# Chapter 7
# Technical Factors in Telemedicine Adoption in Extreme Resource-Poor Countries

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*Telemedicine..." It allows us to connect a patient to a doctor and it allows s to erase time and distance which is really the miracle of telemedicine*
– Jay Robbins, Director of Telemedicine Tift Regional Health System

## Introduction

This chapter discusses technical factors that influence telemedicine adoption in extreme resource-poor (ERP) countries. The adoption of telemedicine and the factors that influence decision-making can differ in ERP nations from more developed nations. Researchers, practitioners, and policy makers from more developed countries seeking to implement telemedicine programs in the developing world often take for granted differences in contextual factors between countries. While some of these factors can be political, social, and cultural, this chapter will describe additional technical factors that can influence telemedicine adoption.

While the medical community is increasingly embracing the use of telemedicine in developed countries, there are still factors that limit telemedicine adoption globally. There is an increase in the adoption of telemedicine. Developed countries such as the United States have seen an increase in telemedicine adoption [1, 2]. Growing use of telemedicine has led some global business analysts to project the telemedicine market to develop into a 66 billion USD industry by 2021 [3]. Despite this growth there are still factors that limit the widespread adoption of telemedicine [4].

The growth in the telemedicine market has been seen as a positive sign, particularly for the potential impact on increasing access to medical care in developing countries [5]. Telemedicine adoption has historically been viewed as a way to

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reduce costs and increase access to care [6]. While the benefits of telemedicine in a growing global market should signal an increase in opportunities for access to medical care, this isn't always the case. In some places the medical community can be reluctant or outright resistant to the adoption of telemedicine [7]. Further, more recent findings have challenged some of the previous assumptions about the benefits of telemedicine. For example, by surveying the literature, reviewers found that long-held assumptions about the cost benefits of telemedicine can actually vary based on context [8]. Contextual, sustainability, legal, and cultural factors are among the differences that influence telemedicine adoption between developed and developing countries [9].

In developing countries, there are many differences to consider, and to a certain extent, many of these challenges become even more significant in ERP nations. In many ERP nations, telemedicine adoption may be considered the only available option to providing needed medical services. Medical professionals in ERP nations may lack the training and equipment to perform many life-saving medical procedures [10]. Distances between care centers and the high cost of medical care may place medical care beyond the reach of many patients in ERP nations. To address these challenges, the perceived benefits that telemedicine provides make it an increasingly attractive solution. This is especially the case in many low- and middle-income countries where telemedicine is viewed as a means of improving access to medical care where there is a lack of professional services [9]. However, even in these contexts, the benefits of telemedicine can vary.

The variety of telemedicine services may make some more appropriate than others in ensuring the success of projects [11]. Among the methods in which telemedicine has been used in ERP nations is to connect medical personnel along with diagnostic and monitoring equipment from developed countries to centers that lack similar well-funded resources in developing countries. For instance, in philanthropic efforts universities and not-for-profit agencies often institute telemedicine programs and research to provide medical expertise in ERP nations. Some of these groups organize medical trips to provide these services. By connecting medical personnel in developed countries to those in ERP nations, these groups often attempt to use telemedicine to address the issues presented by the lack of resources. Some of the findings that will be discussed in this chapter are part of a similar philanthropic research effort conducted in Haiti.

This chapter will discuss some of the contextual challenges that were observed during the implementation of a telemedicine project in Haiti and relate the experiences to similar challenges in the literature. The discussion focuses mainly on telemedicine services provided between institutions as opposed to being provided directly to patients. Key findings from experiential data collected in the development of a telemedicine program in Haiti will be discussed. This study expands on our previous work that included sustainability as a factor and considers the need for steady IT infrastructure, comprehensive ease of use, information completeness, technical service quality, and a solid IT support/service system.

## Telemedicine Adoption

Telemedicine is a broad term that can encompass a variety of other terms such as telecardiology, telepathology, teledermatology, etc. [12]. Due to the lack of consensus on the terms' meaning, there are differing opinions on what telemedicine actually consists of. A broader discussion on the characteristics that define telemedicine is beyond the scope of this chapter. However, definitions of telemedicine center around four themes that include medical, technological, spatial, and benefit components [13]. Those interested in learning more about the evolution of the telemedicine terminology are encouraged to review the research conducted by Oh and Rizo [14] and Sood and Mbarika [13].

Telemedicine adoption has varied throughout the years. During the early years of telemedicine, there were concerns over its ability to successfully provide health services, education, and support [15, 16]. Because of the concerns from the medical community, adoption lagged. Issues such as liability, interstate licensing, insurance coverage, and payment policies served as some of the greatest barriers to early adoption [17].

However, the concerns over telemedicine adoption were not universally shared. Researchers found that views of telemedicine along with potential motivators for use varied among different stakeholders [18]. Research began to suggest that despite the concerns raised, there were a number of advantages for telemedicine adoption. For example, telemedicine could improve healthcare education along with access to and delivery of care [19]. More research findings began to demonstrate the real advantages of telemedicine. Among these are improving access to information, enhancing education and training, assisting in providing care where previously unavailable, improving access to services and the delivery of care, greater control over the quality of screening programs, and reducing costs for care [9, 11, 19–21]. Some studies challenged conventional thinking by showing that in certain contexts there are advantages for telemedicine over conventional medical approaches [20, 21].

Yet despite the potential advantages of telemedicine, there are still a number of issues faced by adopters [19]. Among the issues that can limit the adoption of telemedicine are governmental policies, resistance to change, and limited knowledge and skill [22]. Knowledge, skill, and readiness to move toward telemedicine can limit the adoption of telemedicine services [23]. In addition, environmental changes and funding can put the sustainability of telemedicine efforts at risk [10]. Adoption can also be impacted by the tools, applications, and equipment used to provide telemedicine services. Telemedicine usage can be inconvenient, driven by unreliable or inappropriate tools, and costly to access and implement due to high telecommunications requirements [24, 25]. These issues can create strong resistance toward adoption by both patients and practitioners.

In order to examine these issues and advantages, some researchers have attempted to model the adoption of telemedicine. The technology acceptance model (TAM), for instance, has been used by a number of researchers to explain accep-

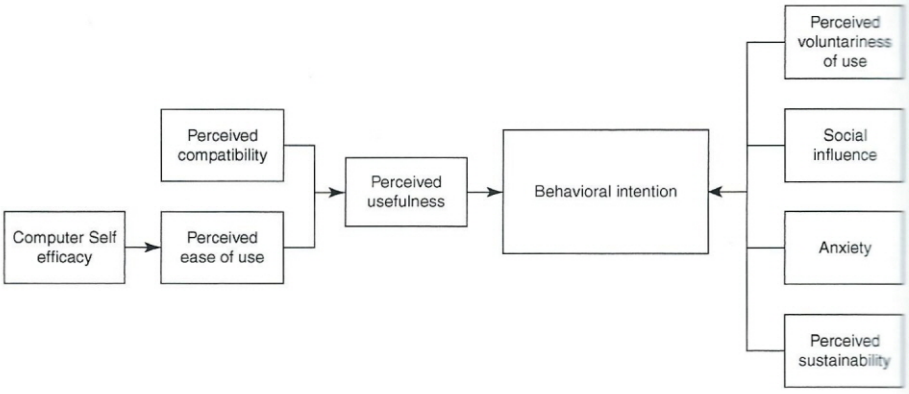


**Fig. 7.1** Adoption model based on results by Adelakun and Kallio [10] and Kifle and Payton [32]

tance of telemedicine [26, 27]. However, the results can vary, and findings suggest that there are contextual components that impact user perceptions of telemedicine and their decision-making [26, 28]. Some research findings have demonstrated some of the influence of some of these contextual components. For example, researchers have shown that different provider groups using similar telemedicine services may not view adoption the same when used in different contexts [18, 29]. Further not all technologies may have the same impact on outcomes and may impact existing medical practices differently and may not always be considered in adoption models [30, 31].

Other contextual factors can include those specific to developing nations and extreme resource-poor (ERP) countries. Kifle and Payton [32] showed how contextual factors in Ethiopian telemedicine services could play a role in behavioral intention. Based on experiences in Haiti, researchers examined the use of this model and expanded it to include sustainability factors [10]. This model is shown in Fig. 7.1. The discussions in this chapter expand on previous studies for development in ERP countries by examining technical aspects of adoption.

## The Case Study in Haiti

In January 2010, Haiti suffered a devastating earthquake that disrupted an already fragile medical system. The earthquake led to a number of issues such as a lack of clean water, electricity, food, and an urgent need for medical services. Roadway and building infrastructure was also damaged during the earthquake making it difficult for Haitians to gain access to resources. Because of the extreme poverty rates in Haiti, recovery from the earthquake was an ongoing process.

Between January 2014 and August 2015, the lead author and other coinvestigators made several research trips to Haiti in order to implement a telemedicine service. The service was set up to connect a Haitian hospital to a university in the

United States. The study was financed through a university pilot grant. In January 2014, university researchers visited Haiti and identified a need for telemedicine services to address a lack of training availability. Researchers designed a program in which medical practitioners in the United States would provide both on-site and telemedicine training to Haitian medical teams. Training would be conducted through video and specialized software. Haitian staff members participating in the training would perform on-site wound care based on training received from US counterparts. US counterparts would also collaborate with Haitian medical staff on managing cases and receive reports on results.

During the implementation of the telemedicine services, researchers originally based their efforts on existing theories of adoption used in the United States. However, during the course of their work, researchers observed that there were differences between existing approaches and the on-ground realities in Haiti. Challenges faced in the implementation of telemedicine services in Haiti included a lack of equipment, poor Internet connectivity and infrastructure, a lack of stable electricity, and issues with funding.

A more thorough discussion of the project can be found in [10]. Based on experiences encountered in this case, some of the issues facing telemedicine adoption in developing and ERP nations will be discussed and recommendations provided in the following sections.

## Technical Factors that Will Promote Telemedicine Adoption

This section focuses on technical/system factors that promote the adoption of telemedicine in ERP countries. These factors are based on literature review and empirical findings from the telemedicine implementation project in Haiti. While the literature has covered many factors that promote the adoption of telemedicine, this paper focuses just on the technical factors. We have defined technical/system factors to include the following: (1) resources and infrastructure, (2) technical service quality, (3) end user support, (4) comprehensive ease of use, and (5) information completeness. These factors are technical in nature covering a wide range of things from application interface design to network architecture that support the telemedicine system. While this research understands that there are other factors that promote the adoption of telemedicine in ERP, we have decided to focus on the technical factors in this paper.

## Resources and Infrastructure

Among the challenges in implementing telemedicine services in ERP nations are the differences between resources and infrastructure. Other researchers discuss these as contextual factors [9]. However, some researchers consider contextual

factors as broad and can include different variables such as competition, age of organization, and size [33]. Because of the technical focus of this chapter, only resources and infrastructure in relationship to the technical aspects of telemedicine adoption in ERP countries are considered. In this text a distinction is made between resources and infrastructure. Resources are considered the components of a system such as computers, switches, routers, etc. [34]. Infrastructure is considered the set of shared IT resources that serves as the foundation for communication and implementation of business applications across organizations [35]. These will be discussed further in the following sections.

## *Resources*

One of the main issues with access to telemedicine in developing countries is the access to computing resources. The lack of "material access" to computing resources is a common occurrence in many developing countries [36, 37]. For many in Haiti, access to computing and networking equipment can be either very limited or nonexistent. Access to equipment at hospitals can suffer due to the costs alone [38]. Government restrictions, regulations, delivery time, and secure access privileges also need to be considered.

For example, during researcher visits to Haiti, additional equipment was needed to set up network services. While Haitian medical partners were eager to work with US counterparts, the lack of available funding for trial projects is limiting. Using funds provided through a US research grant equipment and other resources would be purchased for the project. Initial thoughts were on purchasing the products in Haiti. However, the lack of knowledgeable staff on technical equipment requirements, lack of local vendors, along with delays on delivery, etc. made it preferable to order products directly in the United States.

In terms of considering purchases for telemedicine in developing nations, practitioners should consider where and how resource acquisition will occur in addition to the type of resources needed. Companies exporting products to different countries often have a number of legal requirements they have to fulfill as part of export regulations. In places where sanctions are in place, certain resources may not be available, and alternatives may have to be investigated. Further, companies often also have to undergo extensive internal processes that delay the delivery of different products.

Further the type of technology available for telemedicine projects may vary based the country. The distinct technical profile of each country may make some technologies and telemedicine approaches more appropriate than others. For instance, unlike in more developed nations where patients may have access to computers, many in ERP countries rely on mobile devices for their computing needs [39]. This may make telemedicine services for patients that rely on traditional computing devices unfeasible. Yet the same issues can apply to mobile services in some nations. Although more recent investigations are showing the feasibility of using

mobile devices for telemedicine, the actual ground truth may differ. While Haitians may have growing access to cellphones, the actual usage may differ from the usage in more developed nations. Many people in developing countries may use cellphones similar to landlines. In some places those who cannot directly afford cellphones may rent time to use one from a local vendor similar to pay phone usage. Even for those who own cellphones, the usage may vary due to data plans and connectivity [39].

## *Infrastructure*

Unlike in more developed nations, many developing nations may not have the infrastructure to support certain telemedicine initiatives. The success of telemedicine projects depends on the availability of certain infrastructure. Infrastructure can include organizational, funding, and technical requirements. This discussion will focus mainly on the technical infrastructure necessary to set up telemedicine services. Unlike other forms of medical technology, telemedicine services cannot function without the support of technical infrastructure.

### Life Support Networks

Critical infrastructure can be considered part of an interconnected network of dependencies. These dependencies can have impacts on the realization of other systems. Mili [40] describes many of these connected networks as life support networks. These networks allow the delivery of essential services such as water, electricity, etc. These can include electricity, natural gas and fuels, potable water and wastewater, telecommunications, and transportation.

In many developing countries, the lack of stability and reliability of these networks presents challenges. Many regions may suffer from rolling blackouts, for instance [41]. These blackouts may degrade the reliability of store and forward systems or disrupt real-time teleconferencing. Further in certain areas, this may limit the ability to provide cooling for key hardware resources that may be essential to telemedicine.

However, some infrastructure challenges may also serve as catalysts for telemedicine interventions. Many regions in the developing world may not have adequate transportation networks to and from medical institutions. In these cases, the ability to set up telemedicine services may provide critical access to care where otherwise unavailable.

Because of the variations in life support infrastructure, developers of telemedicine systems should consider the availability of resources in the system design. Life support infrastructure can inform both the need for telemedicine services and the requirements for implementation. For example, lack of transportation infrastructure can suggest the need for certain types of telemedicine services such as those that

allow remote patients to better connect with medical providers through conferencing. At the same time, however, places that lack developed transportation infrastructure may not have reliable wired access and may require the need for off-site setups or wireless network infrastructures.

### Telecommunications Networks

Among the major challenges to telemedicine services in developing countries can be the telecommunications infrastructures. Telecommunications infrastructure in developing nations can vary based on region. The lack of access to telecommunications can result from a variety of reasons. Challenges can include lack of research and development, the invisible hand of investment and policy, and lack of internet exchange points [42].

Some countries have only recently begun investing in network infrastructure, and this can present additional challenges. The relative infancy of telecommunications services in developing countries requires additional investigation into the type of regulations that govern services [43]. Regulations can impact not only the ability to connect to network services but issues for consideration such as privacy and security [44]. The lack of access to telecommunications infrastructure in many developing nations can also affect the relative affordability of services [45]. Unlike in developed nations where the infrastructure already exists to implement many network services, the lack of infrastructure can require additional investment to address. For example, in a place like the United States where an extensive internet backbone exists for broadband connections, it can be affordable to connect a new facility to the network. However, in places such as Haiti where infrastructure may have been destroyed from natural disasters or not have existed in the first place, these connections require additional investment or may not be achievable.

To overcome these challenges, many in developing nations are increasingly investing in wireless technologies. In some cases, the lack of existing telecommunications infrastructure may open up opportunities for investment in newer technologies. In ways this can allow developing countries to essentially leapfrog over neighbors in utilizing advanced services [5, 46]. Wireless technologies such as cellular technology are becoming increasingly common as alternatives to wired services in developing countries [47]. However, the bandwidth and coverage limitations of common mobile network technologies such as CDMA and GSM may limit their usage for certain telemedicine applications. Applications that require higher data throughput or distance from base stations may require alternatives. Some broadband alternatives that have been tested in practice include newer mobile services such as Worldwide Interoperability for Microwave Access (WiMAX), Wireless Fidelity (Wi-Fi) services, and very small aperture terminals (VSAT) [48].

The type of network infrastructure should be a key component of the design of the telemedicine service. Often in telemedicine projects, the host resources are provided through servers in more developed areas. In the cases when telemedicine services are developed between nations, the host of the telemedicine services is

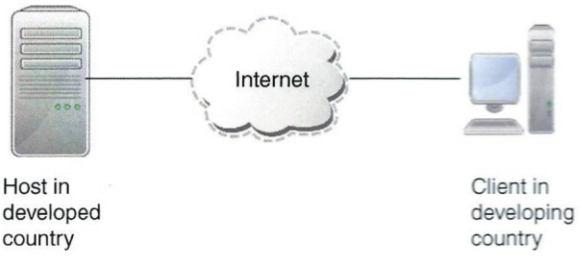


**Fig. 7.2** Image showing typical distribution of telemedicine services

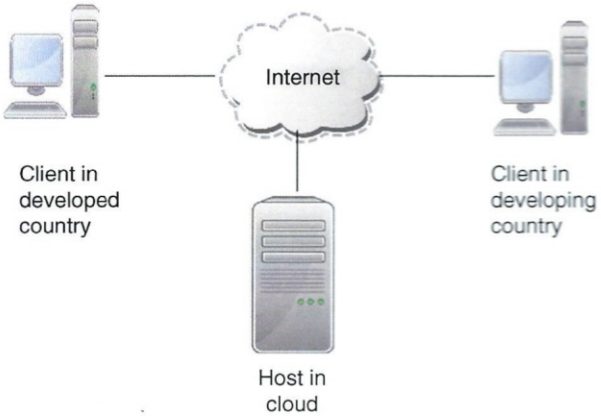


**Fig. 7.3** Model showing telemedicine services in cloud hosting environment

often placed in developed countries as opposed to the developing country. Figure 7.2 shows a typical telemedicine distribution network for ERP countries.

In this example the host of the telemedicine services is in a developed country, and the client accesses content by connecting to the host through the Internet. There can be a variety of reasons for this such as costs, network stability, security, etc. However, there are cases where this approach may not be ideal.

As opposed to hosting the server at a host site, another possible solution is to set up resources on cloud services. The advantage of cloud services is that issues faced by either partner may not directly impact the availability of resources. Figure 7.3 shows an example of this model.

While cloud services can provide a solution, often cloud services exist outside of the Haiti backbone network that connects Haiti to the larger Internet. Connections between the Haiti backbone network and the Internet backbone can fluctuate. This can cause connection issues that limit the ability to connect to cloud services within Haiti.

Even more connectivity between the organization and backbone network is not guaranteed. Due to network connectivity issues like these, often the ability to access resources outside of a medical institution in developing countries may be limited. Depending on the type of services required, connections to resources in developed countries may be limited, or bandwidth may be more critical within the organization than outside. Figure 7.4 shows another type of model in which the telemedicine services are hosted in the developing country.

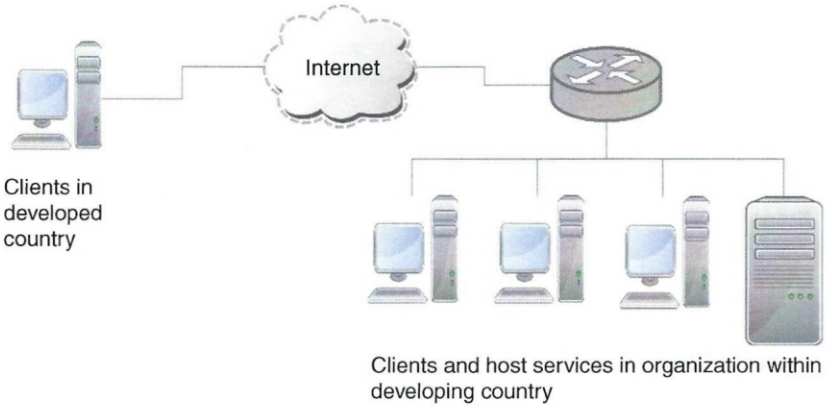


**Fig. 7.4** Showing model in which telemedicine server is hosted in developing country allowing both internal and external access

This model provides advantages in the case where critical or bandwidth heavy resources may be necessary in developing countries. For instance, part of the services provided to Haiti included a 3D modelling visualization tool for training. The tool was both process and data intensive. Having the services run on a remote site produced considerable lag and delay as large amounts of data needed to traverse the network into a low bandwidth connection. Further, at times in which network connectivity was an issue, partners in Haiti were unable to access training resources. A potential solution to this would be setting up the visualization tool on the local organization's network. This would provide greater access to those within the Haiti medical institution while still providing access to remote trainers in the United States.

However, a disadvantage of this approach is that issues with network connectivity within the organization or from the backbone network to the institution will impact the remote client. Another alternative is to connect to telemedicine services using a local cloud service provider. For instance, some companies in developing countries are beginning to provide cloud services that include private services that can potentially be adopted by medical institutions [49]. If the local cloud services exist within the countries' network backbone, then some of the connectivity issues will be limited for medical institutions in developing countries. This can provide an alternative to hosting the services within the local institution if connectivity to the countries backbone is not an issue and there are concerns about local hosting within the institution. Yet, this approach still suffers in the cases when connectivity to the countries' Internet backbone is an issue. An example of this approach is shown in Fig. 7.5.

Another potential alternative is using a hybrid approach. As opposed to hosting all telemedicine services at one site, services can be divided between institutions based on need and existing infrastructure. For example, in the Haiti effort reports on training completion and progress were collected. While this data was not critical to

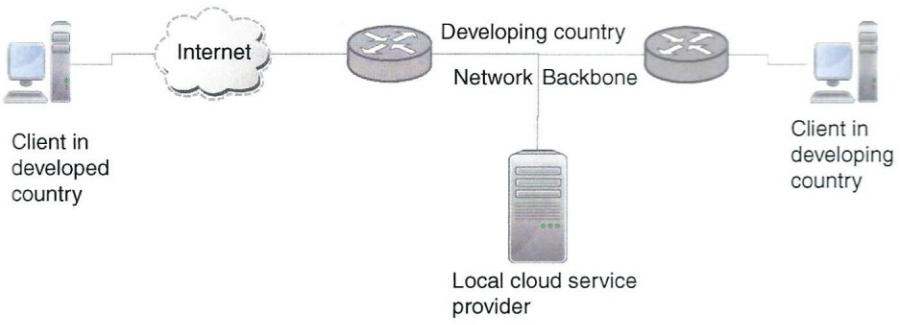


**Fig. 7.5** Showing model in which telemedicine server is hosted in developing country on national cloud

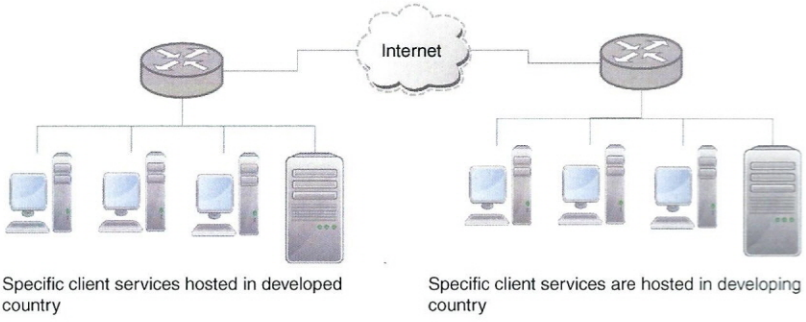


**Fig. 7.6** Showing hybrid model where telemedicine services are distributed between both developed and developing nations

the medical training conducted by Haitian partners, it was important for the research aspects of the study. However, the low bandwidth and priority requirements of text document reports could be transferred to a server in the United States with little issue. Even with connectivity issues, the data could be transferred during nonpeak hours or when connectivity was more stable. Yet the network connectivity issues could cause problems for researchers for on-demand access. In this case placing a server for reporting in the developed country would make sense. At the same time, the requirements of the 3D visualization tools for trainees that have high bandwidth requirements could present issues if hosted on a US server. As the US side did not require access to the training software, it would make little sense to host those services in the United States. Because of the different requirements, this could be a case where a hybrid model would be more appropriate. However, hybrid models can also present additional challenges in relation to costs, complexity, governance, and support allocation, among others. In addition, not all services can be broken down into different components. Hybrid approaches might be more appropriate when using best-of-breed solutions as opposed to integrated telemedicine solutions. The hybrid approach is shown in Fig. 7.6.

## Technical Service Quality

The user views of the quality of a telemedicine system can consist of multiple dimensions [50, 51]. The perceived quality of a telemedicine system can impact user perceptions and satisfaction with the end results. Unlike other medical technologies, telemedicine systems provide multiple services that a user has to evaluate. These services can include informational, medical, and technical. The technical services provided by a telemedicine system can be influenced based on the software, hardware, or underlying network infrastructure used. In the case of telemedicine in developing countries, one of the biggest challenges to technical service quality can be the underlying network infrastructure.

Figure 7.7 shows the relationship between these services. In the figure, the technical service is expanded to demonstrate the relationship between hardware, software, and network infrastructure to technical services. There are other components that can influence the quality of technical services that are not included such as support, net benefits, etc. Further the extent of the relationships is not considered. The illustration is mainly provided to view how these factors relate.

Access to quality telecommunications networks can vary. Some regions have little, if any, access to infrastructure that can provide telecommunications services [52]. In other places access can vary in terms of reliability and connectivity [53]. The reliability of systems can influence overall user perceptions of the quality of a telemedicine system [30, 51, 54].

In ERP countries such as Haiti, service quality might be one of the most important adoption and sustainability factors. For instance, during our implementation of telemedicine services in Haiti, researchers constantly ran into service issues

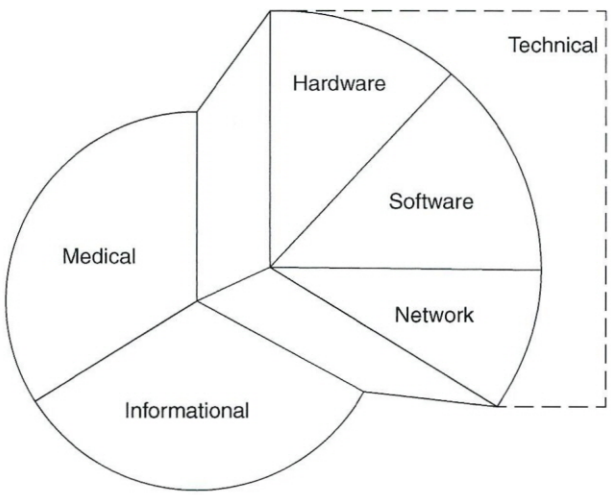


**Fig. 7.7** Showing three prime telemedicine services and expanded view of technical services quality considerations

with telecommunications networks. The connectivity and reliability issues made it impossible to deliver high-definition anatomy lectures by video to remote students. Issues such as network lag, low bandwidth, and service disruptions limited the ability to provide high-quality video lectures. These experiences are not unique. A report by the World Health Organization supports these views of challenges to telemedicine adoption. The report mentions issues such as unreliable Internet connectivity, limited bandwidth, and insufficient communication networks as presenting barriers for the adoption of telemedicine in developing countries [55].

For telemedicine implementations, the quality of service needs to be taken in relationship to the goals of the service. Some functions may not require as high-quality services as others. For instance, many store and forward applications can be designed in a way where data caches can be uploaded periodically when network resources are not in prime use. On the other hand, for real-time services such as real-time video monitoring, bandwidth becomes a critical consideration. Depending on the quality required for the monitoring, different adjustments have to be made to the design of the system.

## End User Support

Among the factors that influence user satisfaction with telemedicine services is the perceived quality of user support [51]. Users of systems often have limited knowledge on the use or setup of systems, and therefore support is often required [56]. For telemedicine the type of needed support can vary based on the type of service provided. A telemedicine system that is entirely based in one host country will have different support requirements than one that is spread between nations or utilizes cloud services.

For many countries, particularly ERP nations, there are limited numbers of technical professionals that are available to implement or make use of network connectivity. Many developing nations do not have the trained workforce necessary to develop and maintain large telecommunications networks at reasonable costs for broader adoption [57]. Although policy makers may be determined to invest in telecommunications infrastructure, they may lack the knowledge of "best practices" and the trained workforce necessary [58]. To complicate matters more, many developing nations often have to compete with developed nations to maintain their talent and avoid the impacts of "brain drain" [59]. The lack of a trained technical workforce can also have implications for both the organizational telemedicine network services and the external telecommunications services used to connect partners.

This requires additional planning on behalf of those interested in implementing telemedicine services. System designers should consider how support will be provided and make the necessary arrangements. Support should be considered not only for internal infrastructure but also for external as well. Prior to implementing a

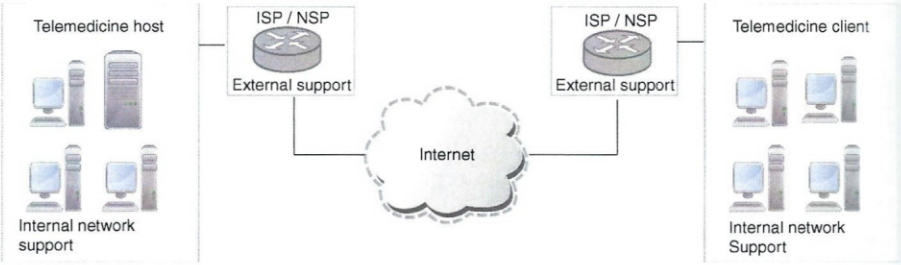


**Fig. 7.8** Image showing support considerations for telemedicine services on client/host model

telemedicine service, developers should consider how the service itself will be supported on all endpoints. Figure 7.8 shows possible support considerations for a telemedicine network.

## Comprehensive Ease of Use

One of the most cited reasons for technology adoption in information technology literature that influences technology acceptance and adoption is perceived ease of use [60]. Users of technology products tend to not want to focus their time and effort on learning to use a new product. Instead users tend to want to use their time in achieving the goals that a product allows. Therefore, the technology design must be easy to use or perceived to be easy to use. In regard to telemedicine, Garcia and Olayele [51] noted that ease of use is defined as the extent to which patients feel using the system will reduce their physical and mental effort. While traditional approaches tend to examine ease of use in relationship to particular software or system configurations, observations in Haiti suggest that more comprehensive investigations are necessary.

During the research endeavors in Haiti, researchers from the United States set up network and client equipment for use by Haitian colleagues. Although software packages and system components were chosen for their learnability and ease of use, there was a major factor that the team did not consider. This factor was the ease of setup. Ease of setup has been discussed in regard to telemedicine in other research [61].

The challenges with ease of setup were observed firsthand in Haiti. Due to concerns by Haitian colleagues over the security of the systems and possible theft if the equipment was left unattended, they would occasionally disconnect the equipment and lock it away. However, this would occasionally lead to challenges for the Haitian team when technical support was unable to provide assistance to medical providers with reconnecting the equipment. As discussed previously, there are often limited number of people with the technical skills to provide advanced support. Further among those that are available, many often have limited time to address all the challenges faced in medical institutions.

Ease of setup and maintenance are among the concerns discussed in previous studies on telemedicine in developing nations [62]. Because of the variations in possible telemedicine setups and the unknown requirements faced by partners in developing nations, it is recommended that a comprehensive approach be taken when examining ease of use. This comprehensive approach should integrate both ease of use and ease of setup and maintenance.

## Information Completeness

Another factor that should be considered in the development of telemedicine projects in developing countries is information completeness. Information completeness is the degree to which someone feels they have access to all the information they feel is important for evaluating the medical care, conditions, and procedures the telemedicine service provides [51, 63, 64]. While telemedicine can increase access to information [19], a lack of information completeness can cause gaps in expectations and lead to dissatisfaction [63]. This can be especially problematic when dealing with partners from different organizations in different countries, where trust is important to relationship building and influences the continuance of projects [65]. In terms of technical services, it is important to ensure the technology usage is transparent and mutually beneficial to partners in developing nations. Technology services should provide access to the information resources necessary so that partners can evaluate the results of their efforts.

## Conclusion

The primary goal of this paper is to present the key technical factors that will contribute significantly to the adoption of telemedicine in ERP countries. This data for this analysis is based on an experiential case and telemedicine implementation project in one hospital and a university in Haiti. Based on an in-depth literature review and our exploratory data, we have concluded that at least four factors must be present to ensure the adoption of telemedicine in an ERP country.

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