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ADOPTION OF TELEMEDICINE IN VIETNAM

– CASE STUDY NEWTEL



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The aim of this study is to draw an overall picture of Telemedicine and its adoption on the healthcare industry in Vietnam. Telemedicine indeed is able to bring many potential benefits to the healthcare system; however, the application of Telemedicine in Vietnam is not significant. In order to know the reasons behind, this study considered Telemedicine as an innovation and applied Diffusion theories and frameworks by Rogers (1982) and Greenhalgh (2004) into analyzing the adoption of Telemedicine in Vietnam background. Moreover, this study also used the disruptive theory from Clayton Christensen in order to give a prediction on the future of Telemedicine in Vietnam.

With the qualitative method, the study approached the issues and collected data through in-depth interviews with medical professionals from metropolitan hospitals in Vietnam, some of them had already been experimenting Telemedicine in the workplace, and some were acknowledged about Telemedicine but had no experience. The study pointed out some factors that encourage the adoption of Telemedicine such as the perceived visible benefits of Telemedicine, the positive attitudes from the caregivers, the efficient infrastructure, cultural factors etc. Besides, there concluded some factors that restrict the adoption of Telemedicine such as the lack of guidelines from government, the norms/perception about the importance of physical proximity and the misdoubt in the quality of Telemedicine diagnosis devices, the possible high price of the system and the vague managerial attitude in making decision in healthcare organizations. In addition, the study also made a conclusion on the potential of Telemedicine to disrupt the healthcare system in Vietnam. The disruption can happen only if there exist Telemedicine systems with reasonable prices that are able to gain the realiance from the caregivers.

KEYWORDS:

Telemedicine, Vietnam, Newtel, Medicine, Technology, Distance care, Healthcare

CONTENT

LIST OF ABBREVIATIONS (OR) SYMBOLS	5
1 INTRODUCTION	6
1.1 Research background	6
1.2 Research problem	7
1.3 Research motivation	8
1.4 Research objectives	8
1.5 Research scope and structure	9
2 LITERATURE REVIEW	10
2.1 About telemedicine	10
2.1.1 Definition of Telemedicine	10
2.1.2 Applications of Telemedicine	11
2.1.3 Benefits of telemedicine in developing countries	12
2.1.4 Telemedicine as an innovation in Healthcare	13
2.2 Adoption of telemedicine	14
2.2.1 Diffusion of innovation theories and application to the case	15
2.2.2. Potential impact of the adoption of Telemedicine as a disruptive innovation	27
3 NEWTEL'S BUSINESS	31
4 METHODOLOGY	33
4.1 Choice of Research Methodology	33
4.2 Sampling method	34
4.3 Data analysis method	36
4.4 Limitations	37
5 DATA ANALYSIS	38
5.1 General information about the data	38
5.2 Diffusion of Telemedicine in Vietnam	39
5.2.1 Perceived innovation characteristics	39
5.2.2 The adoption process as engaged or not by individual	44
5.2.3 Inner and outer organizational context	46
5.2.4 Communication, influence and dissemination	48
5.2.5 Summary on the factors that encourage/restrict the adoption of Telemedicine in Vietnam	49
5.3 Impact of the adoption of Telemedicine in Vietnam	51
6 CONCLUSION	54

APPENDICES

Question Guidelines

TABLES

Table 1. Four main elements of diffusion adopted from Everett M. Rogers (1982)	15
Table 2. Distinguishing Characteristics of Sustaining and Disruptive Innovations (Clayton Christensen, 1997, 2003)	28
Table 3. Interviewees, background, interview method	38
Table 4. Perceived innovation characteristics from interviewees	44
Table 5. The adoption process	46
Table 6. Inner and Outer context	47
Table 7. Rationale on the perceived characteristics of Telemedicine in Vietnam collected from interviews with the characteristics of Disruptive innovation adopted from table 2	51

FIGURES

Figure 1. A Conceptual Framework for Innovation in Healthcare (Omachonu and Einspruch, 2010)	14
Figure 2. Adopter categories based on relative time of adoption (Rogers, 1982)	17
Figure 3. A Model of 5-stage in the innovation decision process (Rogers, 1982)	17
Figure 4. Spread and sustainability of innovation in service delivery and organizations (Greenhalgh et al., 2004)	19
Figure 5. Disruptive innovation model (Clayton Christensen, 1997)	27
Figure 6. Newtel Cloud (Newtel, 2015)	32

PICTURE

Picture 1. Psychological antecedents of the adoption decision (Greenhalgh et al., 2004)	24
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LIST OF ABBREVIATIONS (OR) SYMBOLS

ICT	Stands for Information and Communication Technologies
Caregivers	In this paper, the term will be used for the healthcare providers/practitioners such as doctors, clinicians, physicians, etc.
HCMC	Stands for Ho Chi Minh City.

1 INTRODUCTION

Healthcare is always an important factor mentioning the measures of the well being of a nation. It lies as one of the top 3 amongst 16 indicators for The Index Social Health, the Index created by the Fordham University Institute for Innovation in Social Policy, which has been using to monitor the social well being of American society since 1987 (Institute for Innovation in Social Policy Institute for Innovation in Social Policy, 2011). Besides, Wagstaff (2002 cited in Eckersley et al., 2001) proved that a good healthcare system could help to reduce poverty, since poverty would result in ill health and ill health would be a contribution to poverty. Therefore, ensuring good healthcare services would be one of the top concerns for governments to escape from poverty and enhance people's well being, especially in developing countries.

However, according to a research by Peter, et al. (2008), poorer people tend to have less access to healthcare services, which initially shows that poverty and lack to healthcare service would altogether create an infinity loop in developing countries. This showed how lack of healthcare availability has constantly been an issue for those developing countries.

1.1 Research background

As a developing country, Vietnam shares the same issue in lack of access to healthcare. According to World Health Organization (2015), 70,3% of the population in Vietnam is living in rural or remote areas and, unfortunately, there is inequality between the healthcare service in urban and rural areas. Shorbert (2014) pointed out that most of doctors in Vietnam gather in urban areas instead of staying in remote areas. A vast majority of metropolitan hospitals are located in big cities like Hanoi and Ho Chi Minh City (HCMC)- Hanoi and HCMC have 38 out of 43 central hospitals but the population accounts for only 16% of the total population (Solidiance report on Vietnam Healthcare Landscape, 2015). Meanwhile the provincial hospitals are lacking more advanced

infrastructure and technology as well as high-skilled doctors and healthcare professionals. These factors altogether result in the lack of appropriate care availability in rural and remote areas. These factors also influence patients' decision to skip district and commune facilities to get treatments at provincial and central hospitals, which results in additional costs such as higher treatment expenses, travel expenses, accommodation expenses for companions etc.

Even in urban areas, Vietnam is experiencing a medical personnel shortage – doctors are hard to come by in rural areas and even in urban centers, physician and medical personnel supply still fall far under the demand (Shorbert, 2014). The patient transfer from rural and remote areas also caused the over-capacity at central hospitals in Hanoi and HCMC, which caused the beds occupancy rate of more than 110% at central hospitals during the year from 2009 to 2011 (Solidiance report on Vietnam Healthcare Landscape, 2015)

1.2 Research problem

Telemedicine seems to be able to address this issue in developing countries, and especially in Vietnam. According to a Report on the second global survey on eHealth by WHO, 2010: *"Telemedicine holds great potential for reducing the variability of diagnoses as well as improving clinical management and delivery of health care services worldwide by enhancing access, quality, efficiency, and cost-effectiveness. In particular, **telemedicine can aid communities traditionally underserved – those in remote or rural areas with few health services and staffs** – because it overcomes distance and time barriers between health-care providers and patients"*.

Telemedicine is not a new topic, there are several studies conducted to find the best way to popularize the use of telemedicine to improving healthcare outcome, especially in developing countries such as Telemedicine in Developing countries (Woototon, 2001), the study of the Development of Telemedicine Technology in India (Sood and Bhatia, 2005) etc. However, it is still a new concept in Vietnam and there are not many recognizable studies regarding Telemedicine, especially on its adoption on Vietnam background.

1.3 Research motivation

According to my personal preferences, including huge interest in technology as well as great concern on social related issues, I was really interested in this topic about Telemedicine. During my research for the thesis topic, I found out some information regarding Newtel, a startup based in Vietnam. Newtel has the idea to develop a Telemedicine system that provides cheaper care service using Information and Communication Technologies (ICTs). During the fourth quarter of 2015, Newtel made great efforts to have their system tested in some metropolitan hospitals in Vietnam. I then tried to get in contact with Newtel to learn more about their system – the Newtel Telemedicine solution and was lucky enough to have Newtel interested in the research topic and agreed to provide me with necessary information. Therefore, the topic of the research was chosen according to the author's personal interests and a coincident acknowledgement of Newtel - a leader in developing Telemedicine systems.

1.4 Research objectives

With a lot of potential benefits, Telemedicine services are able to transform the healthcare service delivery in Vietnam. The development of Telemedicine in Vietnam with Newtel as the pioneer is truly showing hopes for the acceleration of healthcare service in Vietnam. As being on its very first stage in bringing the product to the market, Newtel's concern is now directed to the adoption of its system. In this thesis, I would like to carry out a study about the adoption of Telemedicine as well as Newtel's solution in Vietnam, **putting the legal factors aside**. The goal of this thesis is to provide an answer to a big question:

How can Telemedicine and specifically Newtel's solution being adopted in Vietnam?

In order to complement this big question, there needs to answer 2 sub-questions:

1. What are the factors that encourage/restrict customers to adopt telemedicine and more specifically Newtel's solution in Vietnam?

2. What is the potential result in adopting telemedicine and more specifically Newtel's solution in Vietnam?

1.5 Research scope and structure

Since Newtel's business model is mostly B2B, **caregivers** (in this paper, the term will be used for the healthcare providers/practitioners such as doctors, clinicians, physicians, etc.) are an important part as they are the one who make first contact with the system to deliver the care to patients, thus the success of the innovation depends heavily on their adoption decision. Therefore, the adoption of telemedicine among this group is the target to study this research. This research is conducted with qualitative methodology, based on data gathered from the caregivers from several metropolitan hospitals – some of them have already experimented Newtel system and some have not. In order to answer the questions in part 1.4, this research will start by reviewing the existing literature on Telemedicine and its current applications in developing countries, theories related to the adoption of an innovation in healthcare, and impact of the adoption on the healthcare industry in Vietnam using the approach of disruptive innovation in chapter 2 Literature Review. Chapter 3 will review the Telemedicine solutions provided by Newtel. Next, chapter 4 will be the detailed description of the Methodology used to complete the study. Chapter 5 will be the data analysis based on the gathered data to provide the answer for thesis questions. The final part will be conclusion and further possible discussions.

2 LITERATURE REVIEW

2.1 About telemedicine

2.1.1 Definition of Telemedicine

Being first practiced in 1905, when a Dutch doctor, Williem Einthoven used his self-made electrocardiogram in his lab in Liden to listen to the patient's electrical cardiac signals from the hospital at a distance of 1.5 km, the term was later coined in 1970 by Thomas Bird, and literally means: "healing at distance" (Strehle and Shabde, 2006). Since then, there were many cases that the doctors/nurses provide clinical advices via phone calls. (Spooner and Gotlieb, 2004).

In 2007, the World Health Organization adopted a fully described definition, specifically: *"The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid 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 interests of advancing the health of individuals and their communities"* (World Health Organization, 2007)

It can be seen that the term telemedicine only concerns with the providing of clinical information or care service in a distance utilizing telecommunication technology. With the involvement of the Internet, there is a narrower term to describe this type, which is e-Health, referring to Internet-based healthcare delivery (Mc Lendon, 2000 cited in Maheu, 2000). There is another term: telehealth, which is more restrictive than telemedicine since it requires the involvement of physicians in the process (Maheu, Whitten, Allen, 2002). However, in this writing, I chose to use the term "telemedicine" since it is considered as the oldest one and also covers the broadest of services with the least restrictions among those 3 terms.

According to WHO (2010), the key elements of telemedicine include:

1. To provide clinical support.
2. To overcome geographical barriers (provide supports in spite of physical distance)
3. To utilize various types of ICTs (information and communication technologies)
4. To improve health outcome

2.1.2 Applications of Telemedicine

Current common applications of Telemedicine include various medical disciplines such as radiology, pathology, neurology, cardiology, pediatrics, emergency medicine and even mental health (National Commission on Correctional Health Care, 1997). The applications of telemedicine are divided into 3 different levels by Greenhalgh (2004): level 1, the simplest, is the use of telephone and fax technology for patient consultation; level 2 is the file transfer for store and forward medical images or video conferencing over low band width connections; level 3, which includes the most complicated applications, are full motion video images supporting full range of interactive diagnostic services (requires fractional T-1 or higher band width).

Telemedicine was brought to practice in different areas including both developed and developing nations. In developed nations such as America, the applications of Telemedicine have a long history of more than 40 years with different cases and one of them is the national home telecare program for veterans by The Veterans Health Administration, which provided efficient care for the veterans, who mostly live in remote areas (The American Telemedicine Association, 2015). In Japan, after the giant earthquake in 2011, telemedicine system in Japan was greatly utilized to help the patients in remote areas (Japanese Telemedicine and Telecare Association, 2013). In Europe, Telemedicine also placed its path in several nations and most concerned cases are the Teleneurology service in Scotland, personal e-Health service in North Karelia, Finland, Telemedicine service in Diabetes in Norway, Telecardiology

applications in Berlin-Brandenburg, Germany etc. (EU eHealth Stakeholder Group, 2014).

In developing nations such as India, a report on Development of Telemedicine by Sood SP and Bhatia JS (2005) said that the government had acknowledged the benefits of Telemedicine from 1999, as there was a project piloted by the Ministry of Communications and Information Technology. The project created software called "Sanjeevani" that enabled teleconsultations (primarily tele-radiology, tele-pathology and tele-cardiology). This software allowed the doctors to search for relevant information from a database of Electronic Patient Records (EPR) and ask for a second opinion from other specialists. Some other examples from developing nations would be the mobile teleradiology application in Botswana to communicate with radiologists in the capital city of Gaborone; the application of telemedicine in supporting maternal and newborn health in Mongolia whereas "64% were obstetrical, 21% were gynecological pathology, and 15% were neonatal pathology"; the telemedicine network funded by the federal and states governments in Mexico with the goal to screen 1.3 million women in the 30-month period to find and early treat of breast cancer in Mexican rural areas between May 2010 and December 2012 etc. (WHO report on eHealth, 2010).

2.1.3 Benefits of telemedicine in developing countries

The report on the second global survey on eHealth by WHO (2010) stated that in developing countries, telemedicine has the potential to **meet previously unmet needs** and **positively impact health service**. It is able to bring about promising benefits in different areas such as:

- Offering expert helps for remote physicians with access to available specialists' opinions.
- Decreasing the requirement of on-site facilities and the needs of patient transfers.
- Reducing the distance travelled for care thus speeding up the time waiting to be served.

- Reducing the distance-related expenses.
- Motivating rural practitioners to remain in rural areas for more balanced system thus avoiding brain drain.
- Enabling Knowledge sharing, Distance learning and training.

The help of Telemedicine is even more promising in developing countries thanks to the technological development in those countries such as the falling costs of ICTs (second global survey on eHealth by WHO, 2010), the increasing computing speeds, and options for high-speed bandwidth, and the falling costs of digital storage (Alverson et al., 2009, 219-225 cited in WHO, 2010).

2.1.4 Telemedicine as an innovation in Healthcare

The term “innovation” is defined in many different contexts; from simple ones such as “something newly introduced” (The Free Dictionary, n.d.), to more comprehensive ones such as “*an invention is exploited for commercial use and generates benefits, it becomes an innovation*” (Sandberg 2008, 53). Omachonu and Einsprunch (2010), from those various definitions, pointed out 3 typical features of innovations, which are the novelty (or the newness), an application component (how it is commercialized) and intended benefit. Based on these features, regarding healthcare, they also restated a more specific definition for healthcare innovations as:

“Healthcare innovation can be defined as the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs.” (Omachonu and Einsprunch, 2010)

In healthcare, innovations are related to goods or services, process (innovations in production or delivery method) or structure (innovations that affects internal and external infrastructure, creates new business model) (Varkey, et al., 2008 cited in Omachonu and Einsprunch, 2010).

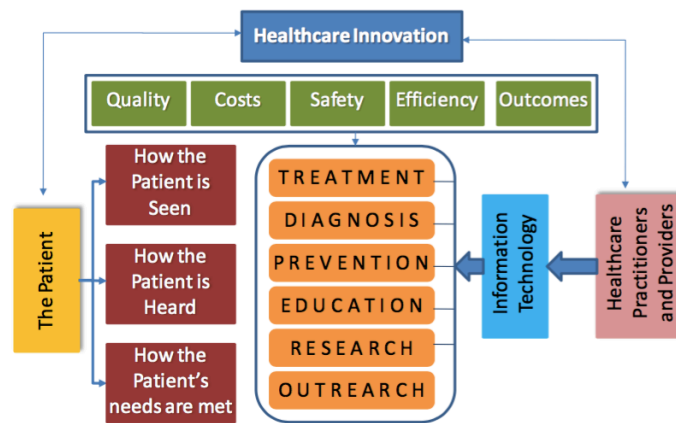


Figure 1. A Conceptual Framework for Innovation in Healthcare (Omachonu and Einspruch, 2010)

Figure 1 showed the factors contributing to the success of a healthcare innovation, which are care quality, cost, safety, efficiency, and outcome. Besides, innovations in healthcare are said to serve six main purposes (treatment, diagnosis, prevention, education, research and outreach). There are 2 key stakeholders that are involved in the success of a healthcare innovation, which are the Healthcare providers/practitioners or caregivers (whose needs are to improve the clinical outcome) and the Patients (whose expectation is to have enhanced care experience with less wasted time and cost and improved outcome) (Omachonu and Einspruch, 2010). It is also seen that healthcare innovations usually relate to new/existing information technology.

As being considered as **“the new face of healthcare innovation”** by Forbes (2014), (to be more specific healthcare delivery). It is **thus valid to apply the models/theories/characteristics related to innovation/healthcare innovation into analyzing the case of Telemedicine.**

2.2 Adoption of telemedicine

In healthcare, invention is hard, but dissemination is even harder (Berwick, 2003), in this part, we will have a closer look on the adoption of Telemedicine as a healthcare innovation.

2.2.1 Diffusion of innovation theories and application to the case

2.2.1.1. Basic diffusion of innovation theory (Everett M. Rogers, 1982)

Rogers in his book defined diffusion as special kind of communication and also it is:

*“The process by which **an innovation is communicated through certain channels overtime among the members of a social system**”.*

It can be seen from the definition that there are four main elements that involve in the adoption, which are the innovation itself, the communication channels, the time and the social system (described in Table 1). Rogers in his book also implied that the newness perceived would affect how an individual react to the information delivered. The newness of an innovation here is not necessarily about knowledge, since someone may have known about an innovation but grow no attitude toward it (favorable/unfavorable) or reaction to it (adopt/reject). (Rogers, 1982)

Table 1. Four main elements of diffusion adopted from Everett M. Rogers (1982)

<u>Elements</u>	<u>Description</u>
INNOVATION	The perceived characteristics of an innovation that affect the diffusion are relative advantage, compatibility, complexity, trialability and observability . It is said that an innovation, if is perceived as having greater relative advantage, compatibility, trialability and observability and less complexity will be adopted faster.
COMMUNICATION	The communication involves 4 main participants, which are an innovation, an individual or a unit of adoption that already acquired knowledge or experience about the innovation, another individual or unit that has no attitude/knowledge/experience toward the innovation and the communication channels that connects the individuals/units. More effective communication occurs when two individuals share common norms, language and have the somewhat similar social and personal characteristics.

TIME	The amount of time considered in Roberts' theory is involved in the innovation decision process, the relative earliness/lateness with which an innovation is adopted compared to other members of the system and the rate of innovation adoption on the system.
SOCIAL SYSTEM	The social system can be groups, organizations or sub-systems. Rogers defined the issues of the Social System that affect the diffusion that are the social structure, norms, roles of opinion leaders and change agents, types of innovation decisions and consequences of innovation.

b) Categories of adopters

As one can see from Figure 2, Rogers (1997) also categorized the adopters into 5 categories: innovators, early adopters, early majority, late majority and laggards based on the adoption speed. The adoption of innovation is spread from the earliest adopter groups to the whole target market.

- Innovators: Very first users, who are active information seekers and usually have a high degree of mass media exposure, which accounts for 2,5% of the target market
- Early adopters: Opinion leaders of the market, accounts for 12,5% of the consumers
- Early majority: Leading segment of the market with 34% of the target market
- Late majority: The consumers who follow the early majority, accounts for 36% of the target market
- Laggards: The consumers who are conservative towards innovation, accounts for 14% percent of the target market

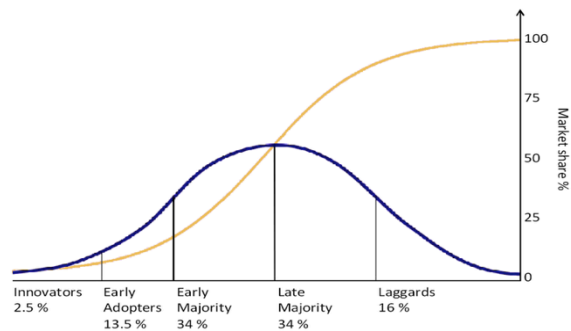


Figure 2. Adopter categories based on relative time of adoption (Rogers, 1982)

In the case of Telemedicine, as mentioned from the previous part, there are 2 stakeholders that decide the success of innovation which are caregivers and patients. The caregivers would be first one to make contact with the innovation and would be the target group to approach firstly. They are the ones who have high level of education, high social status and have greater degree of opinion leadership. These caregivers would potentially be the innovators or early adopters and they will be able to widespread the innovation to other adopter groups.

c) Adoption process

The decision to adopt the innovation or not is made through a process, which is defined as *“the process through which an individual or other decision-making unit passes from first knowledge of an innovation to forming an attitude toward the innovation to a decision to adopt or reject”*. (Rogers, 1982)

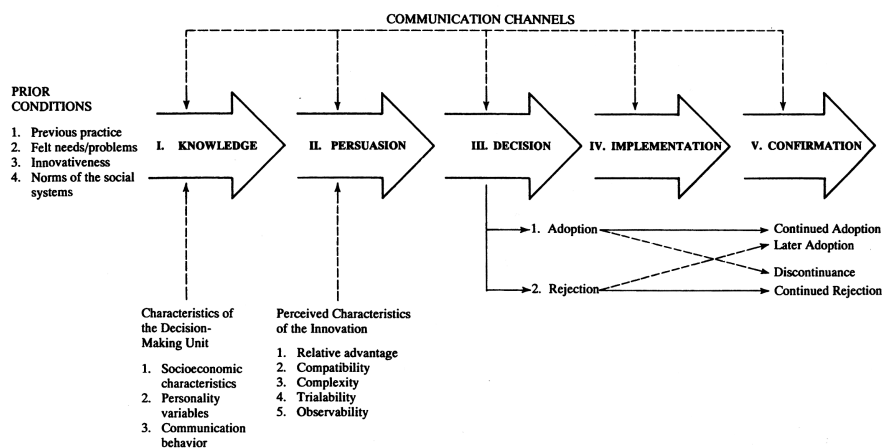


Figure 3. A Model of 5-stage in the innovation decision process (Rogers, 1982)

As one can see from Figure 3, Rogers defined 5 main steps in the adoption process, which are knowledge, persuasion, decision, implementation and confirmation. The first step, *Knowledge*, happens when the decision making unit has the first contact with the innovation to gain some knowledge on how the innovation functions. He/she then gets to the step of *Persuasion*, when the attitude toward the innovation is formed (favor/unfavor). The decision-making unit then makes the *Decision* to adopt or reject the innovation. Next, the *Implementation* step occurs when the innovation is put in use by the decision-making unit. Lastly, at the *Confirmation* step, the decision-making unit will review his decision and there exist a chance of reversing the previous decision. (Rogers, 1982).

Further analyzing the decision process under Rogers' theory, we can see that the adoption decision depends heavily on the Knowledge and Persuasion steps. These steps get influenced from Characteristics of the decision-making unit (the socioeconomic characteristics, the personality variables, communication behaviors) and the perceived characteristics of the Innovation (relative advantage, compatibility, complexity, trialability and observability) (Rogers, 1982). Regarding telemedicine, as mentioned from the pervious part, the caregivers are the one who make first contact to Telemedicine so the decision making unit would be the healthcare organizations, where caregivers would make influence over the decision in individual level (in Newtel case, caregivers or metropolitan hospitals). Therefore, it can be concluded from those above findings that in order to analyze the adoption of Telemedicine in Vietnam, it is necessary to study the decision making in healthcare organizations.

2.2.1.2. Diffusion of Innovation in Healthcare organizations (Greenhalgh et al., 2004)

This theory and model by Greenhalgh et al. (2004) analyze the Innovation diffusion in a social system, which are Healthcare organizations. The target consumers here are the caregivers within those Healthcare organizations.

Greenhalgh et al. in his book “How to spread good ideas” in 2004 use the classical diffusion of innovations theory by Rogers (1982) as an outline in order to further study about the diffusion of innovations in healthcare and more specifically, diffusion of innovations in healthcare organizations. Greenhalgh, through a systematic literature review, found out important attributes in the diffusion of Innovations in Healthcare organizations.

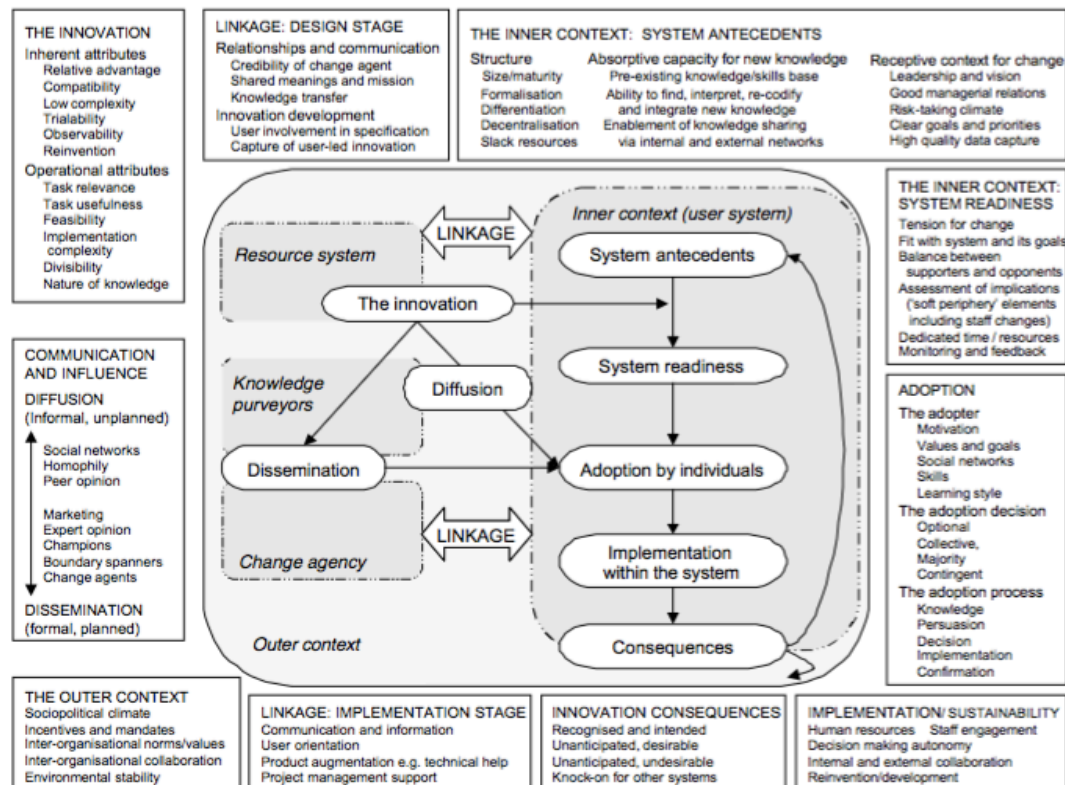


Figure 4. Spread and sustainability of innovation in service delivery and organizations (Greenhalgh et al., 2004)

Figure 4 showed the important attributes in diffusing an innovation in healthcare including:

- The attributes of the innovation (innovation characteristics): the relative advantages, compatibility, complexity, trialability and observability of the innovation.
- The adoption process as engaged in or not by the individuals.
- The inner and outer organizational context: such as the organizational determinants of innovativeness and the environmental impact on organizational innovativeness etc.

- Communication and influence (impact of opinion leaders, champions, regulations etc.)
- Dissemination efforts: campaigns and implementation process to popularize the innovation.

Greenhalgh also discussed some case studies in Healthcare innovations applying his model including the case of Telemedicine. He called Telemedicine 'the Maverick initiative' and analyzed some of the previous Telemedicine projects. He pointed out the advantages and obstacles in diffusing telemedicine as well as the potential of telemedicine in the healthcare system:

- Innovation characteristics:

The report summarized the projects from 1960s to 1980s and concluded the factors leading to failure in diffusing Telemedicine in these projects in the high telecommunication cost and the technically unreliable of technology during those early years. The situation changed as there are significant advances and development in both medial and information technology that enabled what was previously unavailable to practice telemedicine (Grigsby et al., 2002; Mairinger, 2002; Wootton, 2001). These advances along with the decrease in the price/performance ratio (Greenhalgh, 2004 in Moore, 1991) have been the contribution to the relative advantage of telemedicine.

- The adoption process and the communication & influence:

The norms about the fundamental face-to-face contact in diagnoses might make the caregivers think that telemedicine cannot be good as "the real thing". Thus the expansion of services of often **driven by doctors who are technology enthusiasts**. The adoption process of telemedicine is said to be more feasible recently thanks to the advances in technology, which creates more evidence on the overall effectiveness of telemedicine (Greenhalgh, 2004 in Pelletier-Fleury et al., 1997; Wootton, 2001; Field and Grigsby, 2002) and clinicians who are not described as "technical" began to try it out.

- Inner and Outer context:

Greenhalgh (2004) stated that the development of telemedicine might create critical changes on healthcare system, be it the inner and outer organizational structures of healthcare organizations. For example, the notion that “*a medical or surgical specialty develops in a particular area because there exists sufficient regional population base to supply the service with clients*” (Greenhalgh, 2004) will be changed. However, there are several organizational obstacles in Telemedicine widespread such as it remains difficult to put together a system in which components run smoothly and corporately together and it needs strategic plans from the organizations to diffuse the application of telemedicine.

- Dissemination efforts:

Greenhalgh (2004) said he called telemedicine the ‘maverick initiative’ because of its typical scenario of a small team of enthusiasts driven mainly by their own interest in the technology and the innovators who introduced the telemedicine might lack the skills to widespread the initiative within the organization. Therefore, the innovators need to have the efficient dialogue with the clients during initial development of the software and during implementation.

2.2.1.3. Application of diffusion theories into the case of Telemedicine in Vietnam

a) Perceived characteristics of Telemedicine taking consideration Vietnam background

- Relative advantages:

The relative advantage is defined as ” the degree to which an innovation is perceived as better than the idea it supersedes” (Roger, 1995). It briefly means that if the consumers perceive the innovation to benefit them comparing to what they currently have, they will be likely to adopt the innovation faster.

The perceived relative advantages of healthcare innovation based heavily on the evolutions of the caregivers, whose wish mentioned in the previous part was to improve the quality of the clinical care. Therefore, in this case of Telemedicine, there is a need to compare the care service using telemedicine

than the standard face-to-face care service to see Telemedicine relative advantages. In general, there are reports in the world showed relative advantages of Telemedicine. Firstly, some reports showed no difference in the ability of the clinicians in obtaining clinical information, making accurate diagnosis or developing a treatment plan comparing to in-person care when being applied appropriately such as the report by Dimmick et. Al (2003, 13-23), Ermer (1999) (cited in American Telemedicine Association, 2015). Moreover, one of the characteristic of Telemedicine is to provide care despite geographic distance thus increase the availability of the service. Finally, telemedicine has cost effectiveness as some projects showed the cheaper price of telemedicine service comparing to the standard service “Hospital at home” in Albuquerque (Cryer et. al, 2012) or A Patient-Centered Medical Home (Rosenberg et. al, 2012) (cited in American Telemedicine Association, 2015).

In conclusion, Telemedicine has relative advantages comparing to standard face-to-face service in general. However, as this study concerns only on the Vietnam market, there needs to have some analysis on their perceived characteristics of Telemedicine in Vietnam.

- Compatibility

The compatibility is described by Rogers (1995, 2003) as “*the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters.*” For example, the discourage of the birth control techniques are not compatible with the religious beliefs in Moslem and Catholic nations.

Looking more specifically at Telemedicine in Vietnam market, the government has already funded some pilot projects on telemedicine such as Project 1816, which indirectly boosted the usage of ICTs in providing clinical services as well as telemedicine (thuvienphapluat.vn). From this attitude, Telemedicine should have no conflict with the *existing values* in Vietnam and it has *potential adopters*. Lastly about the *past experience*, since telemedicine utilizes the advance of information and communication technology and the services are

delivered sometimes without physical proximity, which differs it from the previous care experience in Vietnam and this difference's impact remains unknown and needs to be studied.

- Complexity

Being defined as “the degree to which an innovation is perceived as difficult to understand and use”. This relatively means that the innovations that are simpler to understand and use will be adopted more rapidly.

There are many different applications of telemedicine and the complexity of each would differentiate from others. Simple form of telemedicine such as teleconferencing to discuss the patients' diagnosis between caregivers using popular software such as Skype would definitely easier to apply than organizing tele-surgery service with connected medical devices. Therefore, the Complexity of Telemedicine application in Vietnam in this case should be taken into consideration and further analyzed.

- Trialability

Trialability is “*the degree to which an innovation may be experimented with on a limited basis*”. It briefly means if the innovation can be tried during the installment process will be easily adopted since the practical information about that innovations is distributed to the consumers thus reducing the uncertainty about that innovation.

As mentioned in the below part, the applications of telemedicine varied so there is a chance for applications such as teleconferencing and Electronic Health Records (EHR) to be experimented in a wide area to gain feedbacks from adopters. These applications can be used in a regular basis in order to gain the feedbacks from the caregivers. In addition, since there are positive the results from previous studies on patients' satisfaction with telemedicine service: Patient satisfaction with telemedicine (Gustke et. al, 2000) showed the overall patient satisfaction to be 98,3%; Telepsychiatry: an update on technology and its implications (Jana, 2000) said that most of patients saw great help in the

treatment with teleconferencing etc.; there will be possibly a high chance that telemedicine companies will introduce a trial process to encourage caregivers to promote the usage of Telemedicine applications.

- Observability

Observability is “*the degree to which the results of an innovation are visible to others*”. That is to say, when the individuals have the chances to consult the adoption of this innovation by another and see the positive results, they are likely to adopt an innovation faster.

Telemedicine has various relative advantages as mentioned above, however, their observability to caregivers in Vietnam needs to be further examined.

b) The adoption process as engaged or not by individual

The caregivers are the ones who directly used Telemedicine in delivering care to patient. As mentioned in the previous part, the expansion of services is often driven by doctors who are technology enthusiasts, thus the adoption is decided as engaged by individual and be influenced by characteristics of the caregivers. The box below described some psychological elements affecting the adoption.

Box 5.3 Psychological antecedents of the adoption decision

- Personality traits – for example, tolerance of ambiguity
- Prior knowledge, experience, beliefs, attitudes and perceptions
- Particular concerns about the innovation (see Figure 5.3)
- Motivation and goals
- Cultural practices and values – ‘generalised, enduring beliefs about the personal and social desirability of modes of conduct or “end-states” of existence’ (Klein and Sorra, 1996)
- Skills
- Learning style

Picture 1. Psychological antecedents of the adoption decision (Greenhalgh et al., 2004)

The prior knowledge, beliefs and perceptions of caregivers will have big impact in the decision making process, as they have already been practiced for a long

time, become the norms and gained reliance from the caregivers. In healthcare, changes may lead to death, disability, or permanent discomfort (Lansisalmi, et al., 2006 cited in Omachonu and Einspruch, 2010); therefore, if the innovation goes against those prior knowledge, beliefs or perceptions, it would be harder to be adopted.

In the case of telemedicine, the Eastern traditional medicine suggested the medical diagnoses with four methods including inspection, auscultation-olfaction, interrogation, and palpation (Jingfeng, C., 2008) or even the most significant figure of Medicine, Hippocrates also known to make diagnoses by tasting the patient's urine and smelling their sweat (New York Times, 2008). In other words, the traditional and well-known diagnosis methods require direct contact to the patients. Telemedicine, in the contrary, does not require direct contact between the caregivers and the patients in many cases, which might go against their prior knowledge, beliefs and perceptions and create negative impact on the adoption.

Concerning other elements mentioned in picture 1, one sees the caregivers in the same workplace usually share similar base on educational knowledge and code of conduct. For instant, the General Medical Council in Good Medical Practices (2013) showed the expected behavior of a doctor as « practice good standards of clinical care, practice within the limits of their competence, and make sure that patients are not put at unnecessary risk ». Caregivers also share the same goal of enhancing clinical outcome and minimizing risks as mentioned in the previous part.

c) Inner and outer context

The inner and outer contexts are the evolution on the inner and outer innovativeness. Regarding the outer innovativeness, taking Vietnam cultural background into consideration, as recorded from Hofstede's website on Vietnam's score on cultural dimensions (Geert Hofstede website, 2015), the country has a low uncertainty avoidance score of 30 so it can be assumed that the country opens to newness. Furthermore, there were pilot projects conducted

on Telemedicine as mentioned in the previous part, which showed a green light from the government even though there are not yet any official regulations applied on Telemedicine.

The inner context concerns with the organizational innovativeness, which depends on various elements. In the case of Telemedicine in Vietnam, specifically Newtel, which is having its products be experimented in metropolitan hospitals, the notable elements to be concerned will be the communication within the organizations, the slack resources of the organization and the managerial attitude towards change (Greenhalgh, 2003). About the managerial attitude toward changes, it is necessary to take a note that the metropolitan hospitals are mostly state-owned (Solidiance report on Vietnam Healthcare Landscape, 2015). These state-owned hospitals, thanks to the financial supports from the government, usually provide cheaper care service than private hospitals. These state-owned hospitals are expected to be the ones to adopt Telemedicine in order to provide cheaper and higher in availability care to a vast majority of population. Since those hospitals are state-owned, its managerial attitude and decision making will be highly influenced by the government, which is currently a highly centralized system dominated by the Communist Party (Global Security, 2015). This managerial attitude and decision-making might create dictatorship and cause psychological reluctance and delay from the caregivers (Small Business website, 2015).

d) Communication, influence & dissemination

As recorded from Hofstede's website (Geert Hofstede website, 2015), the country has a high power distance score of 70 and the individualism score is low of 20, meaning that the opinion leaders have really important role in making the adoption decisions. That is to say if the caregivers make the adoption decision, there will be the high chance that the patients would follow. In the organizational level, if the hospital leaders or doctors with high reputation agree on the adoption of Telemedicine, it will be likely that the caregivers would as well adopt Telemedicine. This suggests an interpersonal approach in the dissemination of Telemedicine as Vietnam is not a risk-taking country (low

Masculinity score) and interpersonal communication will bring about promising results.

2.2.2. Potential impact of the adoption of Telemedicine as a disruptive innovation

Christensen (1997) defined the term “innovation” with a great involvement of technology: *“a change that builds on a firm’s expertise in component technology within an established architecture.”* In the book *“The Innovator’s Dilemma: When technology causes great firms to fall”*, 1997, Christensen mentioned two main types of technologies that will be the game changers for businesses, which are sustaining technologies and disruptive technologies. In his follow-up book *“The innovator’s solution”*, he changed the wording “technologies” into “innovations”, noticing, *“It was rarely the technology per se that was disruptive (or sustaining) but the use that companies made of it, the innovation that it enabled them to undertake.”*

Christensen’s theory explains how the innovations might create a disruptive or sustaining effect on the market. His model on disruptive innovation is visualized in Figure 5.

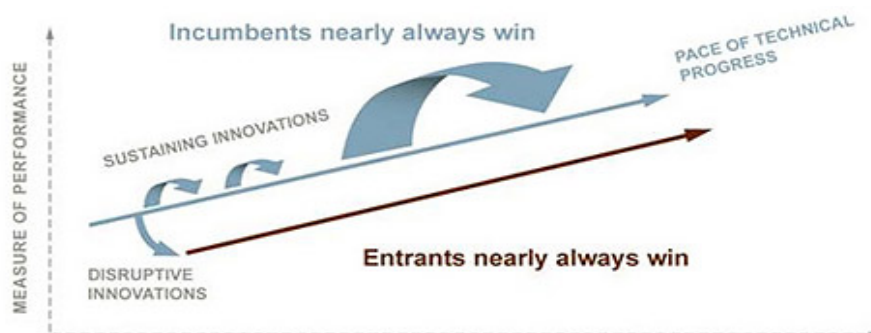


Figure 5. Disruptive innovation model (Clayton Christensen, 1997)

From Christensen’s model in figure 5, there are 2 types of Innovations, which are sustaining innovations and disruptive innovations. Furthermore, Christensen (1997) also pointed out 2 types of disruptive innovations, which are new market

disruptions and Low-end disruptions. The characteristics of those different categories of innovations by Christensen are described in the table below.

Table 2. Distinguishing Characteristics of Sustaining and Disruptive Innovations (Clayton Christensen, 1997, 2003)

<u>Dimension</u>	<u>Sustaining Innovations</u>	<u>Low-end disruptions</u>	<u>New Market Disruptions</u>
Targeted performance of the product or service	Results in performance improvement in attributes most valued by the industry's mainstream customers . These improvements may be incremental or breakthrough in character.	Technology yields products that are good enough along the traditional metrics of performance at the low end of the mainstream market.	Results in lower performance in "traditional" attributes, but improved performance in new attributes - typically simplicity and convenience .
Targeted customers or market application	The most attractive (i.e., profitable) customers in the mainstream markets who are willing to pay for improved performance.	Targets over-served customers in the low end of the mainstream market.	Targets non-consumption : customers who historically lacked the money or skill to buy and use the product.
Impact on the required business model (processes and cost structure)	Improves or maintains profit margins by exploiting the existing processes and cost structure , and making better use of current competitive advantages.	Utilizes a new operating and / or financial approach - a different combination of lower gross profit margins and higher asset utilization that can earn attractive returns at the discount prices required to win business at the low end of the market.	Business model must make money at lower price per unit sold, and at unit production volumes that initially will be small emerging market. Gross margin dollars per unit sold will be significantly lower.

In addition, the term "disruptive innovation" is said to refer also a process (Clayton M. Christensen, Michael E. Raynor and Rory McDonald, 2015). It is the movement of a product/service from targeting the low-end customers or new customers in the market to the mainstream of the market and take over a mass-market share to substitute the incumbents. Christensen, Raynor and McDonald,

2015 also stated that this process is time consuming and sometimes takes a decade so *“incumbents frequently overlook disrupters”*.

Based on the characteristics of sustaining and disruptive innovations in Table 2, it is clear that Telemedicine has the nature of a disruptive innovation as:

- Targeted customers: As mentioned from the previous part, Telemedicine is said to meet the unmet needs. It is able to bring a lot of benefits for patients who lack the abilities such as finance, time etc., being said the group of poor people at the bottom of pyramid (Prahalad and Hart, 2002).
- Performance: Telemedicine enables care services with instant care provided anytime anywhere and geographic flexibility. (WHO, 2010)
- Processes and cost structure: Lower price per unit sold – telemedicine helped patients in America with out-of pocket saving for patients with the amount up to \$1157 per person per consult. (McLaughlin and Lydecker, 2015).

In US, Telemedicine is considered to be disrupting US healthcare industry of a massive \$3.8 trillions (McLaughlin and Lydecker, 2015). Telemedicine is also considered a Disruptive Innovation by Devonas (2015) in a journal published on Clayton Christensen Institute website. Thus **Telemedicine is a disruptive innovation and it has the characteristics of a disruptive innovation.**

Nevertheless, since Telemedicine has the nature of a disruptive innovation, it has impact on the adoption, as the diffusion of a disruptive innovation would take a very long time. Cornescu and Adam (2013) discussed about the resistance toward innovations and concluded that the resistance of innovation can be caused by factors including timing, lack of necessary knowledge or lack of the insurance that the innovation would result in good. Therefore, the long diffusion/adoption time of Telemedicine as a disruptive innovation might cause the resistance and more seriously rejection decision. It is thus advised that **appropriate information is better provided** timely to get better chance of a positive outcome otherwise the rejection decisions from consumers are inevitable.

2.2.2.2. Potential impact of the adoption of Telemedicine as a Disruptive innovation

Innovations, by its very nature, are risky and unpredictable (Perrin, 2001). Therefore, innovations are usually classified in taxonomies in order to understand their outcomes (Garcia and Calantone, 2002 cited in Coccia, 2006). Following the same path, in order to evaluate the potential of the Telemedicine adoption on its market, it is necessary to find an efficient approach.

As Christensen stated that a theory values as it has the ability to be used to make predictions (Christensen, 2006, p. 43), it is clear that we can use his theory to predict the impact that Telemedicine is able to make in Healthcare. Since **Telemedicine has a Disruptive nature**, its potential impact if it is adopted by the market is that it might be able to take over the mainstream market, which is the normal care service with face-to-face and direct contact to provide care services such as examination or treatment. Nevertheless, the disruption by Telemedicine happens only if the value network configures as expected (Devonas, 2015b).

Further discuss about this issue, Devonas (2015a) published a journal about the Future of Telemedicine in Christensen Institute website. Acknowledging that Proximity is the biggest critic on Telemedicine, Devonas stated that Telemedicine could only replace the normal service if the caregivers can effectively do their jobs without having physically proximal, face-to-face interactions. That was to say, Telemedicine could take over standard care service and become a disruption in healthcare only if the doctors overcome the lack of proximity in using Telemedicine. Based on this finding, he built up a hypothesis that “**telemedicine will not thrive without cheap, reliable remote diagnostic tools and other value network factors, such as Interoperable Electronic Health Records.**” (Devonas, 2015)

3 NEWTEL'S BUSINESS

In the Introduction part, Telemedicine was said to be a right answer to enhance the availability of the healthcare delivery in developing countries such as Vietnam. Mr. Nguyen Van Sau, Chief Operation of IMI Vietnam predicted a bright future for telemedicine in Vietnam for several reasons. Firstly, Vietnam has an infrastructure of thousands of hospitals scattered across the nation in both rural and urban areas that would be efficient to apply telemedicine. Secondly, the Information Technology in Vietnam has been boosting robustly and becomes one of the top-notch industries in the economy with the 3G networks covered, which enables more opportunities to develop telemedicine in Vietnam (Newtel website, 2015). However, the imported telemedicine devices are costly as mentioned by Vietbao.vn (2013), a telemedicine system with imported foreign devices would cost approximately \$3 million dollars _ stated by Mr. Nguyen Hoang Phuong, Department of IT, Ministry of Health.

Seeing the great opportunity for Telemedicine in Vietnam, Newtel, a startup based in Hanoi, Vietnam decided to build up an in-house system with adapters that are able to extract digitalized clinical information from existing devices and a cloud for data storage with an user-friendly frontend to access the data. Thanks to this cloud system created by Newtel, clinical data (for example electronic health records) can be stored within the cloud and be accessed by clinicians, experts or specialists anytime anywhere while retaining the security of the records.

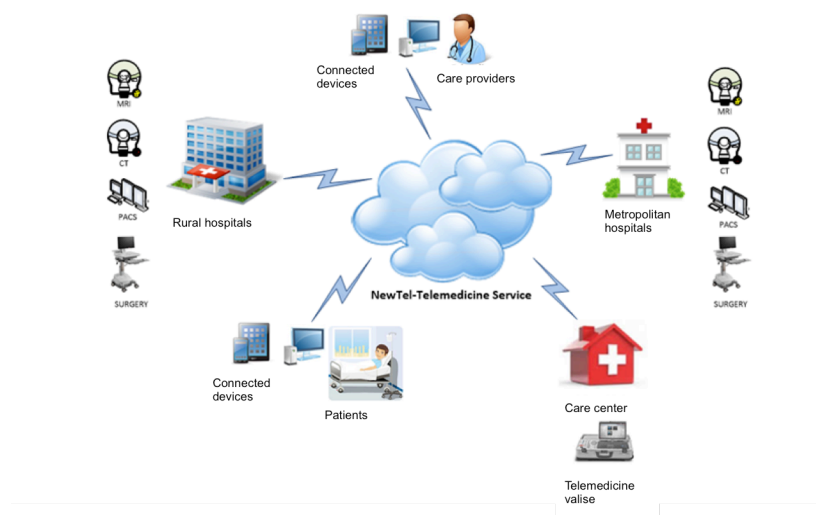


Figure 6. Newtel Cloud (Newtel, 2015)

Newtel's ecosystem is built up providing: connections to all ordinary medical devices via an adapter to digitalize the medical information for Internet transferring cloud-computing services for data storage, a frontend software developed in-house for caregivers to access the medical data. Moreover, the system is build up compatible with the telecommunication infrastructure in Vietnam, allowing the transmit of information smoothly via the existing bandwidth.

Newtel's system has been promoting its trial period from mid-November 2015 in some metropolitan hospitals in the Northern part of Vietnam such as Bach Mai (Hanoi), Saint-Paul (Hanoi), Thanh Tri General Hospital (Thanh Tri). (Newtel, 2015) The applications of Newtel system concerning Telemedicine are mainly on clinical diagnosis, consultation, prevention, medical education, research and outreach but not yet treatment.

4 METHODOLOGY

In the previous chapter, the theoretical background was introduced. In the Methodology part, I will present the chosen research approach, the design of questions, the data gathering methods as well as the application of the theoretical background to evaluate the results in order to answer the 2 sub-questions thus answering our big question: **How can Telemedicine and specifically Newtel's solution being adopted in Vietnam?**

4.1 Choice of Research Methodology

The study's objective is to answer the questions about the adoption of telemedicine and more specifically Newtel's solution on the care system in Vietnam, more especially the exploration of the factors that for and against the adoption of telemedicine as well as the impact of the adoption. The answers needs to be descriptive evidence of consumer's reaction toward telemedicine and help the author to achieve a deep understanding of the issue with detailed information rather than numbers. By its nature, qualitative methods are used to obtain more *"specific information about the values, opinions, behaviors, and social contexts of particular populations."* (Mack et al, n.d.). Therefore, it is more efficient to use qualitative method rather than quantitative method to get the expected data. Moreover, the quantitative method requires a large amount of respondents to generalize the statistics (Saunders et al., 2009, 151); however, telemedicine is a new concept in Vietnam and the short on-going trial period of Newtel's solution (at the time the author was doing the research) limited the number of respondents who have some knowledge about Telemedicine as well as Newtel's solution. Qualitative method was the only solution. Lastly, one ultimate reason why I chose the qualitative method was because of its flexibility. Medicine is a foreign field to the author and it is restrictive in several ways in order to understand a medicine-related problem, there requires a lot of comprehensive and concrete knowledge in biomedical sciences, evidence-based medical practices that the author might not aware of. Qualitative data analysis is an iterative and reflexive process that begins as data are being

collected rather than after data collection has ceased (Stake, 1995) and after studying the theoretical background, I felt the need to have more detailed answer about the issues and the open-ended questions create the flexibility and help the author to gain more information even with limited knowledge about medicine.

In order to collect the necessary data, I decided to have in-depth interviews with the caregivers from Metropolitan hospitals in Vietnam. The data I used in this research was primary data in order to keep the clarity and validity for the answers of the questions I asked. A note about my data collection method is that the data collection based on personal contacts with phone and Skype interviews.

4.2 Sampling method

My sampling method was non-probability and snowball sampling with the data collected from the care givers in metropolitan hospitals, some of them have experienced Newtel's solution and some have not. I also had an interview with CEO of Newtel in order to have an overview about the reactions of his other customers that I had not a chance to contact with and to know something more about his business. Even though the product trial period from Newtel had been going on for only haft a month when I conducted the interview, I was lucky enough to get the contact of 2 doctors from 2 different hospitals using Newtel's product who was willing to spend time for my interviews. These doctors pointed me to some other doctors who had not know about Newtel products, and 2 of those agreed to had interviews with me. The two first interviews with doctors who were trying Newtel's solution made with phone calls and the others were Skype calls, which used Internet to transmit voice (and video) with high signal quality.

Thanks to this sampling method, I had certain controls over my data collected and the answers had the representativeness. (Smith, Thorpe, Jackson, 2012) However, this method have some disadvantages such as the data were not abundant and vary since the doctors share some similar socioeconomic

characteristics such as education background and working/living location etc. Another advantage in my samples is the limited number of interviews due to the limit in time and contacts available. In order to cover those limitations, I tried to have in-depth interview with different groups of caregivers from different hospitals to gather the diversity in the data collected.

4.3. Interview questions

In order to achieve the goal, I had built the question guidelines to 3 different targets, which are the caregivers who were familiar with Newtel's solutions and the caregivers who were not. I chose to have structured interview with guideline questions, but I tried to make it less-structured by occasionally ask the interviewees other questions outside the guidelines based on the flow of the dialogs, which allows me to gain the flexibility in the interview as some of the question were business-related and I might not gain the exact answers expected for some questions. I also had the chance to identify some non-verbal clues (attitudes, gestures etc.) during the conversations.

Concerning the questions, they were selected from Greenhalgh's suggestion of questions used in case studies when applying Greenhalgh's model (Greenhalgh, 2004) and Disruptive innovation model by Christensen Clayton (1982) on expected performance, targeted customers and cost structure. Besides, the author also added some other questions to measure the potential of Telemedicine perceived by the interviewees.

Base on the above mentioned information; I created 3 different question templates for 3 different groups:

Group 1: The caregivers who have experienced Newtel's solution:

When placing the questions for this group, I had to acknowledge that this group had already possessed some basic knowledge on telemedicine thus they are in the DECISION stage in the innovation adoption process whereas they had the chance to try to product, they had some knowledge about the product but they can still make the decision of discontinuance.

Group 2: The clinicians/hospitals who has not adopted Newtel's solution:

As for this group, they might have heard about Telemedicine or the solution from Newtel but this information is limited. They are still at the first stage KNOWLEDGE of the decision process. Therefore, they can only speak from their experience to evaluate the impression about Telemedicine. There needs some guidelines involved for them to get the answers that stick on the topic.

Group 3: Innovators from Newtel (Newtel CEO)

Since telemedicine has the potential to create a disruption in the market, we are expecting a disruptive business from Newtel. In order to make the solution a disruption, there requires a targeted performance, a targeted segmentation or market application and required processes and cost structure. Therefore, the questions will concentrate on the evaluation of the company's performance, segmentation and cost.

4.3 Data analysis method

In order to analyze the data collected, I chose the "Comparative analysis" strategy. This strategy requires taking one piece of data and compares it with all others in order to find out the similarities or differences so that the author can develop the concept about the possible relations between various pieces of data and generate knowledge about the behavior pattern. It is generally used in themes within human experience whereas the researcher would like to explain something of human behavior and experience. (Evidence based nursing, 2000). In our case, by doing the interviews with people having the same base knowledge and similar socioeconomic characteristics, I would like to figure out the factors that impact the adoption of telemedicine in a particular market that is Vietnam and try to find the recommendations in order to make Telemedicine be applied in Vietnam care system to benefits the patients. The data gathered would thus be analyzed to find out the answers for the sub questions, which will be present in detail in the data analysis chapter.

My data analysis is taken through 2 main stages: Data preparation and Structuring and making sense of data. After the data preparation stage, I was able to collect the data from the interviewees and translated them into English. Later on, I would like to group the information collected into different categories

such as the perceived characteristics innovation, the perceived performance of the innovation (expectation and reality), the application progress of the innovation, the behavior patterns toward the adoption of innovation etc.

4.4 Limitations

In this part I will analyze the limitations of my data using Lincoln and Guba's evaluative criteria for qualitative research (Lincoln, YS. & Guba, EG. ,1985). Firstly, regarding the Data Collection, the limitation lies in the limited number of interviewees. This was because I am not in the field and do not have a lot of contacts with the interviewees whereas their contact information were mostly confidential and could not be found from the Internet. Furthermore, my choice of qualitative research with in-depth interviews as data collection method has restricted me from gathering a massive of respondents, as the information collected will not be concentrated. Besides, the interviews require a lot of time to be arranged and gone through whereas caregivers are known as busy people so even though I was introduced by Newtel and their colleagues, they could hardly take time for my interviews. This might affect negatively to the transferability and credibility of the research due to the lack of diversity in the data collected. The second limitation is the engagement between the interviewees and interviewer. Since I am not in the field of Telemedicine so my questions concern a lot on business and economic terms and my observation had a lot of difficulties with the understanding of medical terms, which created sometimes the misunderstanding between the interviewer and interviewees and made the answers sometimes not clear and straightforward, which might impact on the Confirmability of my research. Finally, the interviews were conducted in Vietnamese; it took time to translate everything correctly into English including medical terms and the translation might also negatively impact the confirmability and dependability of my research.

Therefore, a more careful preparation with a clear timeline is essential. Besides, the needs obtain more knowledge to understand the interviewees are extremely necessary.

5 DATA ANALYSIS

This part would mention all the detailed analysis of the data collected through the in-depth interviews (see Appendix). The theories from chapter 2, literature review, will be the frame to guide the data analysis in order to deliver the answers for the thesis questions. The Conclusion part will follow to conclude the answer for the big question: **How can Telemedicine and specifically Newtel's solution being adopted in Vietnam?**

5.1 General information about the data

As mentioned, the interviews are conducted via phone calls and Skype calls. The data gathered were from doctors from 4 different metropolitan hospitals in Vietnam and from the CEO of Newtel Company, specifically:

Table 3. Interviewees, background, interview method

<u>Name and position</u>	<u>Hospital</u>	<u>Interview method</u>	<u>Experience with Newtel system</u>
Mr. Tran Trung Kien (General doctor)	Vietnam - Germany Hospital (aka. Viet Duc), Hanoi. . Founded in 1904, Viet Duc is the largest surgical center of Vietnam. (Viet Duc website, 2015).	Phone calls	YES
Mr. Dao Tuan (Doctor, vice president)	General hospital of Thanh Tri District, Hanoi – one of the biggest hospitals in Hanoi.	Phone calls	YES
Mr. Tran Quang Vinh (cardiologist)	Vietnam National Hospital of Pediatrics. Established in 1969, the hospital is the Institute for the Protection of Children's Health. (Vietnam National Hospital of Pediatrics website, 2015).	Skype call	NO
Mrs. Le Thi Thu	Thanh Nhan hospital in Hanoi, which regarded as the hospital for the poor and workers. Thanh	Skype call	NO

Ha (pediatrician)	Nhan hospital is one of the biggest hospitals in Hanoi with the population of 945 labors. (Thanh Nhan hospital website, 2015)		
Mr. Nguyen Thanh Hai, CEO of Newtel.	Newtel Corp	Skype call	YES

5.2 Diffusion of Telemedicine in Vietnam

As studied from Greenhalgh (2004) model, the diffusion of Telemedicine depends on 5 most important attributes, which are the innovation characteristics, the adoption process, the inner and outer context, the communication and influence and the dissemination efforts.

5.2.1 Perceived innovation characteristics

The perceived innovation characteristics can be analyzed from answers from the interviewees. As there are differences between groups of interviewees, in which group 1, who had already experimented Newtel product would have more specific reviews about Newtel's product whereas group 2 would have perceived characteristics of Telemedicine in general.

Section: Relative advantages

During the interview sessions, interviewees were asked to say about the performance of Telemedicine/Newtel's solution.

For group 1, when comparing between standard care service and the service provided with Newtel's solution, the interviewees pointed out many positive outcomes of the solution. During the product trial period, the hospitals organized distance diagnosis with central hospitals as well as teleconferencing with some hospitals in remote areas such as in Hoang Sa island and concluded that the system help to save the transportation fee for patients as well as shorten the

delayed time before getting the care. This helped a lot in not only reducing the flooded-patient situation in metropolitan hospitals but also increasing the success of curing emergency cases thanks to timely treatment. As stated by an interviewee: *"There is no need to transfer patients to upper level hospitals for treatment. (...)I see the clear potential of reducing the over-capacity situation in my hospital"* (Mr. Dao Tuan, group 1).

Also in group 1, the caregivers agreed that the medical images from Newtel connected devices are transferrable in real time, in high quality via the Internet created no difficulty in distance diagnosis. *"The quality of medical images is very impressive"* (Mr. Dao Tuan, group 1). Besides, the shareable electronic health records help in building a slack source of medical data for scientific researches and other studying purposes. Caregivers from remote areas have more chances to learn from professionals in metropolitan hospitals, which enhance the care quality in remote areas. Ultimately, when using Newtel system, the patients in remote areas were not only the ones who benefit: as each metropolitan hospital has their own specific field, the slack of resources as well as online consultation enhanced the communication between metropolitan hospitals and let them learn from each other to leverage the service comprehensively, which was the case when Viet Duc hospital held live consultations and conferences via Internet easily and more frequently with central hospitals such as Thanh Tri hospital, Saint Paul hospital etc. *"The live ability to have live medical consultancy with other professionals during operations is really a great help"* _said by Mr. Tran Trung Kien, group 1.

For Group 2, even though not being able to experiment the Telemedicine, the caregivers still perceived some advantages of Telemedicine such as the increase in the availability of the care service in remote areas, the cost effectiveness of telemedicine by reducing the transportation - as said by Mrs. Le Thi Thu Ha - *"I was thinking about the reduced cost for the service and having the Telemedicine applicable in remote areas"*. Besides, they also perceived that the shareable data enables the consulting results to be made by not only one person that helps professionals to avoid errors in diagnosis due to personal

subjective opinions, the cloud storage makes it easier for data sharing and storage thus assisting in education and scientific researches. *” I think the convenient and shareable source of medical information for diagnosis would help to avoid a lot of mistakes in examination due to personal subjective opinions (...) It also helps in doing scientific researches”* (Mr. Tran Quang Vinh, group 2). **These advantages** from Telemedicine perceived by the caregivers in both group **would be the factors that motivate them to adopt Telemedicine.**

For all groups, the interviews also discussed the price of Telemedicine devices. According to Mr. Hai and group 1, the price of telemedicine devices provided by Newtel is relatively cheaper than foreign devices, which created a relative advantage on the price for Newtel’s solution consequently decreased the price of the care service using Telemedicine and overall encourage the adoption.

”The price of Newtel devices is about 1/10 other foreign devices” (Mr. Nguyen Thanh Hai, Newtel CEO)

”Currently we are making free treatment with Newtel system but I expect a cheaper diagnosis price (...) The care service provided within Telemedicine system should be cheaper (...) The fee for storage and maintenance of medical data will be a lot cheaper” (Mr. Dao Tuan, group 1)

However, according to interviewees from group 2, **the prices perceived** for Telemedicine services as well as Telemedicine devices were high, which **might be a barrier to adopt Telemedicine.**

”The price for care service with Telemedicine should not be too expensive otherwise we cannot use it” (Mrs. Le Thi Thu Ha, group 2)

”I expect the price for Telemedicine care services to be high at first but the price will drop in no time” (Mr. Tran Quang Vinh, group 2)

Section: Compatibility

As by asking if the groups would recommend using Telemedicine or not and further explanations about the adoption of Telemedicine/Newtel’s solution into the system, the interviewers expressed a positive attitude toward Telemedicine. *”it is necessary to adopt Telemedicine”* _ stated by Mrs. Le Thi Thu Ha. These

positive attitudes proved a certain level of compatibility between Telemedicine and the existing values, and needs of potential adopters. Mr. Hai, Newtel CEO also said about Newtel solution that the system was designed with the adopters to extract clinical data from the existing devices in hospitals. Therefore the Newtel system technically did not conflict the existing system in hospitals. Also added by Mr. Dao Tuan *“The system is applicable from central hospital to commune hospitals”*. These above mentioned would be **factors that encourage hospitals to adopt Telemedicine or specifically the solution from Newtel.**

However, when speaking about diagnosis/examination and treatment, interviewees, especially ones from group 2 still mentioned a lot about traditional face-to-face diagnosis and treatment and questioned on the quality of the examination and diagnosis via Telemedicine system. This showed the potential conflict between the use of telemedicine and past experiences, **which would be the barriers in adopting Telemedicine.**

“Adopting telemedicine is a must, but it’s better for consultation and sharing data rather than conducting examination because distance examination cannot be as accurate as direct examination and diagnosis.” (Mr. Tran Quang Vinh, group 2)

“I think its better to combine these two examination methods. Direct contacts with patients are always necessary. ” (Mrs. Le Thi Thu Ha, group 2)

Section: Trialability

For the caregivers who had not experimented Telemedicine, when being asked about the performance of Telemedicine in the workplace and its most popular solutions, the interviewees mentioned about tele-conferencing and electronic medical records. They believed those solutions can easily be put into trial and gain positive reviews, and they are willing to try using the solution. As stated by Mrs. Le Thi Thu Ha, “If we have financial supports, we will surely try using Telemedicine. I guess the supports will not a massive amount for applications such as an online cloud source for medial data”. Fortunately, acknowledging the

importance of the trial process, Newtel had offered free trial periods for some hospital, which is promising factors to encourage the adoption.

"I heard that the price of Newtel machines are cheaper but right now we are on the trial period and Newtel are providing us the solutions free. (...)" (Mr. Dao Tuan, group 1).

Section: Complexity

The overall answers about the complexity of Telemedicine pointed out that the caregivers thought using Telemedicine devices is not complex, which would be **a factor that encourage the adoption:**

The interviewees who were experimenting Newtel's products in group 1 said that the devices were not difficult to use. Besides, as mentioned by Mr. Tran Trung Kien, most of the caregivers were required to have a National IT certificate before graduating from medical universities so most of them were fast when adopting new devices. Caregivers would definitely need some training before using the products then there were no problem found. *"Trainings are needed for sure, but I think the system is easy to use"* _ said Mr. Dao Tuan.

For group 2, the overall opinion is that using new medical devices would require some training but the caregivers and most of their colleagues *"would get used to those new devices in no time"* (Mrs. Le Thi Thu Ha). Interviewees also stated that mobile devices and computers were generally used since most of people got used to getting the information from those devices, having electronic health records seemed to be even more convenient than having to carry the paper records around.

"Everyone in my workplace uses computers to read medical data from outside. (...) I think there will definitely no or only some minor difficulties for us in using new Telemedicine devices" (Mr. Tran Quang Vinh, group 2)

Section: Observability

It would be difficult to clarify the perceived observability of Telemedicine because even in group 1, the trial period is not long enough to have some

numerical data to analyses the benefits from Telemedicine to see how critically Telemedicine can help to improve the service, for instant the average cost and time saved etc. However, all interviewees mentioned about the different advantages in cost and time effectiveness, which showed the possible observability of Telemedicine's benefits. Furthermore, interviewees from group 1 complimented a lot on the benefits of electronic health records in storage and sharing the data that showed how visible the benefits of Telemedicine is to the caregivers as confirmed by Mr. Dao Tuan: *"The benefit from Newtel system is so subtle"*.

Summary on the factors that for/against the adoption of Telemedicine from the perceived characteristics

Basing on the perceived characteristics of Telemedicine/Newtel's solution, the table 4 above showed the possible results from those characteristics in FOR or AGAINST factors that impact the adoption of Telemedicine.

Table 4. Perceived innovation characteristics from interviewees

<u>Characteristic</u>	<u>FOR or AGAINST FACTOR on the adoption</u>
Relative advantages	BOTH FOR AND AGAINST FACTORS
Compatibility	BOTH FOR AND AGAINST FACTORS
Trialability	FOR
Complexity	FOR
Observability	FOR

5.2.2 The adoption process as engaged or not by individual

The caregivers will be the one to use Telemedicine to deliver care service so their individual decision matters a lot in the adoption process. The individual

decision can be affected by psychological attendees such as knowledge about the information, perceptions, and beliefs etc., which were mentioned in picture 2.

For the caregivers in group 2, who had not the chance to try the product, there showed the conflict between the use of Telemedicine and past practices. The reason behind was because they feared that the examination of Telemedicine could not be comprehensive as direct contact and examination, which affected the quality of the perceived service quality provided by telemedicine and might cause some potential risks when applying telemedicine. *"Lack of direct contact might lead to the skip of patient's comorbidity"* _stated by Mr. Tran Quang Vinh, group 2. **This perception might be a factor that restricts the adoption of Telemedicine.**

On the other hand, according to Mr. Dao Tuan, who was utilizing Newtel's system for connected laparoscopic surgeries in Thanh Tri Hospital, there were minor or no risks estimated during usage because telemedicine was used for professionals to assist the diagnosis/examination and treatment process with the help of on-site caregivers who had direct contacts with patients.

In addition, the group 2, when being asked about the price of Telemedicine devices, the 2 interviewees seemed to be against the idea of cheap price connected devices: *"I don't go for the idea of a cheap system. We need the delicate in healthcare and it's hard for me to ensure the quality of cheap machines?"* _ said by Mr. Tran Quang Vinh, group 2. They have a perception of the correlation between the product price and its quality. These two interviewees considered the medical device being used should better be not too cheap since the medical information from the devices played an extremely important role in the accuracy of the diagnosis. **This would be a factor that restricts the application of Telemedicine** since the foreign devices were known to be expensive whereas domestic solutions could not gain the reliance from the caregivers due to cheap price. In contrary, when the interviewees had the chance to try Newtel devices (Group 1), they perceived those devices

provided good medical information (as mentioned in the previous part about relative advantage).

Therefore, it can be concluded that the adoption process, as engaged by the individual decision from the caregivers, **might meet the adoption barriers** at Knowledge stage (interviewees who had not tried the product but obtained some knowledge about the product) and **both for and against factors** affecting the adoption at persuasion/decision stage (interviewees who experimented the product). Another note on the adoption process is that when being asked about the adoption of Telemedicine, the interviewees agreed that the process would take time, which also is a factor that restricts the adoption since the long time might result in the increase of uncertainty amongst the caregivers.

Table 5. The adoption process

<u>The adoption process</u>	<u>FOR or AGAINST FACTOR on the adoption</u>
At Knowledge stage	AGAINST
At Persuasion/Decision Stage	BOTH FOR AND AGAINST
Time	AGAINST

5.2.3 Inner and outer organizational context

In order to analyze the inner and outer organization context, there were questions concerning the managerial attitude and the communication within the hospitals as well as the government's attitude towards telemedicine.

For the outer context, the cultural behaviors in Vietnam were proved to encourage the adoption of innovations. The question remained is on the government attitude toward Telemedicine. This question was answered by Newtel's CEO. He stated that the government was making positive moves in the application of telemedicine in a wider range even though there were no official

regulations on Telemedicine. Newtel was also cooperating with the Ministry of Health in order to consult some pilot projects on Telemedicine.

For the inner context, about the managerial attitude, all the interviewees said that the hospital listened to their opinions before getting to a decision of adopting a new practices taking in consideration that the decisions must be patient-centered. Sometimes the President of the hospitals or Heads of department made the decisions based on the votes from the employees. However, most of the time the decision was made centralized.

“The decisions to adopt new practices or not are usually made by the hospital leaders. But they do record our opinions or hold meetings to discuss” (Mrs. Le Thi Thanh Ha, group 2)

This managerial attitude created the uncertainty amongst the caregivers, as one of them skipped the question about how the decision is made, saying that he did not clearly know the decision process in his hospital. This might result in a factor that restricts the adoption of Telemedicine. Besides, continue with the inner context, about the communication inside the hospitals, the interviewees claimed that there were meetings several times a week (Mr. Dao Tuan, group 1) and there were slack sources as storage rooms to keep all paper records (Mrs. Le Thi Thu Ha, group 2), which keeps the communication inside the hospitals at an efficient level and creates a factor that encourage the adoption.

Table 6. Inner and Outer context

<u>The adoption process</u>	<u>FOR or AGAINST FACTOR on the adoption</u>
Outer context	BOTH FOR AND AGAINST
Inner context	BOTH FOR AND AGAINST

5.2.4 Communication, influence and dissemination

When being asked about by which channel the hospitals in group 1 acknowledged Newtel's solution, the answers were via seminars (Mr. Tran Trung Kien, group 1) and via the introduction of an old classmate (Mr. Dao Tuan, group 2). This proved how effective interpersonal communication is in delivering new innovations. Mr. Hai, CEO of Newtel also confirmed his ways of reaching potential customers were via interpersonal contacts as well as seminars and *"Newtel products have not been exposure in social media"*. These answers showed the importance of interpersonal communication channels. However, if Newtel has a better branding strategy, the caregivers will be able to know more about the solution thus reducing the uncertainty, as the interviewees said they thought the company would make moves on social media to spread the information about Telemedicine to not only caregivers but also patients (Mrs. Le Thi Thu Ha, group 2).

On the other hand, when discussing about patients' refusing on using Telemedicine, the interviewees advised that if the patients were disseminated about the benefits of Telemedicine, they would have a high rate of adoption. Furthermore, the interviewees believed that in the relationship between caregiver – patient, the caregivers were the ones to know the situation best and patients usually agreed on the caregiver's opinion. It is thus essential to communicate and persuade the caregivers to use the innovation in order to have it adopted by the whole market.

"I think the doctors most of the time are decision makers. Patients believe and listen to them" (Mr. Dao Tuan, group 1)

"Patients need more information on Telemedicine. I don't think they will refuse it if they know its benefits" (Mr. Tran Quang Vinh, group 2)

5.2.5 Summary on the factors that encourage/restrict the adoption of Telemedicine in Vietnam

According to the notes from previous parts, which analyzed the possible for and against factors on the adoption of telemedicine based on the model by Greenhalgh (2004), I will summary the factors that encourage/restrict the adoption of Telemedicine in Vietnam.

- Factors that encourage the adoption of Telemedicine in Vietnam:

Talking about the factors that encourage the adoption of Telemedicine in Vietnam, we firstly have to mention about the benefits of Telemedicine in Vietnam. As perceived by the interviewees about the relative advantages Telemedicine, it is able to enhance the availability of the service, to offer cost and time effectiveness to patients by distance diagnosis/examination, as well as to create a slack resource for storage. The cloud base storage would make it easier for knowledge sharing and distance training. The enhanced availability of care service also provides efficient care for patients in remote areas and reduces the overloaded situation in metropolitan hospitals. Overall, these visible benefits from Telemedicine itself will be an important factor that encourages the adoption.

The second factor comes from the caregivers who was proved in the part about the perceived complexity, who are technology enthusiasts and open toward Telemedicine. They are opinion leaders who widespread the innovation to other caregivers as well as patient.

The third factor would be the encouragement from the outer context with a cultural openness toward innovation (low uncertainty avoidance score) and the pilot projects as well as positive attitudes towards Telemedicine (willing to adopt attitude). In the near future, if there is an official regulation specified in the application of Telemedicine in Vietnam, the adoption of Telemedicine will be supported.

The fourth factor would be the compatibility of domestic solution from Newtel with the existing system. Besides, as mentioned in the Literature review, better digital infrastructure of Vietnam with the coverage of 3G, coming with the falling costs of ICTs (second global survey on eHealth by WHO, 2010), as well as the worldwide enhancement of computing speeds, and high-speed bandwidth (Alverson et al., 2009, 219-225) is another reason proving the compatibility of telemedicine to the current system in Vietnam.

The last factor that encourages the adoption of telemedicine is the involvement of entrepreneurs such as Newtel in developing telemedicine solution, which offers systems with good price as well as free trial periods.

- Factors that restrict the adoption of Telemedicine in Vietnam:

The first factor that restricts the adoption of Telemedicine in Vietnam is the perceptions in traditional healthcare practice in Vietnam that requires direct contact with patients. Telemedicine, which encourages making health examination without direct contact, will be questioned about its quality unless there are efficient trial set up.

The second factors would be the perceived high cost of medical connected devices. Even if the domestic devices provided by Newtel has good price, there are perceptions from caregivers that the cheap price will result in not good quality of medical information from the devices, which make the caregivers to turn their back to cheaper domestic solutions.

The third restriction to the adoption of telemedicine that was retrieved from the outer context is the lack of official information as well as a regulation framework imposed by the government or responsible organization. This lack of knowledge and guidelines would lead to higher rate of uncertainty among adopters.

The fourth factor causing restrictions on the Telemedicine adoption process is the managerial attitudes in hospitals, which create dictatorship and might cause resistance from the caregivers.

The final reason that restricts the adoption of telemedicine lies in the long adoption time (as mentioned in the part about Adoption process in Data Analysis), which would create higher level of uncertainty and growth of the refusing possibility.

5.3 Impact of the adoption of Telemedicine in Vietnam

In the Literature, we found out that “*telemedicine will not thrive without cheap, reliable remote diagnostic tools and other value network factors, such as Interoperable Electronic Health Records.*” (Devonas, 2015b). Therefore, disruption of the Healthcare in Vietnam happens only if the **value network of Telemedicine in Vietnam configures as expected that made it into a disruptive innovation and the diagnostic tools should be cheap and reliable enough for the caregivers to use it without having to make physical proximity** (Devonas, 2015a). In order to find out Telemedicine’s possibility to create disruption in the healthcare industry in Vietnam, we have to look at the answers given by the interviewees with the assessment guidelines from Christensen’s theory and Devonas’ hypotheses. In the table 7, we compare the current perceived characteristics of Telemedicine to the characteristics required to be a disruptive innovation adopted from table 2 by Christensen (1997, 2003)

Table 7. Rationale on the perceived characteristics of Telemedicine in Vietnam collected from interviews with the characteristics of Disruptive innovation adopted from table 2

<u>Characteristics of a Disruptive Innovation</u>	<u>Telemedicine in Vietnam rationale</u>
Targeted performance of the product or service	<p>Patients: The quality of diagnosis/examination provided by Telemedicine is still questioned by the caregivers. However, overall Telemedicine was able to cost and time effectiveness as well as enhanced availability to the current care service.</p> <p>Caregivers: Telemedicine provides tools that help caregivers to do their work more conveniently by enabling a sharable resource and the possibility to communicate and learn from other caregivers.</p>
Targeted customers	<p>Patients: Telemedicine/Newtel’s solution is said to be benefit patients who live in remote areas, who previously might not have enough money and chance to enjoy</p>

<p>or market application</p>	<p>good healthcare service. However, it might benefit the new market of patients who previously got used to going to hospital for care.</p> <p>Caregivers: The application of telemedicine enables a sharable resource that encourage the caregivers to exchange more information and utilize the system to give distance care –that is to say, Telemedicine was able to target the consumers who previously do not have the need of using it.</p>
<p>Impact on the required business model (processes and cost structure)</p>	<p>Patients: the care service provided to patients with telemedicine is expected to be not too high (cheaper than standard service). If the price for care service by telemedicine is relatively cheaper than the face-to-face service, there will be a disruption.</p> <p>Caregivers: The devices are perceived to have high price but in reality, the price is much cheaper. In order to get the disruption effect, the price for Telemedicine must be cheap.</p>

From the table above, we can see that telemedicine in Vietnam clearly brings a product with efficient performance to the customers at the low-end of the market as it enables care service for patients in remote areas which previously do not have enough money or time or other conditions to use care service. This is the feature of a Low-end disruption with the market here to be the healthcare industry. Nevertheless, it also benefits the caregivers who previously had not have the need to use Telemedicine with new tools for doing their job conveniently (electronic health records, cloud storage etc.), which was the features of new market disruption with the market here to be the healthcare tools/devices supply. In order to make the disruption happens, as the model of a Low-end Disruption and New market disruption suggested, the care service provided via Telemedicine should have a cheaper price than the face-to-face care service (1) and/or the devices for doing Telemedicine should remains low (2). We can see that the (2) and (1) has a cause and effect relationship as Telemedicine in order to be diffused, must have been adopted first by the caregivers, which means the price of the Telemedicine devices must be low enough to be used generally by the caregivers. The lower price for medical devices will lead to the cheaper price of care service provided with telemedicine and in the long run, the drop in price will increase the usage quantity thus creating a total disruption in the healthcare system in Vietnam.

From the previous part, there are barriers for the adoption as well as the disruption to happen, which concern the **quality of diagnosis done via Telemedicine** and the **quality of cheap medical devices**. It happens exact the

same way as Devonas' hypotheses that the disruption only happen if there are ***cheap, reliable remote diagnostic tools***. Therefore, in order to conclude this part, we can say that there **is potential for telemedicine to take over the healthcare system in Vietnam but only if there are cheap medical devices that are able to gained the faith and reliance from the caregivers.**

6 CONCLUSION

The study provides the knowledge about telemedicine as an innovation in healthcare and states the great benefits that telemedicine can bring to developing countries like Vietnam. The benefits are the enhance availability of care service, the decrease on the need for patient transfer and reduce the over-capacity situation in metropolitan hospitals in Vietnam, the cut on the transportation cost and time waiting to be served for patients, the balance out of the gap between the care service in rural and urban areas thus avoiding brain-drain and the revolution on knowledge sharing, distance learning and training etc.

Following the same path as other innovations in healthcare, the adoption of Telemedicine has always been a huge topic to discuss. The study, achieved its objective, by being able to answer the sub questions on **“The factors that for/against the adoption of Telemedicine”**: There are many positive factors that inspired the adoption of telemedicine in Vietnam such as the visible benefits of telemedicine in Vietnam itself, the openness to innovation of caregivers, the efficient ICT infrastructure to develop Telemedicine, the cultural factors etc.; however, there are still a lot of barriers in the adoption of Telemedicine in Vietnam, namely the lack of guidelines and regulation from responsible organizations as well as proper trial programs, the norms/perception about the importance of physical proximity and the misdoubt in the quality of Telemedicine diagnosis devices, the possible high price of the system and the vague managerial attitude in making decision in healthcare organizations. It also analyzed the potential impact of the adoption of Telemedicine to answer the sub questions about **“What is the potential result in adopting telemedicine and more specifically Newtel’s solution in Vietnam”**, and predicted that Telemedicine can transform the healthcare industry in Vietnam and replace the physically proximal care, but only with certain conditions such as the existence of cheap price Telemedicine diagnosis devices and the reliance on those devices from the caregivers.

From the answers for these sub question, the study thus makes the conclusion on **“How can Telemedicine and specifically Newtel’s solution being adopted in Vietnam?”** by pointing out the factors that should be put in consideration if in the adoption of Telemedicine or Newtel solution in the market. For example, the factors that encourage the adoption, which are worth utilizing to popularize Telemedicine to the public; or the factors that restrict the adoption of Telemedicine that should be avoid by having the government publish an official regulation on Telemedicine application or promoting Telemedicine solutions by providing trial periods and financial supports to hospitals. Although there are some existing limitations mentioned from the Methodology part, the knowledge gained from the study is practical as it can be the guidelines for Newtel to make its way into the market and for the hospitals to consider the adoption of Telemedicine considering the transforming effect that it can bring about.

Suggestions for further research

For further development of this study, I suggest to study the adoption in detail of each Telemedicine applications as they are distinctive from each other and some applications such as the Electronic Health Records, which seems to be able to make a disruption earlier than the other application or Home eHealth, which provides at-home medical service. For the sake of Newtel, I would recommend a more effective advertising/branding strategy in order get more exposure and to gain the trust from caregivers paralleling with the advertising of the products in seminars or prestige medial workshops with high reputation among professionals. Last but not least, it was reflected that the caregivers were willing to test the products; therefore, more trial campaigns should be done to more hospitals.

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QUESTION GUIDELINES

QUESTION CATEGORY FOR GROUP 1:

Perceived facts:

- (1) Why do you acknowledge Newtel and why you agreed to try Newtel's products?
- (2) What Newtel's solutions were put into trial in your workplace?
- (3) How do you expect benefits of Newtel's solution in the system?
- (4) How do you evaluate the care quality when applying Newtel's solution comparing to your standard care service that you used to provide?
- (5) How effective is the Newtel system in your workplace? Please provide answers relating to the price of devices, price of care service, quality and availability of the care service. Do you recommend using Newtel's product?
- (6) How do you see the risks when using Newtel's system/devices?
- (7) How do you find the system easy to use/difficult to use to you and your colleagues? What skills/knowledge do you think it requires being able to use Newtel's product?
- (8) What are the patients' reactions when seeing you using the product (especially in operations)?

Opinions:

- (9) How do you evaluate the communication within people in your workplace? Is there available a slack source of information?
- (10) How do you think about the adoption of new practices in your organization?
- (11) What are the potential reasons for patients to resist using Newtel's system?
- (12) From your experience, what communication channels do you find effective to disseminate Newtel's products (social media, doctor's advises etc.)?

(13) What do you think are the barriers to adopt Newtel's solutions?

(14) What are your recommendations in further developing Newtel's products?

QUESTION CATEGORY FOR GROUP 2:

Perceived facts:

(1) What is your knowledge about telemedicine? What do you think are the main benefits of telemedicine? Please list the answers.

Opinions:

(2) How do you expect the performance of Telemedicine if applied in your workplace comparing to standard care service? Please provide answers relating to the quality and availability of the care service. Do you recommend using Telemedicine?

(3) Which telemedicine solution do you think the easiest one to apply in your workplace?

(4) How do you expect the price of the Telemedicine devices and care service?

(5) How do you see the risks when using Telemedicine system/devices?

(6) How do you evaluate the computer skills and the ability to get used to new medical devices of you and your colleague in order to use telemedicine? Do you think extra trainings are necessary?

(7) How do you evaluate the communication within people in your workplace? Is there available a slack source of information?

(8) How do you think about the adoption of new practices in your organization?

(9) From your experience, what are the potential reactions from patients when using telemedicine (distance care)? What are the potential resistances?

(10) From your experience, what communication channels do you find effective to disseminate a new care delivery method (social media, doctor's advises etc.)?

(11) What are your recommendations to make Telemedicine applicable in the care system?

QUESTION CATEGORY FOR GROUP 3

(1) How do you evaluate the quality of care service with Newtel's solution comparing to face-to-face service? Are there any big differences between the qualities of those two?

(2) What are the main difficulties for the users when using Newtel's products?

(3) Please provide some feedbacks from the users of your service (hospitals, patients)? How do you evaluate the overall feedbacks?

(4) What do you think are the main reasons if the customers refuse to adopt your solution?

(5) What are your target customers and how you reach them?

(6) What are your main competitors in the market?

(7) How do you compare the price of your products to non-connected devices and devices from your competitors?

(8) How do you expect the cost of care service after applying your products?