcher can have the inside view of the field of study, has more access to confidential and sensitive issues and be more flexible than being an outsider (*ibid.*). The main drawback of being an 'inside' researcher is that the subjects may feel that the researcher is having a direct

personal stake on their matters and thus may feel awkward to freely express their views. Another important feature is that insiders tend to experience their own assumptions as obvious truths given that even the insider will know only a limited amount of information about the field under study (Forsythe, 1999), and that some sacred 'religious' places may still be hidden (Randall *et al.*, 2008).

The role one acquires depends upon how much access or freedom are received during the research or fieldwork in the organization, the time one spends, quality of study and knowledge thereof, relationships with the subjects, and possession of different social skills. Accordingly, during the study period, I justify myself as being an outsider. Being an outsider has advantages – the subjects view the researcher as not one of themselves and having been seen that the researcher has no direct personal stake in various interpretations and outcomes, they usually become more frank to express themselves once the trust has been build up, and there is less chance of 'going native' (Randall *et al.*, 2008). It implicates that a relative distance and less emotional attachment are crucial for an outside researcher.

> *"The 'outside' researchers remain at more physical and emotional distance from the subjects,"* – (*ibid.*).

During my presence at the site, I tried to put myself in unbiased position as far as possible with all the respondents – I observed the working environment but I did not interfere with their work, I heard what they said but did not unnecessarily bother them. In addition, I did not ask for their time, rather I waited for them and listened to them. Since I did not interfere with their whereabouts, their work or what they said, I made a distance with the respondents.

The limitation of being an outsider is that the 'outside' researcher will not be present on each and every occasion and at each site of study, and thus will not be able to grasp and understand what is going really inside there. However, these issues sometimes were very helpful to me. In some informal gatherings (such as during tea hour), they used to talk about happenings of the meeting and expressed their reactions, even their personal feelings and about their work without considering my presence. May be they felt that I had no concerns about it or they just ignored me. In these circumstances, I just nodded my head and listen to

them and that which I found useful for study I used to note it down latter. However, I also found myself debarred from access to certain data or issues that are deemed to be confidential and sensitive to be shared. For instance, I could not have access to some records, and some did not answer the questionnaires while other showed no response to my visit.

3.5.3 Interpretive Fieldwork and the Principles

An account on interpretive research approach has already been provided in earlier sections. Similarly, I have also presented my perspectives on accessibility issues and on my role as an outsider in the sections above. Here, I have tried to provide a basis for evaluation of my role as a researcher and the interpretive work in this study. So, an account on the principles for interpretive field studies by Klein and Myers (1999) has been presented here, irrespective of their order and those reflecting to this study.

According to the first principle of the hermeneutic circle (*Klein and Myers, 1999*):

> *"We come to understand a complex whole from preconceptions about the meanings of its parts and their interrelationships."*

That is, all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form, and is implicated to all the other principles. Therefore, it is considered meta-principle upon which all other principles expand (*ibid.*). Indeed, human understanding is filled with preconceptions, and it is necessarily not the basics to interpret accordingly right or without bias. We have to consider each and every part to fully acknowledge the facts so that each piece of knowledge brings good understanding as a whole. It is an iterative process.

Similarly, I have repeatedly transcribed and analysed the interview. This helped me to increase my confidence in the data I had gathered and good understandings of the segments so that I was able to classify them according to the topic of interest and later relate them as a whole, for example, data related to technology on one place and those interrelated to

technology with social perspectives on another place. This allowed me to analyze data in an efficient way and latter to form a whole knowledge after iterating to and forth between each segments of data. Nevertheless, it was time consuming, yet worthy. I transcribed the data with vigorous effort, and repeating the details, in order to interpret them as exactly as possible keeping the view of the informants in mind. It was a challenging part as the informants are also their own interpreters and given this fact, it may not necessarily be true that my interpretations are correct. It can be reflected to the third principle for interpretive field studies, which is the principle of interaction between the researchers and the subjects (Klein and Myers, 1999). According to this principle, it requires –

> *"critical reflection on how the research materials (or "data") were socially constructed through the interaction between the researchers and participants."*

Klein and Myers (1999) argued that the participants can be seen as interpreters and analysts just like the researcher, as they also have their own preconception and can well be altered by interaction with the researcher or as their work practice changes. Within these perspectives, I had tried to discuss my understandings with the informants, for instance, I used to ask them in the next meeting and whether it was the same thing as I understood. This would ease my confusion.

Likewise, the data collection procedure was also a challenging task, as it depends upon access to the site, the interaction with the informants, and researcher's own skills. An account on accessibility issues has been providing in earlier section.

> *"Field research is by no means straightforward: it takes talent, training, and practice to become a competent field researcher, and careful data-collection and analysis to produce reliable results, and above all it's about expertise,"…"Competent researchers do not take for granted what people say at face value; they treat people's views as data,* ***not*** *results,"* – (Forsythe, 1999).

I have to admit that I am a novice researcher and therefore it is very likely to miss important clues or information, misjudge or misinterpret and even go unobserved of important facts

given the fact that even a well-experienced researcher can do errors. I had tried to be as neutral as I could and not provide my acquisition of knowledge I had gained during the study period. More importantly, I remained calm, waited for appointments and interviews, smiled as much as I could, and behaved as a visitor. Thus, I claimed myself as an outsider. Details of outsider perspectives had already been dealt in section 3.5.2.

The second principle, the principle of contextualization, proposes that the subject matter be set in its social and historical context so that the intended audience can see how the current situation under investigation emerged (Klien and Myers, 1999). In the section 3.5.1, I had mention that the research topic was not selected randomly or all of sudden, but it was well discussed with my supervisor. With extensive search, I came to know about the organization where I conducted my case study. I came to know about the organization, its history, and mission and achievements (*See Section 4.2*). Accordingly, the study was planned. After I got access to the field, I worked on strategy to collect data. Initially, during data collection, it was difficult for me to persuade people for the survey. Some of them were not interested at all and I got my empty questionnaires back. It was a kind of frustration at that time. However, with increasing presence in the field and being known to them for a quite a time, I managed to get interview with them.

> *"Organizations are not static and that the relationships between people, organizations, and technology are not fixed but constantly changing,"* – (*ibid.*).

Fieldwork is challenging owing to its dynamic nature – time and changing environment, the subjects and relationship with them, unseen biases and prejudices, and moreover, the criticality of information being sought. In this study I found that, the main challenging part was waiting time for appointment and interview. There were numerous occasions where appointments with the informants were canceled. Most of them were due to their busy schedules, long list of patients awaiting medical check-ups, administrative works such as auditing and meetings. There were occasions where I had to wait for more than five hours for 5-15 minutes of interviews. I had waited in queue of patients for my turn to meet the doctors and set up appointments, and it took several days to finally get the interview with them. Moreover, the data collection schedule was also hampered due to political situation at that time. There were frequent general strikes called on by political parties causing riots,

transportation halt, and closures of schools, colleges, and offices. These directly affected my visits to the hospital, and hence my data collection, and at many times, I had to postpone the appointments with the informants.

The fourth principle, which is the principle of abstraction and generalization, suggests that theory (s) be used in relation to the study. This principle implies that theoretical abstractions and generalizations should be carefully related to the field study details as they were experienced and/or collected by the researcher (Klien and Myers, 1999). In this case, I have used two theories – Information Infrastructure (II) and Actor-Network Theory (ANT).

> *"Theory can be used as an initial guide to design and data collection, as part of an iterative process of data collection and analysis, or as a final product of the research,"* – (Walsham, 2006).

A theory is necessary to pursue any study as it provides vision to achieve the desired objectives in relation to the research questions in consideration. In my opinion, these theories basically helped me to know the socio-technical understandings in the given settings and interaction of people, organization and the technical artifacts. For instance, I have used the notion of information infrastructure to relate telemedicine as an infrastructural tool while, through ANT, I had been able to identify different actors, how they are enrolled in socio-technical web, what are their interests and how they have negotiated to integrate technology in practical settings. Thus, a theory provides concepts which can be used as a philosophical basis for conducting interpretive studies with accompanying of some outcomes. These outcomes or generalizations, as described by Walsham (1995), can be of four types of generalizations: the development of concepts, the generation of theory, the drawing of specific implications, and the contribution of rich insight. However, my effort (with this study) is neither to develop concepts or new theory, but to contribute to research in this field by drawing inferences and bringing knowledge to existence. Thus, by using theories of II and ANT, I intended to explain the challenges and scope of telemedicine in Nepal and to highlight the factors essential for its sustainable development.

While it accounted that theory has driven the study, I also admit that my preconceptions has led to better understandings of the organization and the subjects. As such, I was aware that

accessibility would be difficult in my part as I had to go to Nepal and apply for permission for the case study. I was cautious right from the beginning, however, I got access, and in this part, I would say I was very lucky. When I went to the organization for the case study, initially, my thought was that it would be easy going and collecting data would be no problem. As I moved on, I felt many hurdles like accessing people, understanding them, and confronting them. While some of them ignored me, others were more generous. For example, the IT officer introduced me to the department and to other informants, which made me somewhat easier to access and collect data. In real sense, he was the one who rescued me while I was hovering to collect information. After I convinced him about my plans, he guided me until the completion of the study.

During writing the thesis, I also asked help from my friend (who had knowledge about the subject matter) to counter check if my interpretations were reflective to that of informants or not. Moreover, the discussion with my supervisor and his feedback was very helpful to bring about confidence in me and avoid any doubts. This provided trustworthiness to my findings

3.5.4 Ethical Considerations

For the case study, permission was sought from the Department of Telemedicine (UiT, Norway) and OMHRC, Nepal. First, approval from the Department of Telemedicine (UiT) was sought for conducting the study in Nepal. Second, the letter from my supervisor was a basis for seeking permission for study at OMHRC. Third, this letter, along with an application for permission for study, was handed to the IT department at OMHRC, and the letter of permission for the study was obtained (*See Section 3.5.1 and Appendices 3 & 4*).

All the respondents were informed about the purpose of the study at the beginning of the study. Appointments were sought from the subjects wherever needed. Their willingness in the study was highly treasured, with respect to their anonymity, information sharing, compliance to tape-recording and their participation throughout the study. Also, they were free to ask questions and not confined to any time or event during the study.

[In this study, patients were not involved and hence ethical permission from them was not sought.]

3.5.5 Limitations of the Study

This study is a part of an academic curriculum 'Master's Thesis' and thus cannot be reflected as standard research. However, attempts have been made to follow standard guidelines as far as practicable. Since this is a case study conducted in only one organization, it may not resemble as a whole to describe the situation in the country or similar institutions. Nevertheless, the study should be viewed as an effort to bring knowledge into focus as there had been less or no research of its kind in this field in Nepal. Regardless of the facts presented here, it is difficult to express the in-depth reality in the given setting due to less resources and activity in this area. Also, I found it very difficult to find literatures and other related documents concerning telemedicine in Nepal. Therefore it calls for further research, multiple case studies (or other methods), to explain the current situation and to predict the overall picture of how telemedicine is functioning or being implemented in Nepal.

‘SECTION-4’

“RESEARCH SETTING AND THE BACKGROUND”

[This section provides details of the case study and thus deals with context of study and research setting. It starts with the brief introduction of the country – Nepal, and provides a brief account of the population health status and health service provision in the country. It is followed by description of research setting where the case study was carried out. This will provide an insight into the telemedicine center as well as its objective. Further, in this section, the outcome from the study is presented in its empirical form and its interpretation thereof.]

4. RESEARCH SETTING AND THE BACKGROUND

4.1 Background: Country Profile

Geographically, Nepal is located at the latitude of 26°22' North to 30°27' North and longitude of 80°4' East to 88°12' East. It is a small landlocked country, situated between the two giants, China and India. Nepal has border with China in the North and with India in the East, West and the South. It occupies 0.03% and 0.3% of total land area of the world and Asia respectively. The country has extreme topography and climate, the altitude ranging from 70 to 8848m and the climate varying from tropical to polar. Out of ten highest peak in the world, eight lies in Nepal including the Mount Everest-8848m, the highest peak in the world. Nepal covers an area of 14,781 sq. km with a mean length of 885 km (East to West) and mean width of 193 km (North to South). Ecologically, the country can be divided into three regions: the mountain region comprising about 35% of total land area; the hill region comprising about 42% of total land area; and the terai region comprising about 23% of total land area (MoH, 2009a,b; Nepal in Figures, 2008).

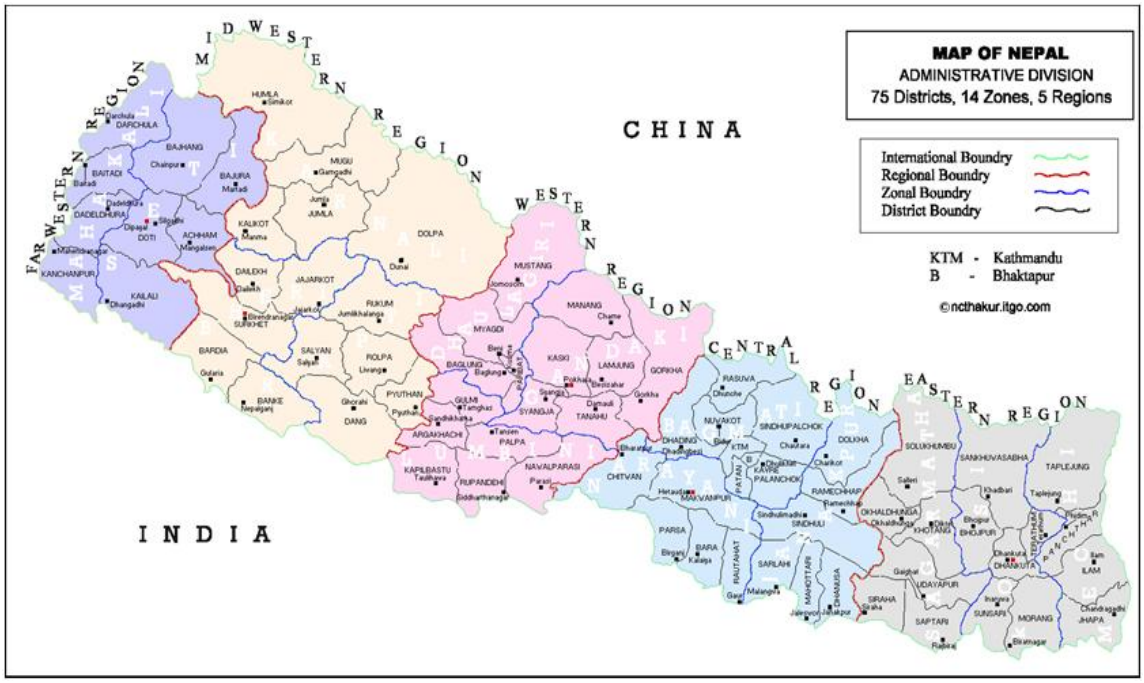

Figure 3: Map of Nepal showing Administrative Divisions

(Available from http://ncthakur.itgo.com/map04.htm)

Administratively, Nepal is divided into five regions comprising 14 zones: the Eastern Development Region, the Central Development Region, the Western Development Region, the mid-Western Development Region and the Far-Western Development Region. The country is further divided into 75 administrative districts and includes Municipalities and Village Development Committees (VDCs). There are 58 Municipalities (urban areas) and 3915 VDCs (rural areas) in the country (MoH, 2009a). Each VDC is further divided into 9 wards, while municipalities consist of 9 to 35 wards.

4.1.1 Nepal: Facts and Figures

4.1.1.1 Population

With the annual growth rate of 2.25%, the population of Nepal (2008) was estimated about 27 million. The urban population is about 13.9%, i.e. more than 85% of population lives in rural areas (Nepal in Figures, 2008).

4.1.1.2 Poverty

Nepal is one of the least developed and poorest countries of the world. Nearly one-third of population (30.8%) lives below poverty line - less than 1$ a day, as per the Nepal Living Standards Survey (2003/2004) and the Gini coefficient that measures inequality between the rich and poor is 41.4 (Nepal in Figures, 2008). The human development index (HDI) for Nepal is 0.527 and the human poverty index (HPI) is 38.1.

4.1.1.3 Literacy Rate

According to Nepal Labor Force Survey (NLFS, 2008), the adult literacy rate for both sexes (15 years and above) was 55.6%. The literacy rate was 70.7% and 43.3% for male and female respectively, indicating low female education in the country. The urban literacy rate was 77.2% while the rural rate accounted for 51.1%. This shows that there is high difference in education among the poor and the rich and gender inequality in terms of education.

4.1.1.4 Burden of Diseases

The top 10 diseases in the country are Tuberculosis, Malaria, Pneumonia, Cholera, Diarrhea, Diphtheria, Japanese Encephalitis, Leprosy, Measles, HIV/AIDS (WHO, 2010).

4.1.1.5 Water and Sanitation:

About 88% of the population has access to improved drinking water sources while only 31% has improved sanitation facilities (WHO, 2010).

4.1.1.6 Indicators of Health and Health Work Force

The data given below are drawn from the report World Health Statistics (2010) published by World Health Organization, and resembles the latest available data for the country.

Table 2: Health Indicators for Nepal (*Source: WHO, 2010***)**

Health Indicators	Value (2008)
Average life expectancy at birth	63
Maternal Mortality Ratio (per 100,000 live births)	281
Adolescent fertility rate (per 1000 girls aged 15–19 years)	106
Crude Birth Rate (per 1000 population)	27.7
Crude Death Rate (per 1000 population)	8.3
Children aged <5 years underweight (%)	38.8
Infant mortality rate (probability of dying per 1000 live birth)	41
Under-five mortality rate (probability of dying by age 5 per 1000 live birth)	51

Table 3: Health Work Force in Nepal

Health Work Force	**Value** (per 10000 population)
Physician	2
Nursing and midwifery personnel	5
Dentist	< 0.5
Pharmacist	< 0.5
Environment and Public Health Workers	< 0.5
Community Health Workers	6.3
Lab Technicians	1.2
Other Health workers	0.7

Table 4: Health Service Indicator

Human Services Indicators	**Value**
Primary health centers (per 100,000 population)	0.8
Antenatal care coverage (at least one visit) (%)	44
Deliveries by qualified attendant (%)	18.7
Children immunized (%) Average	77
Hospital beds (per 10,000 population)	50

4.1.1.7 ICT Status

Internet connection is slow in Nepal, expensive and limited, and therefore, access to information is also limited. According to 2008 figures, Nepal ranks the lowest 15th in the world and fourth lowest in Asia in terms of telephone subscriber rates, both mobile and fixed, which is about 6.4% (ITU, 2010).

4.2 The Research Setting

The case study was carried out at OM Hospital & Research Center (P) Ltd., Kathmandu, Nepal.

4.2.1 OM Hospital & Research Centre (OMHRC)

Figure 4: OM Hospital & Research Centre (OMHRC)

OMHRC is located at Chabahil, Kathmandu-the capital city of Nepal. There are about 400 employers in the hospital, including over more than 50 health personnel.

Launched with the motto '…*we care for you*', OMHRC was first established as a 8-bed nursing home in 1990 as OM Nursing Home, which then turn into a 150-bed hospital in 2002. The main objective of the hospital is to provide diagnostic, preventive and curative services through a group of dedicated professionals and services. The hospital provides modern clinical services at competitive rates, provides training to health professionals and research information to the medical world. The concept of the hospital has been to provide reliable diagnosis and health care of the highest quality under one roof so that it would save patient's time while providing confidence to the patients for the services they acquire.

4.2.2 Om Telemedicine Centre

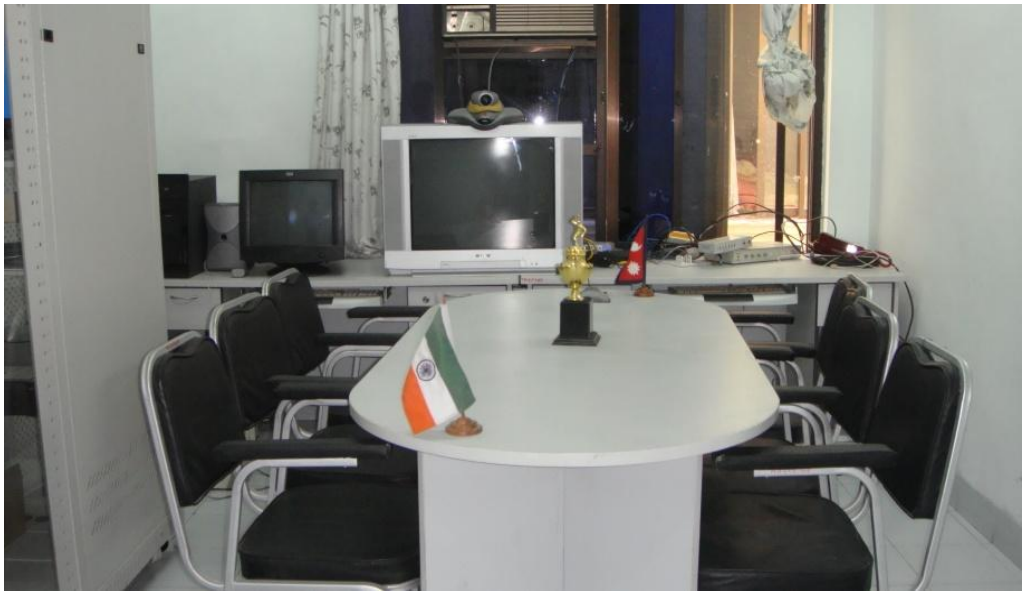

Figure 5: Om Telemedicine Centre

The Telemedicine Consulting Centre at OMHRC was established on 2004, and was named OM Telemedicine Centre. It is the first telemedicine centre in Nepal, which came as a service extension of the hospital to meet the new health care demands and to provide quality health care to general public. The main purpose of establishing telemedicine centre was to provide patients with specialist care when needed.

The Om Telemedicine Centre is a 20x12 ft. room, spacious for telemedicine equipments as well as 4 to 7 persons. It is equipped with one set of videoconferencing equipment – one television (SONY-29 inches), one web camera (Polycom VSX 7000), one microphone, one set of desktop computer and printer/scanner, and an Integrated Service Digital Network (ISDN) modem and a media converter for broadband internet connection. The electric supply is available 24 hours, backed up by Uninterruptible Power Source (UPS) and generator.

4.2.3 The Role of IT Department

OM Telemedicine Centre is headed by IT Department. It is located on the 3rd floor of the administrative block of the hospital. Currently, there are two IT staffs in the department.

Figure 6: IT Department

The IT department, however, is not fully functional. According to Key Informant-A, the department runs with a motive.

> *"Presently, we are initiating and involving IT in healthcare. But we are in initiation phase and a lot of work is there. We are not organized (still), as you can see…and it's a big responsibility for us,"* – (Key Informant-A).

According to the informants, the IT department is continuously upgrading its resources, and is more involved in administrative work. It is responsible for support and maintenance of hardware, software management, email and internet, recording and maintaining hospital database such as patient registration, library , preparing seminars and meeting that needed IT support, and auditing. It is currently working to implement hospital information system (HIS), providing computing and internet service to each department of the hospital and training to use computer and software for various purposes, including telemedicine. The department is also solely responsible for telemedical work. It is responsible for carrying out telemedicine link and as support staff to doctors and patients. One IT personnel has to be present throughout the telemedicine consultation.

4.3 Empirical Investigations and Findings

The findings presented here are mainly based upon the initial survey carried out as a data collection strategy and the interviews, and also includes observations.

4.3.1 Telemedicine Linkage with Apollo Hospitals

OMHRC collaborated with Apollo Hospitals for telemedicine linkage. Apollo Hospitals Group is one of the largest hospital chains in India. It is also one of the Asia's largest and most trusted healthcare providers.

Figure 7: Launch of Telemedicine Linkage between OM and Apollo Hospitals

The telemedicine linkage was formally inaugurated by honorable Health Minister Mr. Ashok Rai and H.E Shri Rakesh Sood (Indian Ambassador to Nepal) on November 6, 2004. Through the telemedicine linkage, the OM Telemedicine Centre at OMHRC is linked to the Telemedicine Specialty Centre (TSC) at Apollo Hospitals, New Delhi (India). OM Telemedicine Centre serves as a Client Station whilst the Apollo Hospitals, New Delhi (India) serves as a Server Station.

By networking with Apollo Hospitals, the Om Telemedicine Centre has been mainly providing the following services:

- help and confirm diagnosis
- plan treatment
- make cost effective investigations
- provide quality and cost effective health care
- provide acute interventional plan in case of a medical emergencies
- organize, advice, and assist in conducting lectures, trainings and seminars

4.3.2 Rationale for Initiating Telemedicine Service

Apollo Hospitals (India) is the largest and pioneer group of hospitals in India. A large number of Nepalese people visit Apollo hospitals and around India for treatment. The rationale for initiating telemedicine service at OMHRC as stated by Key Informant-C is given below:

> *"It is not always feasible for the patients to visit India for follow-up every time because of geographical distance and cost, and most of them usually cannot afford such high cost of treatment."*

The telemedicine linkage would reduce the need to transfer patients to a site of medical expertise and decrease in the relocation of medical specialists to the patient. This is one of the main reasons why OMHRC and Apollo Hospital collaborated for networking via telemedicine. In addition, Om Hospital can be linked with other hospitals that have collaboration with Apollo Hospital (*as of future plans*); however, it had not been initiated till the time of study.

After its launch, many patients had already benefitted from the service.

> *"The positive side is that they [patients] can now consult Indian doctors and specialist for expert advice on various health problems being in Nepal, and we are very proud to offer them our services"* – (Key Informant-A).

Likewise, the other informant had other views:

"As being part of IT, I see many possibilities of this prospect like use of newer technology, opportunities for better health, and also getting experienced," – (Key Informant-B).

Indeed, it would make health care facilities better organized and less costly, ensuring quality service to the patients. It also ensures more efficient and effective use of medical and technological resources, which would result in enhanced diagnostic and therapeutic quality of care while opening up new possibilities for continuing education or training for isolated or rural health practitioners, and creating new opportunities for technical expertise, and to learn and practice new technology for IT personnel and doctors/consultants at OMHRC.

4.3.3 Telemedicine Consultation: *an Overview*

Telemedicine consultation at OMHRC usually follows a routine procedure. First of all, the patient who wants to use the telemedicine service requests a doctor and sometimes the doctor asks the patient if he/she is willing to take telemedicine consultation. This depends upon the disease condition and its severity and the criticality of the decision to be made under uncertain conditions. Generally, telemedicine consultation is requested by patients themselves who have done treatment in Apollo Hospital, India and those who cannot afford going to India for the purpose. So, it is mostly being used for a follow-up treatment, however, it is the doctor who decides if it is needed.

Once the patient is selected, a requisition is made with the concerned doctor (Specialist) at the Apollo Hospital, mostly via emails and occasionally by telephone, for an appointment to carry out the consultation. After the date and time of consultation has been fixed by the Specialist at the Apollo Hospital, the patient party is informed as well as the Medical Officer and Consultant at OMHRC. They are requested to be present at the telemedicine centre (the Client Station) at least 10-15 minutes prior to consultation. After all of them have gathered at the centre, a telephone call is made to Server Station (Apollo Hospital) to make sure all the technical aspects are sound at both ends. After an assurance that

everything is fine, a video consultation is then carried out. However, if something goes wrong during the consultation, the next schedule is then fixed among the concerned groups.

Figure 8: Demo of Telemedicine Consultation

Video consultation usually lasts for 30-45 minutes, and involves usually three personnel in addition to the patient and/or accompanying patient member - IT staff, Doctor and the Consultant. Prior to consultation, the patient needs to fill a consent form and it is mandatory (*Appendix 5*).

4.3.4 User's Attitudes

The user's perspectives to the use of telemedicine at OMHRC have been preferentially their experiences which I have accounted for. For instance, it ranged from experiencing technology to building career to increasing competencies at one hand while satisfaction level is accounted on the other. In this study, patients were not involved; however, I have tried to know their level of satisfaction with telemedicine through the informant's views.

> *"Patient's response has been very supportive to us. Before consultation, we assure them the technical aspects of the technology and doctors also guide them during the procedure. During the consultation if they do not wish to continue in any case, we stop the consultation…and…in many cases, it's only due to technical faults,"* – (Key Informant-B).

Similarly, Informant-E argues that amidst high price, their [patient] satisfaction is growing and it's one of the reasons for offering this service. Their satisfactions may be increasing because most of the patients who come for telemedicine consultations are follow-up patients of Apollo Hospitals and they find it more practical than going to India for the treatment. For them, traveling costs as well as living costs are saved. However, for those patients other than the follow-up, their interests have not been as predicted. According to Key Informant-C, he also observed the same behavior, however, he also emphasized that the outcome is not so favorable, for instance, in terms of the number of patients expected and in financial terms.

> *"The number is increasing than we expected, but the output is not as viable as we understood...and perhaps, it may be the reason for discontinuation of the service."*

[The telemedicine service was not in operation during the time of study. This issue is discussed in the Section 4.3.6.]

Similarly, doctors are positive with the use of technologies but are unaware of their inability which makes some of them egoistic as informed by Key Informant-A. He also argued that whether or not the doctors are willing to use telemedicine depends on their experiences with IT and using computers. He points out that doctors (especially young) are affirmative and trained with basic IT skills, but experienced doctors lack knowledge in IT. According to him, it is a concern for telemedicine future.

> *"Some local doctors usually do not want to refer the case for telemedicine as they feel capable of curing patients themselves...I sensed it as egoistic. However, in most of the cases, the doctors' views are positive towards this aspect to use telemedicine…while doctors, usually young, are optimistic in this aspect; some doctors, even experienced ones, need training."*

There are issues of people being egoistic and technological downturn. For example, ego may have dual meaning – first due to supremacy where people think that they can do on their own and second, feeling of inferior due to less or no knowledge of the subject and awkwardly showing off.

This usually happens in real life situation, and can equally confronted by knowledge and training. In this case, if users have knowledge in telemedicine or if they are trained, there would have been less hesitation to use it.

For some, telemedicine may be a career building opportunity, as depicted by the following statement:

> *"In the context of Nepal, telemedicine is a new technology which is still out of reach for many rural Nepali populations. As I am involved in technical field, every use of technology will enhance my technical carrier…and I feel telemedicine has helped me to build my professional career. So far, telemedicine experience is good for me,"* – (Key Informant-A).

Besides the need of skills, the use of telemedicine also depends upon the context and the nature of people. According to Key Informant-C, in Nepal, telemedicine seems to be the right situation, but unless there are people who can utilize it, it has no meaning.

> *"In our context, the technology [telemedicine] is favorable, but we need to develop and show our competencies."*

Likewise, Informant-D also had the same concern.

> *"We [doctors] cannot go anywhere from here, but we can virtually to meet the demands of the patients… and I think it's a good opportunity for us."*

Nepal is geographically difficult to access, and most health providers and doctors being centralized to cities, enables telemedicine to foster. Technology matters but not without users, and since it's about distance, doctors are not able to reach the patient as per the political situation of the country, and thus doctors do agree that technology would be helpful to broaden their expertise. According to the informants, the doctors are satisfied with the use of telemedicine service; however, they need formal training in IT skills, at least basics of IT, and knowledge in ICT.

4.3.5 Telemedicine Halted – *the Reasons*

The users' attitudes towards telemedicine seemed to be positive in different aspects such as experience and opportunities and equally emphasized on training and expertise to broaden their concepts and utilize for people's good. Despite this fact, telemedicine was not in operation – telemedicine was halted, why? What went wrong? The obvious reasons were related to funding, as these finding will illustrate:

4.3.5.1 Funding was the Key

Funding is an important aspect of technological deployment. While funding enhances development, it also assures sustainability and future use. It can be both internal and external. In case of Om Telemedicine Centre, initially, the funding was solely internal, i.e. the OMHRC provided the entire budget to run the telemedicine program. The cost of setting up the Telemedicine Centre was around Nepali Rupees (NRs.) 500,000. Around NRs. 40,000 per month was issued as a budget for running telemedicine program.

> *"We were financially backed-up by Apollo Group as they paid connectivity fees, and we [OMHRC] pay them half the income,"* – (Key Informant-A).

However, it was realized that OMHRC alone cannot take upon the financial burden, owing to high cost for connectivity and other associated expenses. The consequence was that the telemedicine program could not run smoothly. Then, OMHRC and Apollo Hospitals both agreed for a deal to share the expenses together as well as the income from the program. According to the deal, Apollo Hospitals was to provide expenses related to the connectivity, apart from the technical expertise. Thus, in this case, funding through external source was the key for continuing use of telemedicine.

What this prospect indicates is that external funding is a major part of development processes in Nepal and sustainability thereof. The continuing section will reflect more on this issue, and will be discussed more in the discussion section.

4.3.5.2 Sustainability and the Funding Dilemma

One of the major problems of any development project in Nepal is about its sustainability. Usually, after execution of donor support, the program also gets terminated due to lack of resources (Pradhan, 2002). This is what had happened in the case of telemedicine program at OMHRC.

> *"The program is closed for a moment…and…as soon as the funding problem is solved, we will start it all over again,"* – (Key informant-A).

Telemedicine consultation was temporarily halted according to the informants. Om Telemedicine Center is not an independent actor when viewed in financial terms. The criticality is that of interdependency and partnership. Since, Apollo has withdrawn from this partnership; no further telemedicine consultation has been carried out at Om Telemedicine Centre. It is observable that the service had been closed.

The obvious reason was funding problem, as quoted by Key Informant-A:

> *"It is a big amount of money and hospital cannot afford it as they [management] say," and "now they [Apollo] have stopped to pay."*

The importance of funding is well documented in several literatures in relation to technological transfer, its implementation and use. Issues related to funding have also been depicted as successful and unsuccessful parameters to advocate the sustainability of technology and its growth. Nepal is a poor country, and in many instances, cannot afford to pay for technology. Even if it manages to pay, sustainability is always a barrier. In case of OMHRC, the hospital is well established in the context of Nepal, but small in relation to its counterpart (Apollo). OMHRC, however, can start the service, but the cost of using the service would be very high. It would, in turn, be implicated to the patient, which they are not going to pay.

[Patients are already paying high cost for consultation fee; see Section 4.3.6.4 for more on payment issues.]

According the Key Informant-B, the reason why Apollo decided to quit the program and what it might be thinking could not be understood, but it seemed related to payment issues.

> *"May be Apollo was not satisfied...but I don't think so. It was all running well…and suddenly they said they will not be paying further,"* – (Key Informant-B).

He argued that the underlying motive is not clear as it is between the management team to settle the issue. However, he was also in doubt about the time taken to resolve the issue, but still believed that the program would continue.

It may be that Apollo thought they were losing their patients. For instance, patients pay for the service, hospital stay, medicine costs, etc. if they visit the Apollo Hospital. With telemedicine, they might not get the same profit as they could have got otherwise or might be that they feel that the outcome is not as that expected in terms of income (and service and time). Whatever may be the reasons, it is the patients who are suffering between two service providers.

Now, OMHRC is looking for other sources of funding such as the ITU (International Telecommunications Union) and more importantly thinking of utilizing internal resources. However, how much time would take is still unknown. Nevertheless, progresses are underway, as mentioned by Informant-D:

> *"I don't know the exact cause, but it's about finance…we are looking for supports elsewhere, and soon it will be finalized."*

Funding is a complex issue and is different to different actors. For example, while it is more a service provision for OMHRC, it may be financial benefits for Apollo or *vice-versa*. The complication of external funding is always implicated to the donors, since they are never static; however, the level of impact is less than the receiver. In this case, since Apollo has withdrawn hands from the project, OMHRC seems helpless to rerun the program and patients are deprived of the service. Nevertheless, it is trying other way round and planning to start the service sooner as far as the events are favorable.

4.3.6 The Focal Point: Key Challenges

In this case, major challenges related to telemedicine had been identified, in addition to funding and payment discussed in earlier sections. They are related to technology procurement, internet connectivity, and lack of technical expertise among others.

4.3.6.1 Procurement & Dependability

Nepal is a developing nation; economically poor and land-locked. Therefore, Nepal has to be dependent on other countries for many of its developmental work. Technological growth and development is slow and limited, which makes the country further dependable. This is to relate that we do not have technology of our own and thus, most of the time; we have to procure from outside world. For instance, telemedicine is the western property, which is well disseminated now over the world. Seemingly, for a country like Nepal, all the necessary technological equipments required for telemedicine program have to be procured from other countries.

> *"We have to procure major items from India as they are not available here, and they are cheaper to buy than other countries"* – (Key Informant-A).

Purchasing and procurement of telemedicine equipment were challenging part as referred by key informant-A. According to him, these equipments are not available in Nepalese market, except for the television part. All other items had been purchased and procured from India.

Another thing is that of *extra money* that is spent during purchasing and procurement from outside the country.

> *"We have to send people to India, confirm order and then pay customs and duties which makes buying little expensive…had it been in here, it would be the other case,"* – (Informant-E).

India is a neighboring country and has open border with Nepal. Relatively, buying from India is cheaper than from other parts of the world and at the same time is efficient. It is efficient in the sense that it easy to replace damaged or malfunction equipments or to order their parts or order a new one. Also, they provide technical assistantship. However, it is still expensive due to customs and duties that have to be paid for importing such equipments.

4.3.6.2 Connectivity and its Cost

Connectivity is one of the biggest issues when comes to internet usage. Nepal is one of those countries which do not have regular electricity supply, and where broadband connections are still underway. Internet connection is slow, expensive and limited, and mainly confined to major cities only. Rural penetration is almost negligible.

Connection speed is crucial in real-time consultation, the higher the speed, more lively the consultation. The telemedicine program at the OM Telemedicine Centre started with 128 Kbps dial-up connection. With this limited connectivity, it was difficult to carry out real-time consultation. The connection was slow and often disturbed (disconnected time-to-time). On the other hand, it was also difficult to assure the doctor and the patient regarding its use, as quoted by Key Informant-A:

> *"It was very difficult to explain to other users [doctors and patients] of the outcome from slow connection, for instance, the lag-time, blurred images and the system, too often, disconnect while being online…and we were not satisfied."*

He also mentioned that due to these reasons, the internet connection has been upgraded from 128 Kbps to two 128 Kbps to 1 Mbps broadband connection via leased line. However, he also argued that the cost was very high.

> *"Initially, broadband connection in Nepal is relatively new. It was costly, when we started the service. We had to pay NRs. 35,000 per month for 1 Mbps connection, and it's a hefty price."*

This was one of the reasons for funding the telemedicine program through external source, i.e. the Apollo Hospitals. According to Key Informant-B, the cost may be the primary reason why Apollo left the project.

> *"The reason for us was connectivity costs, and may be for them too, to withdraw from this project."*

Key Informant-A also agreed that it is high cost of connectivity which made telemedicine program unsustainable, and admitted that:

> *"If the cost had been low, we would have managed it from our side."*

For a 1 Mbps connection, the hospital has to pay NRs. 35,000 per month to the Internet Service Provider (ISP), which the OMHRC cannot afford to pay alone. Collaboration was a key to implement telemedicine service successfully. Now, since there is dispute between partners, the telemedicine service had to be stopped.

4.3.6.3 Lack of Expertise

According to the key informant-A, initially, there was only one IT staff and there was no telemedicine and IT was slowly being introduced at the OMHRC at that time. With increasing administrative jobs, another IT staff was recruited. At the time of study, there were only two IT staffs and were involved in administrative jobs, core IT jobs, and telemedicine work.

With the introduction of telemedicine program in 2004 came more responsibilities and duties, and with only two staffs, it was difficult to carry out telemedical work and administrative work at the same time. With low number of staffs, telemedicine just became an added duty, as stated by Key Informant-A:

> *"The IT department is more involved in administrative jobs. Telemedicine operation is an added duty list for IT staffs."*

Key informant-B also expressed serious concern regarding staffing in the department:

> *"We found it hard to carry out multiple functions at a time, and we have urged the management to recruit more staffs in the department."*

Due to fewer personnel in the department, they also have to be mentally prepared for telemedicine work, as highlighted by Key Informant-A:

> *"Sometimes it happens like that…while we are busy on our daily work; suddenly it happens to go for telemedicine, and we have to leave all our works at stock. The result is that we have to do it again and we have to be well prepared for those shortcomings."*

They also stated the difficulties of using new technology.

> *"Initially, we also faced some difficulties – it needed time to understand new technology, but my background in IT has made things simpler and easier for me,"* – (Key Informant-A).

> *"Videoconferencing was my first experience in telemedicine at OMHRC. My senior has guided me using the technology and I think it's important to learn more if you are going to use it,"* – (Key Informant-B).

According to Key Informant-B, it was challenging to train doctors and making patients understand how telemedicine works and how to use of devices.

> *"It was also difficult to train doctors for using the equipments and computers…yet…more challenging was to make the patients understand how telemedicine works"*

Telemedicine program came with added duties, which according to the informants is simply difficult to manage. Had there been more staffs dedicated according to specific jobs, smooth operation would have been likely to be carried out. Recruitment on the other hand, takes

time and unless the management sees that it is worth employing new staff, recruitment seems far away. As such, IT department has shortage of IT personnel. With only two IT staffs, it is difficult to carry out administrative function, core IT jobs and telemedicine. For instance, one IT person has to be involved when telemedicine consultation is being conducted, leaving behind the other IT personnel on administrative jobs which is not sufficient. Since it is mandatory that at least one IT personnel be present during telemedical consultation, it is more administrative jobs that are affected, along with increased workloads pressure to the IT staffs.

4.3.6.4 Telemedicine Consultation Fee – Is it high?

For each telemedicine consultation at OM Telemedicine Centre, patient has to pay the fee of NRs. 3100 per session, each lasting 30-45 minutes. The fee was higher than the general consultation fee, which is around NRs. 250-500. When asked about this issue, the Key Informant-A replied as,-

> *"We alone cannot afford the telemedicine costs. We have to charge the patient…the running cost is high at the moment."*

For a majority of Nepalese people, the amount for telemedicine consultation is very high when compared to normal consultation. These fees were only the source of income and have to be equally shared between the OMHRC and Apollo Hospitals.

About the high consultation fee, Informant-E quoted as saying:

> *"Yes…they [patients] already are paying high now, but we wanted to make them pay less, however, you have to pay for technology and it's the cost what we take."*

These statements are crucial here. The fee is structurally based on expenses of the telemedicine department such as salary to staffs, payment to internet service provider (ISP), as well as to Apollo Hospitals and other related expenses. The department has an average

budget of NRs. 40,000 per month, which may be seemingly low at the moment. On the other hand, the income is also not generated well as mentioned earlier – *the outcome is not as viable as we understood*.

This means that the number of patients coming for telemedicine consultation in a month is not well enough to compensate the expenses, despite increasing level of patient satisfaction. There is an income deficit at one hand, and high expenses on the other, which makes the cost of service high. However, this cost had not affected the number of follow-up patients as commented by the Key Informant-B:

> *"The consultation fee has not marked any differences among the patients. In fact, we have the same number of follow-up patients at a time. Their satisfaction is growing."*

He also clarified that the cost is seemingly high, but it is nothing when compared to the cost of treatment when going to Apollo and the situations they got into while traveling so far and those extra costs. This effect is not understood well, and satisfaction does not mean sustainability in any case. Thus, despite the users' satisfaction, the telemedicine program had been a failure.

It should be noted that the fee for telemedicine consultation is 7 times higher than normal fee. The satisfaction of patients as described by the informants may not be in terms of money but to the service they are getting at the expense of travel time and costs as well as expert consultation. For a large Nepali population, this fee is extremely high and for majority of them it is more than their monthly income which is just around NRs. 3000 to 5000. The consequence is that they are not able to use the service even though they wanted to. Considering the socio-economic condition of the country where more that 30% of population live under the poverty-line of less than 1$ a day, telemedicine would be just a piece of technology serving the rich.

4.3.6.5 Reimbursement – Is it a concern?

Reimbursement to the use of telemedicine technology or service is not well documented and practiced in Nepal. Generally, it becomes as a part of work practice, as quoted by Informant-C:

> *"It's only the monthly salary we get; we don't get extra salaries or bonuses for using the service."*

For each telemedicine consultation at OMHRC, patient has to pay the fee of NRs. 3100 per 30-45 minutes sessions. These fees were only the source of income and have to be equally shared between the OMHRC and Apollo Hospitals. Doctors are not part of such income; rather it becomes part of their normal practice.

> *"Doctors do not get paid for telemedical consultation…it is like a part of their normal routine practice,"* – (Key Informant-A).

The issue of reimbursement is not well established, partly because the number of users [doctors] who uses telemedicine is less, and also it is also not a well established business in Nepal. According to Informant-D, since telemedicine is not commonly used in clinical practice, this issue must have been overshadowed. He also stated that reimbursement is not big issue, not today, but it can be to tomorrow.

> *"This feature had been completely overlooked; however, I think it will gain momentum in coming years, when it will be used more and more."*

In case of OMHRC, doctors are dedicated to use the service, and also they are equally satisfied though they are not reimbursed for their work. However, as Informant-D said, this issue may raise a concern among users as telemedicine will be put more on practice.

4.3.6.6 Marketing

Marketing or advertisement is a valuable tool to foster product growth and enhance its use. It not only helps product promotion, but also helps the product to reach people far out. However, in health sector, the concept of marketing is different; and it cannot be used for commercial purposes except for health promotion. Key informant-A highlights this issue as ethical prejudice:

> *"Ethically, we can do nothing about it. Since we cannot advertise it, people are not aware of telemedicine or other technologies in health sector. The consequence is that they will not use it and we cannot offer them."*

He also pointed out that, however, this concept may differ among different communities and countries. In Nepal, marketing of product accountable for public health is forbidden for business purposes unless it is done for health promotion. Informant F also admitted that marketing is a challenging aspect for telemedicine development in the country; nevertheless, he also argued that there are other ways of doing it.

> *"You know we need money to sustain…we are helping people but its business anyway. It [marketing] can be done and we are planning about it but not as market products…we are doing seminars, meeting people and publicizing about the benefits of telemedicine technology. We are about to conduct free health programs in rural areas also…we are building our mechanisms for it,"* – (Informant-F).

According to Informant F, marketing is not only about making money but he did not completely ignore this fact and emphasized more on social activities to promote telemedicine such as conducting seminars, going remotely, and raising awareness. Nonetheless, marketing of telemedicine is challenging in the context of Nepal due to geographic limitations, available human resources and institutional capacity in this field.

4.3.7 Promoting Telemedicine – *what can be done*?

The informants have highlighted some of the important areas for promoting telemedicine in Nepal. They are related to infrastructure development, policy implementation, building competencies and creating opportunities for growth.

Key Informant-A pointed out that the government should play a major role to diffuse telemedicine in the country by not only bringing out policy but by acting accordingly. He argued that in Nepal, policy is just a paper.

> *"In Nepal, policies are just in a piece of paper and part of political speech. It should be much more than that…the government needs to bring forward clear-cut vision and policy regarding use of ICT technology such as telemedicine,"* – (Key Informant-A).

He also mentioned that though IT policy is in effect, its implementation has not been as desired.

Similarly, Informant D emphasized on building competencies:

> *"Since medical information is changing rapidly, I think we have to acknowledge this fact and try to incorporate it into medical practice. Being IT enabled is the best way to do it."*

Education and training is a prerequisite to good work force. Lack of expertise and inadequate human resources can impede any developmental work. Telemedicine, being new to medical field (in Nepal), requires users to be at least familiar with the equipments and working procedures, along with basic IT knowledge or training. It has now been realized that modern doctors need some IT knowledge to keep with the pace of information era. About use of ICT in medical perspectives, Key Informant-C has similar reflection.

> *"As I am in health profession, now I am being used to computers such as checking emails, surfing the internet and updating information."*

On the same issue, Key Informant-B told that there should be provision of training.

> *"Building competencies is the best way to foster growth of telemedicine in Nepal. It has a tremendous scope, but we lack enough resources in this field."*

He also emphasized that since telemedicine is new to Nepalese context, it will take time to have specific outcomes such as training modules or courses in telemedicine. Nevertheless, people have to be motivated for it. Moreover, Key Informant-A referred more on publicizing about telemedicine. He argued that majority of Nepalese do not know what telemedicine is, and even doctors or other health professions are unaware of it:

> *"How can you motivate people without publicizing it [telemedicine]? Unless people (also doctors and nurses) know what is it or what benefit it can bring, no one is going to use it or train themselves."*

While he highlighted that developing infrastructures in the first hand is very important in the case of Nepal, he also acknowledged that it is equally challenging in Nepal.

> *"We should think on developing infrastructures which is really important on the first place like transport, telecommunications, and electricity. However, I think it is also the biggest problem in our country,"* – (Key Informant-A).

Informant-E also agreed that it is the infrastructures for slow ICT development and which makes the country dependable to other resources while admitting political influences in their development.

> *"The main problem is we do not have enough infrastructures and enough human resource in our country…also, we lack vision for growth. We are not just economically poor but 'governmentally' poor,"* – (Informant-E).

He stressed that political instability and insecurity also created havoc to active participation by private organizations to invest in technology acquisition, while the government failed to effectively implement policy and provide support to private institutions.

‘SECTION-5’

“DISCUSSION”

[Section 5 aims to discuss various issues related to implementation and use of telemedicine, and therefore focuses on sustainability issues and roles of diverse actors for developing telemedicine infrastructure.]

5. Discussion

In this section, first, I will describe telemedicine as an infrastructure by using the characteristics of information infrastructure (II). I will then follow the notions of II and ANT to relate with the case in order to explain how infrastructure is a socio-technical web of people and technological artifacts, and the consequences when actors fail to respond to their interests. Accordingly, I will try to provide an account on sustainability and how funding can as an actor and influence other actors in the network. Likewise, other principle actors who have stake on the development of ICT infrastructure in Nepal are indentified and their roles are discussed. Finally, an insight into challenges to ICT development in the country is provided.

5.1 Telemedicine as an Infrastructural Tool

Being born as a distinct entity from the information system and as ICT application, telemedicine shares many of the attributes of information infrastructure. It is evolving continuously, is supportive to wide range of tasks, people and organization, is open regarding the number of users or technical components it can integrate, shareable by a larger group of users, is heterogeneous network of technological and social components, and has installed base.

Telemedicine is supportive. As an application, it covers a wide range of medical specialties such as radiology, dermatology, psychiatry, oncology, cardiology, etc. It supports healthcare providers, doctors and patient. It can ease decision-making and thus can act as a problem-solving tool as well as policy-making to health providers and to people as a way of getting better access to health services, especially targeting the rural and remote or underserved communities (Edworthy, 2001). For instance, telemedicine at OMHRC is not limited to one specialty or one professional conduct. During its linkage to Apollo Hospitals, telemedicine consultation had been used for diagnosis and treatment for various types of illnesses, for seeking professional advices pertaining to different medical treatment strategies and communication purposes.

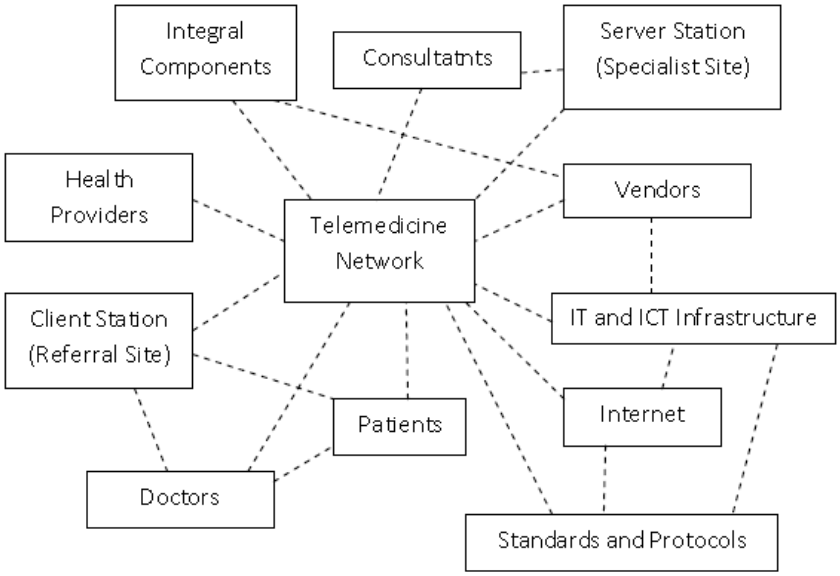

Figure 9: Telemedicine Infrastructure

In this sense, telemedicine is also shareable due to its application to many areas in health sector. Being shareable means it can be used by larger community – health professionals, researchers, organizations and patients. It helps information sharing by virtue of integration of information and communication technologies, for instance, between Apollo Hospital and OMHRC. Here, OMHRC shares technological links with Apollo Hospital, technical as well as professional expertise, including price sharing of the telemedicine costs and benefits. On the other hand, both the institutions share the patients – those who had treatment at Apollo Hospital and then get followed-up through OMHRC (those who need advice from Apollo doctors). Thus, telemedicine provides a common ground for doctors and patients, and is equally shareable in terms purpose of use. For example, patients and doctors in Nepal can get expert advice and treatment plans, while Indian Specialists can offer cross-border services to Nepal, using the same set of telemedical solutions. In other words, telemedicine provides a similar platform for different users with different motives. Thus, openness is an inherent property of infrastructures.

Telemedicine is open and everyone can use it once it is implemented irrespective of who the actors are, for example, it can include people, technological components or organizations. Thus, new features and technologies can always be integrated into existing telemedicine base. As such, openness also creates opportunities to improvement. Since telemedicine started at Om Hospital, the number of users had increases – more doctors are trained to use it, patient's satisfaction is increasing, and technological components are constantly being upgraded to meet the need. Actually, shareable and openness also refer to being heterogeneous creating networks. It is because telemedicine technology encompasses a wide range and ever-expanding range of equipments and technologies, and networks of human and technical (non-human) artifacts (Hanseth and Monteiro, 1998). Hence, the success of telemedicine lies on a socio-technical phenomenon where human and technical artifacts interact with each other forming networks of aligned interest. Thus telemedicine can be considered as ecology of networks where different networks are superimposed to one another through integration of different components ultimately making a link of logically related channels that are interdependent. For example, the interrelations of various departments in a hospital, or of one hospital with another, in a region or a country, which is supported through videoconferencing or other telemedicine applications.

As an infrastructure, telemedicine is evolving with new dimension and continuously growing and standardizing from the installed base, that is, information and communication technologies. Infrastructure does not grow instantaneously, rather it is ever-evolving and continuously improving overtime as new ideas, information, technology, and features are added to the older existing ones. It has come a long way from telegraphy and telephony to radio and television to digital technologies (Norris, 2002). It is still in continuous process of development, indicating requirement from other support structures involving people, organizations and technologies. Nevertheless, telemedicine can be acknowledged as an infrastructural tool, a network of socio-technical elements.

5.2 Sustainability: Funding as an 'Actor'

Pradhan (2002) argues that one of the major problems of any development project in Nepal is about its sustainability, and most of the time after execution of donor support, the program also gets terminated due to lack of resources, the most important being the

financial issues. Funding plays a major role in any kinds of developmental projects – from implementation to practice and sustainable growth. It is an important actor and a social element.

According to Aanestad and Hanseth (2000), technological and social elements are tied together into networks. As such, funding can and do influence other actors in a network. Funding can create stable network by translating actors' interests into common goals, i.e. towards sustainability. By saying this, I do not mean that funding is the only solution to sustainability; but it does play a part. Nevertheless, negotiations are key part for funding to act in all circumstances. For instance, in this case, had it (telemedicine program) been funded by Apollo, the program would not have been closed. Else, had there been enough funding with OMHRC, it would not necessary depend upon Apollo for assistance or had it been funded by government, sustainability would be less problematic.

Funding as an 'actor' may not act independently; however, this does not mean that other actors can act alone. If they could have acted alone, a network would not have existed or would not be necessary, and thus would have followed either technological determinism or social reductionism (or constructionism) approach. According to technological determinism, the development of technology follows its own logic and that the technology determines its use. In contrast, social reductionism or constructionism believes that society and its actors develop the technology it "wants" and use it as they want; implying that technology in itself plays no role (Hanseth and Monterio, 1998). But, in socio-technical interplay, each actor needs to incorporate the concepts of ANT – through *inscription* and *translation* – in order to stabilize the network of aligned interest. Thus, as an actor, funding has the enabling and constraining effect, that is, it can influence actors to motivate to perform a certain task (in this case the telemedicine program) or even restricts actors in doing so. For instance, initially, both OMHRC and Apollo agreed upon to start the telemedicine link. In this case funding was the key to successful telemedicine network (*enabling effect*). But as Apollo stopped to pay for the connectivity, the telemedicine program also became motionless (*constraining effect*). What was important here was the negotiation process, where both organizations failed to accomplish causing the network breakdown.

Walsham (1997) puts it this way:

> "*Successful networks are created through enrollment of sufficient body of allies, and their translation of their interests such that they participate in particular ways and in common ground of thinking and acting in order to maintaining such networks*."

According to him, a successful network is a stable coordination of all its entities working together for a common purpose and also maintaining such network once they are created. Here '*maintaining such networks*' refers to sustainability. In other words, a network without sustainable future cannot be stable. This reflects to this case also. OMHRC was not wary of this situation and they have to close the telemedicine program. The role of funding in developing countries is therefore indispensable owing to poor economy, underdeveloped infrastructures and lack of related resources. This is one of the common problems of other developing countries as well (Braa *et al.*, 2007).

5.2.1 The 'Breakdown'

Telemedicine can be seen as an infrastructure, which is embedded in socio-technical relationships. In the case of telemedicine at OMHRC, the so-called aligned network collapsed, eventually halting the service. Though, telemedicine has been temporarily closed (*from the informants' perspectives*), in real sense, it may be considered as a failure. Implementation, use, and sustainable use are quite different things. According to Aanestad and Hanseth (2000):

> *"In real life, implementation turns out to be a notoriously complex and unmanageable process, and failure stories abound."*

Telemedicine application that is successful in one situation may be completely failure in another situation. The users' attitudes towards telemedicine seemed to be positive in different aspects such as experience and opportunities and equally emphasized on training and expertise to broaden their concepts and use of telemedicine. Despite this fact, telemedicine had been a failure in the context of OMHRC. Thus, implementation never means success of use, and satisfaction of users is not the only criteria for measuring success of an event. Failure may reflect to lack of total control, the presence of risk and ambiguity,

and the importance of dedicated commitment and attention that can emerge when people and technology interact owing to openness and evolving nature of infrastructure (Aanestad and Hanseth, 2000). As it grows and diffuses, the perception of a technology may differ in terms of usability and the nature of user itself. That is, in the process of reinterpretation – translation – assigned meaning, the technology and the users are both continuously changed and aligned to each other forming a network (*ibid.*). In ANT terms, such a network is called actor-network and consists of actors having common interests in the same phenomena.

In this case, OMHRC is a 'focal' actor whose interest led to the establishment of telemedicine centre. The main purpose was to link the centre to Apollo Hospitals so that it can serve the follow-up patients from Apollo Hospitals as well as the hospital's own patients. Conceptualizing to ANT, it can be referred to as *problematization* phase, the process whereby an actor gives meanings to its own purpose and identify other actors with similar goals (Callon, 1986). OMHRC and Apollo are the actors with aligned interest. Through *interessement* (the process by virtue of which actors get aligned to common interest of the other), the Apollo agreed to create a telemedicine linkage, a common network, to provide telemedicine services. In the process, several other actors were enrolled (the *enrolment* phase) – IT personnel, physicians, consultants, and vendors, including technological components such as telemedicine equipments and communication channels such as internet connection and telephone. They were fashioned to work in harmony (the *mobilization* phase) – IT personnel to establish connection between the two parties and to assist attending doctors and patients with respective to use of devices; doctors to communicate each other and to patients response and their treatment; television equipments to show both parties in the single screen; sound devices to deliver and hear voices on both sites, and so on. During translation, it is common for actors to negotiate in order to provide stable network. In this case, OMHRC and Apollo Hospitals both agreed for a deal to share the expenses together as well as the income from the program. Accordingly, Apollo Hospitals was to provide expenses related to the connectivity (apart from specialist expertise), and in return, it would get half the income generated through telemedicine consultation. Though, the notion of translation for successful network applies to this scenario, the case is very different than expected. As one of the actor loses interest, a network momentum is lost causing disorganization of a network – a reversal of a translation process.

According to Klein and Myers (1999):

> *"Organizations are not static and that the relationships between people, organizations, and technology are not fixed but constantly changing."*

That is, actors in a network are in never fixed but dynamic. Their interests or alignment become stable as a momentum is gained and becomes irreversible, however, when one of the actor fails, the whole network collapse and becomes visible. As Bowker and Star (1999) puts it,

> *"Infrastructures are visible upon breakdown."*

Therefore, for a network to be stable, a continuous process of negotiations is necessary among actors because different actors have different motive and they invariably change with time, for instance, within rapidly advancing technology, old component needs to be upgraded or removed and new one needs to be added. Similarly, organizations grow bigger and people interests may change over time, and so on. These may be the reasons why telemedicine came to halt at OMHRC.

5.3 Enrolling Actors: What Role they Play?

A core feature of ANT is that humans and non-human components are treated symmetrically, that is, both the components are tied together into networks that are interrelated and dependent upon one another forming heterogeneous networks. Thus, each actor influences others in a network (Aanestad and Hanseth, 2000). According to ANT, networking means each actors requires to be aligned to the social interest and towards common goal to build a stabilized network, e.g. development of ICT infrastructures requires actors such as people, or organization having common interests, policy and strategies; an installed base or existing infrastructure to design and build upon; and use of technologies to achieve what is desired or to move towards the common goal or interest. Since there are heterogeneous group or actors into play, there is actually 'nothing' that is common or remain so. Therefore, heterogeneity should be maintained within the network through social

negotiation process because no network is stable over time (Walsham, 1997). A socio-technical approach then becomes a vital tool to maintain harmony among diverse actors.

Reflecting to the case, several actors can be distinguished, which are influential to the development of telemedicine infrastructure in Nepal. In a broad sense, these actors include the government, donors, private sectors, human resources, existing technologies and infrastructures. These actors should be considered as part of heterogeneous network or ecology, instead of separate worlds (Nicolini, 2006). This heterogeneous group of actors and their role of interests determine the future of telemedicine in Nepal. They need to socialize, get aligned and make a network that is stable and developmental because establishing networks creates opportunities for sharing of experience, knowledge, technology, and value between the various nodes of the experience (Braa *et al*., 2004), through translation and sharing of artifacts among diverse group of actors in the network.

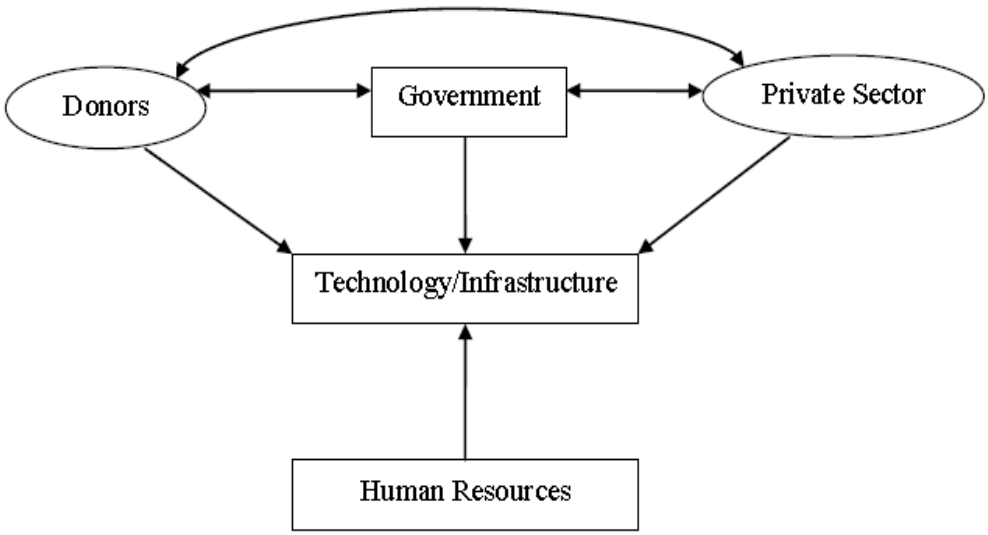

Figure 10: Actors Responsible for Infrastructural Development in Nepal.

5.3.1 The Role of Government

In Nepal, the government is responsible for any kind of developmental work. It formulates plans, policies, and strategies and implements them. It is also the regulatory body of all governmental, non-governmental and private organizations.

5.3.1.1 Policy Papers

Three national policies that can be supportive to development of ICT infrastructure (including) are focused here.

- The National Health Policy (NHP) was implemented in 1991 to bring about improvement in health conditions of the people of Nepal. The main objective of this policy is to extend primary health care system to the rural population so that the people benefit from modern medical facilities and trained health care providers, and to develop a healthcare system having equitable access to coordinated health care services in rural and urban areas (MoH, 2010; WHO, 2010). The main objective of this health policy is to extend primary healthcare system to the rural population so that the people benefit from modern medical facilities and trained health care providers, and to develop a healthcare system having equitable access to coordinated health care services in rural and urban areas. It addresses delivery of health care services such as preventive, promotive, and curative health services and basic primary health services as well as information and administrative issues, including community involvement, private sector participation as well as inter-sectoral coordination among national and international non-governmental organizations (WHO, 2010).

- The Information Technology (IT) Policy was introduced in 2000 with a view to bring about economic consolidation, development of democratic norms and values, proportional distribution of economic resources and means and enhancement of public awareness, thereby raising living standards and, most importantly, contribute significantly to poverty alleviation (NITC, 2010). The main objectives of this policy is to make information technology accessible to the general public and increase employment through this means and to build a knowledge-based society, and to establish knowledge-based industries.

- The National Telecom Policy was introduced in 2004 (NTA, 2004). The main objective of the policy is to create conducive environment in order to make the telecommunication service reliable and accessible to all the people at reasonable service charge in a fair competitive atmosphere. The policy also aims to develop

telecommunications as a main pre-requisite for national development and to contribute to the social, political and economic development of the country, and also by involving private sector by implementing the policy of liberalization in the telecommunications sector.

The government has a major role to play by fostering ICT because countries that do not keep up with IT often collapse and are unable to achieve social-economical growth (Sachs, 2000). It is a tool that can bridge the gap between developed and developing countries. A national IT strategy is therefore necessary to develop such infrastructure and to participate in the process of global integration. The government has to play an important role, not merely as a major user, but also as regulator, promoter and diffuser (Pradhan, 2002).

5.3.2 Private Sector Participation

Private sectors can actively participate in infrastructural development of the country. Several IT companies are flourishing in Nepal and use of IT has been rapidly expanding over a few years. However, using IT without necessary infrastructure may have negative results as it will be unmanageable. Private IT companies can influence health sector by developing systems, by providing IT expertise, and educational support and training to health workers and professionals. Similarly, health organizations can play a major role in diffusing telemedicine projects by establishing telemedicine centers, providing training to health professionals and upgrading services in rural areas. However, it is required that private telecommunication companies provide technical infrastructures such as connectivity in these areas.

5.3.3 The Donors Perspectives

In Nepal, most development projects come as a package from donors and for a definite time-frame (Pradhan, 2002). Donor-based funding is funding provided by external countries, development agencies, and non-governmental organizations that sponsor a variety of projects in developing countries. An important aspect donor-based funding is that it has time-spans, limiting their ability to be sustainable (Nicolini, 2006). Another

perspective is that donor agencies want to be certain with respect to their financial grants, that is, they are actually financing the right projects. Some projects, however, are continued through renewals and extensions. There is less or no provision to build the technological capability of the recipient organizations to sustain the use of new technology beyond the lives of the project and also that there is lack of institutional capacity to sustain the use of the new technology on internal resources creating dependency on external resources (Pradhan, 2002; World Bank, 2000). In fact, it's due to failure to regulate donor agencies by effective implementation of policies regarding technological acquisition, or being too liberal and practicing technologies in an ad hoc basis.

Donor agencies should provide receiving organization with sustainability and scalability requirements. For this, they may take the challenge to make an information system work in a local setting. They should provide mechanism for shaping and adapting the systems to a given context, cultivating local learning processes, and institutionalizing routines of use that persist over time, even after they leave and external funding is over (Nicolini, 2006). Furthermore, they should also provide mechanism to scale up and diffuse working solution spread to other sites and to make it successful in that socio-technical context.

5.4 Addressing the Challenges

Development of information and telecommunication technology (ICT), and its expansion and proper mobilization are vital for the overall development of the country. It is necessary to develop and expand this sector as a foundation for the enhancement of public awareness, for increased accessibility to new technology and inventions, and to save time, development of knowledge and skill, proper dissemination of information, as well as for getting merged into the mainstream of globalization (NPC, 2008). By far, technological growth in Nepal has been very slow, owing to country's topography, poor economy, political instability and sociological hindrances to name a few. Besides, lack of human resources, weak institutional capacity and organizational planning are other limiting forces for slow ICT development. While there are challenges to ICT development and its implementation, there are also possibilities. Successful implementation of ICT infrastructures therefore requires following issues to be addressed in a coherent manner.

5.4.1 Infrastructure-related

Topography of the country has been one of the major obstacles in the socio-economic development of the country. More that 80% of land consists of rugged terrains, hindering movement of people and technology. Even today a large part of the country remains inaccessible by modern transport and communications; essential goods and information cannot reach remote areas in a timely manner (MoH, 2009a). Even, doctors, nurses and health workers are in short supply or absent in these areas. Therefore, health facilities are extremely poor in remote communities. Transportation infrastructure is poorly developed, which ultimately hinders ICT growth and expansion, particularly in rural and remote areas; thus, contributing a direct and negative impact on health system. Similarly, electricity supply is the biggest problem in Nepal as it is involved directly with the livelihood of the people. There is electricity cut 'off' (short supply) on a daily basis of about 8-14 hours. When I was in Nepal for data collection, I am experienced it for 16 hours per day. It's unimaginable for a country which is considered the second richest country in water resources in the world. For a majority of rural communities, electricity is still unreachable, and without electricity, there is no connectivity. Unless, these infrastructures are developed, ICT penetrations will be low.

Connectivity is a radical element of ICT applications like telemedicine. While several literatures have argued that cost of information and communication technologies is decreasing, in the context of Nepal, it is expensive and limited as illustrated by the following text:

> *"...in India the average price of a broadband internet connection is less than $7.50 (250 Indian rupees) per month, while in Nepal, a much slower connection could cost more than $50 (3500 Nepali rupees) per month. Although some of this difference may be attributable to India's large market size, the great majority is due to exorbitant licensing fees that are set by Nepal's government and eventually passed on to the end user. Thus, access to information is restricted not because it is intrinsically expensive or limited, but simply because it has been set a premium in a given context," –* (Shields, 2008).

Building local and vital structures are utmost prerequisites for technological development. For example, developing transportation infrastructures is crucial for communication and information technologies to reach remote areas of the country. So, it is important to maintain, improve, and expand this infrastructure. However, this needs heavy funding, and need support from local communities and donors. Also, without the development of telecommunications and electricity infrastructures, ICT will not speed up and nor will telemedicine. These infrastructures should be mobilized to all the regions of the country. There should also be provision to reconstruct and re-establish damaged infrastructures, and to resume service. Unhealthy competition and bad politics should be avoided as they impede development process. Technologies should be tailored according to the need of the context where they are going to be part of.

5.4.2 Poor economy and Dependability

Nepal is economically a poor country. So, local funding and buying expensive technology is difficult. Nepal is economically depended upon funds from external communities. Economical limitation has been a major drawback to building ICT infrastructures, and this also reflects to telecommunications and transportation networks as a whole. Most technologies in Nepal come as a package from donors and for a definite time-frame (Pradhan, 2002). After this period, these technologies are not well mobilized and maintained. Sustainability and scalability issues are common, and are mostly finance-related (*ibid*). There are issues regarding renewals and extensions of projects due to financial problems, politics and dependency, and lack of internal resources and institutional capacity. Scalability then becomes far-off trade as little or no provision has been made to scale up existing and successful projects (Pradhan, 2002; World Bank, 2000). Resource utilization is one of the approaches to be self-reliant. Nepal is rich in water resources, agriculture and tourism. It should exploit its hydropower potential since without electricity there is no connectivity (ITCD, 2002). Tourism and agriculture are the other two economically influential resources that the country can eye upon. It is better to depend on internal resources for sustainable development. Therefore, combined efforts from all the sectors – at regional, national and international levels – are highly important to achieve success.

5.4.3 Politics and Policies

Political crisis and instability have been major obstacles in any kind of development work in Nepal. Strike, closures (*bandhs*), and destruction of infrastructure foundations are some of the outcomes of political conflicts and instability in the country. Still the political situation has not been improved. Also, many of the works are politically motivated (*bad politics*), for instance, selecting countries/vendors while technology transfer. Irrelevant and unhealthy exercising of power in the deployment of infrastructures and technology have been the major obstacles in political development of ICT infrastructure.

Policymakers should have good (far) visions and strategies to uplift the health system and hence better services to the people. There should be strict provisions of monitoring and evaluation of systems that have been implemented. Policy reforms should be made if it is obstructing the development processes. Policies should be implemented efficiently and effectively down the root level for better outcomes, for example, implementing liberal IT policy. Political crisis should be resolved through negotiation process. The more is the country stable, the stronger it grows towards development, socially and economically. There should be provision for active participation of private parties in the socio-economic development of the country.

5.4.4 Institutional Capacity and Human Resource-related

Chronic institutional weaknesses and severe financial constraints at both the national and local level pose formidable barriers to the delivery and utilization of health services. The country's social and economic infrastructure is underdeveloped, and its administrative systems and institutions lack the capacity to plan and effectively implement programs (World Bank, 2000). Private sectors should be welcomed to participate to compete in the development processes. For example, hydropower is one of the economic assets of the country, so it should be properly utilized. Economic development will then help drive technological development. Similarly, a system is required to properly mobilize national and international organizations to get best out of them for socioeconomic development of

the country. The government should implement suitable strategies and policies to attract private sectors with technology transfer and its growth.

Moreover, there is lack of skilled or trained manpower – acute shortage of doctors, nurses and health workers, IT expertise – in Nepal. Similarly, migration (brain drain) and urban-centered localization of expertise creates further problem of inequities in rural and city areas as well as at the national level. Lack of human resources can slow down the overall development process of a country. Illiteracy, inadequate training and lack of skilled human resources are some of the constraining issues in any kind of infrastructure development. This also holds true to ICT infrastructure as well, because Nepal acutely lacks technical manpower. In health sector, most of the health care experts and physicians are practicing at the urban areas, mainly the Capital and other major cities. Health workers, who serve most of the population, are isolated from specialist support and up-to-date information. Telemedicine may be a very useful tool in this regard, for sharing information, planning, and treatment of patient. It would be undoubtedly useful in reducing the burden of diseases (Pradhan, 2004). Therefore, there should be provision for education, training and specialization, and motivation for human resource development as well as to manage skilled human resource capable of adopting new technology and opportunity. However, it also requires motivating people to work in remote communities by enabling and empowering them.

Thus, the development and growth of ICT infrastructure is determined by to what extent these challenges are faced successfully and at what length of time, which largely depend upon active participation regarding vision, plan and policy by both the government and private sectors.

‘SECTION-6’

“CONCLUSION”

6. Conclusion

Technology has changed our lives. It has influence how we shape this world. Development of information infrastructures, computing technology and telecommunications, and so on, has envisioned us with a new way to see and perceive things. Things have gone simpler, easier, faster and cheaper (comparable to function) than ever and are changing radically; new findings and innovations coming quickly, and technology being more friendly, accurate and precise. Advanced technology has paved a way for new health dimensions; more specific, more result oriented and unique. For example, advancement in computing technology, telecommunications, internet, web-based technology, etc. have given rise to new fields like telemedicine and concept of e-health, and literatures have shown that these have been largely proved valuable in managing patients with their illnesses. State-of-art equipments and processes dedicated at patient care have revolutionized the health care system, and at this stage we are fine tuning the technology-into-health.

Development of ICT infrastructure cannot be envisaged without the development and expansion of information and telecommunication technologies. It is therefore necessary to develop, expand and mobilize this sector for socio-technological development of the country, despite the country's difficult and remote terrains, weak economic status and infrastructural systems. It is also necessary to develop and expand ICT infrastructure to improve health services. It is a foundation of telemedicine applications. It will only be viable and reachable if these infrastructures, including transportation and electricity infrastructures, are strong and developed. Strategic plans, reforms, visions, and effective monitoring and evaluation systems are required from the government in order to implement ICT infrastructures and at the same time private sectors should be allowed to actively participate in its development. Government should also make effective policies to attract foreign communities for investments and technology transfer. Local infrastructures should be maintained, re-established, and improvised. Education, training and development of human resources are foremost important in technological development of the country. Overcoming problems is in itself a challenging job, but is a way to success.

Infrastructure development may be a difficult task in Nepal. There are many challenges to developing ICT infrastructure, and hence telemedicine implementation in the country. However, there are also possibilities. Infrastructure development, implementation and maintenance are very crucial for any country, and even more for developing countries. ICT infrastructure might be a boon for Nepal since it has many opportunities for development; however, a lot of hard work is required. Thus, it requires efforts from people and organizations at all the sectors of the economy – government and private – including donor agencies as well. In addition, it requires good strategies, far-vision and effective planning to achieve success.

It is concluded that more research in this field of study is necessary regarding technology acquisition, pre- and post-problems in socio-technical perspectives and implementation, including sustainability and other related issues such as networking. It is because using technology for granted, without needed infrastructures, may impose long-term problems in the future since they may be unmanageable, uncoordinated and uninteroperable. Installation of technology is not an end, it has to be preserved and maintained as well.

Therefore, feasibility studies and other related researches should be carried out in full phase before implementing telemedicine applications or other ICT applications in the local setting.

‘SECTION-7’

BIBLIOGRAPHY

7. BIBLIOGRAPHY

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‘SECTION-8’

APPENDICES

Appendix 1: Survey (*for simplicity, the writing space has been reduced*).

A Master's Thesis Survey on Telemedicine in Nepal
08.07.09

Hello, my name is Rudeep Piya and I am a Master's student in Telemedicine and e-Health at the University of Tromsø (UiT), Norway. I am conducting a survey about '**Scope and Challenges of Telemedicine Implementation in Nepal**' and therefore I would like to have your opinion on the matter. I would like to assure that your anonymity will be highly respected. Your opinion and suggestions are very valuable for my thesis work. Are you willing to take part in this survey?

Age (in years): ……..

Gender: **Male** ☐ **Female** ☐

Level of Education: ……

Main Occupation: ……

---

1. **When did Telemedicine started at OM Hospital and Research Center?**

   ……

2. **When did OM Hospital and Apollo Hospital get collaborated for telemedical work?**

   ……

3. **Who funds the telemedicine program?**

   ……

4. **How much is the funding amount?**

   ……

5. **Is there any Government funding or assistance of any kind?**

   ……

6. **If yes, please quantify the government funding or specify some details of government assistance. If not, please skip this question.**

   ……

7. **Who are the users of telemedicine services?**

.....

8. **In your opinion, how do patient react or feel about the service?**

.....

9. **Do patients need to pay for the service?** .....

10. **If yes, how much for each telemedical consultation?** .....

11. **Is the number of patients increasing for teleconsultation?**

.....

12. **In your opinion, what is the doctor's view on telemedicine?**

.....

13. **Are they paid for teleconsultation?** .....

14. **Are they satisfied with the pay?** .....

15. **Are doctors willing to use telemedicine services? If no, why?**

.....

16. **How is your experience with telemedicine?**

.....

17. **How is telemedicine consultation conducted?**

.....

18. **Who is responsible for conducting the consultation?**

.....

19. **Are there any official procedures (for patients or doctors) to be fulfilled before telemedicine consultation?**

.....

20. **If yes, please specify.**

.....

21. How many persons are involved in a telemedicine consultation? .....

22. How did collaboration with Apollo Hospital initiated?

.....

23. Does Apollo Hospital charge for the consultation? Please specify, if any.

.....

24. Can OM Hospital be linked with other hospitals or institutions having collaboration with Apollo Hospital?

.....

25. Please have your say on telemedical integration with Apollo Hospital.

.....

26. Do you feel that Apollo Hospital has been cooperative with Om Hospital?

.....

27. If no, why? If yes, please skip this question.

.....

28. Is the telemedical work documented? .....

29. Is the documentation in electronic or paper form? .....

30. If not documented, please specify why? .....

.....

31. Has telemedicine enhanced the quality of the service provided by the hospital?

.....

32. If yes, how? .....

.....

33. Has there been any change in work practice since telemedicine service started?

.....

34. If yes, how? .....

.....

35. What are the scopes of telemedicine in Nepal?

.....

36. What are the challenges that are faced during telemedicine implementation phase?

.....

37. What are the challenges that are faced during telemedicine running phase?

.....

38. Telemedicine Infrastructure:

a. **Room Space:** .....

b. **Personnel:** .....

c. **Instrumentation/Equipments:** .....

d. **Electricity Supply:** .....

39. How can we make Telemedicine program sustainable?

.....

40. How is governmental law or Act governing telemedicine?

.....

41. What do you think the government should do to raise the telemedicine program at the national level?

.....

42. What do you think the private organizations/hospitals should do to implement telemedicine program?

.....

43. What is the attitude of hospital administration towards telemedicine Program?

.....

44. Will telemedicine program be continued at OM hospital in the coming days?

.....

45. What is the role of IT in Healthcare in Nepal?

.....

46. Is there policies concerning IT development in Nepal?

.....

47. If yes, is it effective and well implemented?

.....

48. How can IT be made Influential in Nepal?

.....

49. How would you relate IT and Telemedicine?

.....

50. Please state about the past, present, and future of telemedicine at Om Hospital.

.....

.....

"Thank you for your RESPONSE"

Appendix 2: Interview Guide

Interview Guide

1. What was the main reason behind starting telemedicine project?
2. What were the motivations to run the telemedicine program?
3. What was the plan to establish the telemedicine center?
4. Who were the project members? And what efforts were made?
5. Who are the present members?
6. What were the challenges faced before telemedicine installation?
7. What was the total cost of the project?
8. Who funded the telemedicine project?
9. Was the funding amount sufficient to run the project?
10. Who is funding now?
11. Is there any government funding or support available?
12. How was telemedicine project being sustained?
13. How can telemedicine project be sustained in the future?
14. Is the telemedicine infrastructure sufficient?
15. What are the challenges faced during telemedicine running phase?
16. Who are the users of telemedicine?
17. How many patients have used the telemedicine consultation?
18. What types of consultation or for what diseases is telemedicine generally carried out?
19. How patients are made involved in telemedicine consultation?
20. What kind of procedure should the patient follow before teleconsultation?
21. What kind of form need to be filled in?
22. What are the patients' views on telemedicine?
23. Did they accept such service?
24. What is the cost of telemedicine consultation for the patients?
25. Are they willing to pay?
26. Can hospital provide teleconsultation for free?
27. What are the doctors' views on telemedicine?
28. What is the role of a doctor in a teleconsultation?
29. Are doctors paid for teleconsultation?

30. Are doctors willing to use telemedicine in the future?
31. All the doctors do not use telemedicine service, why?
32. What can be done to motivate doctors for using telemedicine?
33. How is telemedicine consultation conducted?
34. Who are present in the telemedicine session?
35. Is it conducted daily or on what basis?
36. What is the time period of each consultation?
37. Is record about telemedicine maintained?
38. Are records maintained in electronically or in paper form?
39. What are the views of administration/management towards telemedicine?
40. How is it worked on if any problems arise during telemedicine?
41. Why is telemedicine not running now?
42. Is it due to politics?
43. Is it now closed for long time or is it going to be open? When will it be functional?
44. What should be done to successfully run telemedicine program?
45. What are the advantages of telemedicine in Nepal?
46. How you perceive these as advantages?
47. What are the challenges of telemedicine in Nepal?
48. How can be such challenges negated or eliminated?
49. Does Nepal government have specific policy or program regarding telemedicine?
50. What role should government play for telemedicine development?
51. What role should donors play?
52. What is the feedback from Apollo?
53. How much will Apollo charge for each consultation?
54. How do you foresee future of telemedicine in Nepal?
55. What can be done to diffuse telemedicine in Nepal?
56. How is your experience with telemedicine?
57. How will be telemedicine shaped in coming days?
58. What can be done to make telemedicine easily accessible, available and efficient?
59. Please, can you say something about IT facility/service in the hospital.

Appendix 3: Letter from Telemedicine Department.

TO WHOM IT MAY CONCERN

I, hereby, confirm that Mr. Rudeep Piya (resident of Nepal), is a Master student at University of Tromsø, Norway. He is enrolled in a 2-year program in Master's in Telemedicine and E-health. He has successfully completed his first year and his results are very satisfactory. He is hard working and has good performance skills.

As a part of the curriculum in second year (Master's Thesis), he would do his fieldwork in Nepal. He requires 10 weeks (22nd June - 30th August) to fulfill his fieldwork. During this time period, he will carry out his qualitative study and collect data.

I would like to request you for helping him in conducting the study in the best possible way.

Sincerely,

Gunnar Ellingsen

gunnar.ellingsen@unn.no
Head of Department of Telemedicine and E-health
University of Tromsø, Norway.

10.06.09

Ren Kopi
10.06.09

DET MEDISINSKE FAKULTET
Universitetet i Tromsø, No-9037 Tromsø, tlf 77 64 40 00, e-post postmottak@uit.no, http://uit.no
førstekonsulent Lise Johansen, tlf 77 64 68 52, faks 77 64 53 00, e-post Lise.Johansen@fagmed.uit.no

Appendix 4: Permission Letter for Fieldwork.

OM HOSPITAL & RESEARCH CENTRE (P.) LTD.

Date: 7 July 2009

To Whom It May Concern

It is to certify that Mr. Rudeep Piya, Master's student at UiT, Norway; has been enrolled in this institution to carry out the field work regarding his Master's Thesis, for the period sought.

He is not obliged for ethical permission as no patients are involved in the study.

He is free to perform & conduct study as long as he obeys the rules & laws of this institution.

I hope for his best for the work & future endeavor.

Sincerely Yours

Bishwo B Rana
Officer-Information Technology

P.O.Box: 13494, Chabahil, Kathmandu, Nepal, Phone: 4-476225, Fax No.: 977-1-4466128
Email: omhrc@wlink.com.np, Website: http://www.omhospitalnepal.com

Appendix 5: Consent Form for Patient for Telemedicine Consultation.

Apollo Telemedicine

REGISTRATION FORM

PATIENT INFORMATION

Patient Name Mr./Mrs./Ms. : [redacted] Marital status (tick one) Single / Married

Date of birth: [redacted] Age: Sex: ☐ M ☐ F Telephone nos. : [redacted]

Permanent address:

UHID No.: IP No. [redacted]

City: Kathmandu State: Pin / ZIP Code: Country: Nepal

TO BE COMPLETED BY PATIENT/ATTENDANT/CONSULTANT

Choose Hospital referred to or want to connect:

☐ Indraprastha Apollo, New Delhi

☐ Any Other:

Specialization requested: Specialist to consult:

Clinical complaint/Diagnosis

TO BE COMPLETED BY TELEMEDICINE OFFICER

1. DATE & TIME OF CONSULT:

Name & Address of Center:

Contact person's name: Contact no. of Partner:

2. BILLING ACTIVITY:

Person responsible for bill: Address (if different): Phone no.:

Type of Consult: ☐ Telemedicine Same City ☐ Telemedicine Remote City ☐ Telemedicine Continued Care ☐ Telemedicine Critical Care ☐ Other

Amount Due:

Please select appropriate box	☐ Within Delhi	☐ Outside Delhi	☐ Outside Country		
Mode of payment	☐ Apollo Billing	☐ Partner	☐ Credit Card	☐ Reliance	☐ Any Other
Details of payment:	Date	Invoice no.		Amount paid:	

Signature of Operations Manager Date Time

GENERAL CONSENT

1. My health care provider has explained to me how the video conferencing technology will be used to affect such a consultation. I understand that this consultation will not be the same as a direct patient visit, due to the fact that I will not be in the same room as my health care provider.

2. I understand there are possibilities of technical limitations to this technology, including interruptions, unauthorized access and related difficulties. I understand that my health care provider or I can discontinue the telemedicine consult/visit, if it is felt that the videoconferencing connections are not adequate for the situation.

3. I understand that my healthcare information may be shared with other individuals for scheduling and billing purposes. Others may also be present during the consultation other than my health care provider and consulting health care provider, in order to operate the video equipment. All the above mentioned people will maintain confidentiality of the information obtained.

4. I further understand that I will be informed of their presence in the consultation, and thus will have the right to request the following: (1) omit specific details of my medical history/physical examination that are personally sensitive to me; (2) ask non-medical personnel to leave the telemedicine examination room; and/or (3) terminate the consultation at any time.

5. I have had the alternatives to a telemedicine consultation explained to me, and in choosing to participate in a telemedicine consultation, I understand that my physical examinations and tests may be conducted by individuals at my location, at the direction of the consulting health care provider.

6. In an emergency consultation, I understand that the responsibility of the telemedicine consulting specialist is to advise my local practitioner and that the responsibility of the telemedicine consulting specialist will conclude upon the termination of the video conference connection.

Patient/Guardian signature [redacted] *Date* [redacted]