

2011

Exploring factors that affect teleconsultation adoption: In the case of Malaysia

Nurazean Maarop
University of Technology Malaysia

Khin Than Win
University of Wollongong, win@uow.edu.au

Maslin Masrom
University of Technology Malaysia

Sukdershan Singh Hazara Singh
Ministry of Health

Follow this and additional works at: <https://ro.uow.edu.au/infopapers>



Part of the [Physical Sciences and Mathematics Commons](#)

Recommended Citation

Maarop, Nurazean; Win, Khin Than; Masrom, Maslin; and Hazara Singh, Sukdershan Singh: Exploring factors that affect teleconsultation adoption: In the case of Malaysia 2011.
<https://ro.uow.edu.au/infopapers/3816>

Exploring factors that affect teleconsultation adoption: In the case of Malaysia

Abstract

This study identifies the factors that could affect the adoption of teleconsultation technology in public hospitals in Malaysia from the qualitative standpoint. Based on theory-driven and prior-research approach, a conceptual framework was developed and used to facilitate the data collection and analysis processes. The underlying framework derived from a consideration of integrated model of established technology acceptance and diffusion theories and also findings of published telemedicine studies. Semi-structured interviews involving twenty eight key informants coupled with reviews of relevant documents were conducted within eleven participating hospitals to examine the key issues addressed in the framework which subsequently entailed thematic analysis. A summary of six themes and sub-themes drawn upon a priori issues appeared from the patterning of the responses were found to be of great importance in describing teleconsultation adoption phenomenon in Malaysia. Most respondents perceived teleconsultation as beneficial and useful for delivering health services. However the central issues appeared to be more focused on the actual need for the technology, perceived trust in technology and subsistence of facilitating conditions in explaining the way teleconsultation is utilized, suggesting more rigorous research should be conducted to uncover and acknowledge the actionable factors that potentially influence teleconsultation and health information technology adoption.

Keywords

Teleconsultation, Telemedicine, Adoption, Diffusion, Utilization

Disciplines

Physical Sciences and Mathematics

Publication Details

Maarop, N., Win, K. T., Masrom, M. & Hazara-Singh, S. (2011). Exploring factors that affect teleconsultation adoption: In the case of Malaysia. PACIS 2011: 15th Pacific Asia Conference on Information Systems: Quality Research in Pacific (pp. 1-12). Queensland: Queensland University of Technology.

EXPLORING FACTORS THAT AFFECT TELECONSULTATION ADOPTION: IN THE CASE OF MALAYSIA

Nurazean Maarop, Advanced Informatics School, University of Technology Malaysia, Kuala Lumpur, Malaysia, nurazean@ic.utm.my

Khin Than Win, Faculty of Informatics, University of Wollongong, Australia, win@uow.edu.au

Maslin Masrom, School of Engineering and Advanced Technology, University of Technology Malaysia, Kuala Lumpur, Malaysia, maslin@ic.utm.my

Sukdershan-Singh Hazara-Singh, Telehealth Division, Ministry of Health, Malaysia, drsukdershan@moh.gov.my

Abstract

This study identifies the factors that could affect the adoption of teleconsultation technology in public hospitals in Malaysia from the qualitative standpoint. Based on theory-driven and prior-research approach, a conceptual framework was developed and used to facilitate the data collection and analysis processes. The underlying framework derived from a consideration of integrated model of established technology acceptance and diffusion theories and also findings of published telemedicine studies. Semi-structured interviews involving twenty eight key informants coupled with reviews of relevant documents were conducted within eleven participating hospitals to examine the key issues addressed in the framework which subsequently entailed thematic analysis. A summary of six themes and sub-themes drawn upon a priori issues appeared from the patterning of the responses were found to be of great importance in describing teleconsultation adoption phenomenon in Malaysia. Most respondents perceived teleconsultation as beneficial and useful for delivering health services. However the central issues appeared to be more focused on the actual need for the technology, perceived trust in technology and subsistence of facilitating conditions in explaining the way teleconsultation is utilized, suggesting more rigorous research should be conducted to uncover and acknowledge the actionable factors that potentially influence teleconsultation and health information technology adoption.

Keywords: Teleconsultation, Adoption, Diffusion, Utilization

1 INTRODUCTION

In late 1990s telemedicine was introduced in a number of developing countries including Malaysia (Maarop & Win 2009). One of the most emerging telemedicine applications proven to be beneficial to hospital management and patients' health outcomes is teleconsultation. Teleconsultation comprises broad collection of information and communication technologies (ICT) as part of health care facilities to deliver and manage long-distance clinical health services especially at the underserved areas to consult with specialists. In Malaysia, this includes consultation and referral over electronic platform (web-based technology) which takes place between primary (also secondary) and tertiary health care facilities. The rapid advances in ICT have vastly increased the capacity and potentials of teleconsultation. In one glance, teleconsultation has made the services of specialists' consultation available throughout the hospitals' network. In Malaysia, telemedicine project was launched as one of the national flagship applications in April 2000 aimed to virtually expand the clinical service and expertise to rural and remote areas thus to improve quality of national health care. It was implemented in the pilot mode over a 30-month period commencing in 2000, linking 38 Ministry of Health (MOH) hospitals and health clinics across the country (mainly peninsular Malaysia). However at that point of time albeit its advantages, teleconsultation in Malaysia had not been embraced due to some implementation and adoption barriers and the implementation had gone through evolution of massive technological and infrastructure alteration and upgrades as to uphold the providers in promoting good health and preventing morbidity and mortality. Due to inconsistency in service needs and demand, sustainability of utilization has been an issue of concern. Consequently, the transfers of teleconsultation equipment from majority of sites to new sites were performed; this is because some sites were not active and therefore reallocation of the sites had to be carried out in tandem with the needs for the service (MOH Malaysia 2007). In turn, the potential of the latest teleconsultation technology which commenced in early 2010 is now gradually being realized and transpired. This research was derived from a motivation to encompass several issues concerning factors determining utilization behaviour of teleconsultation technology. At the national level, there are no in-depth studies about physicians' teleconsultation acceptance and adoption. The overall objective of this study was to identify the factors that could influence the way teleconsultation is utilized in Malaysia. In particular, the study was intended to discuss about teleconsultation adoption issues from the qualitative standpoint. There is a lack of qualitative perspective in technology adoption studies. Thus, most of the literatures associated with technology adoption are explanatory in nature emphasizing on model validation. The findings can be used to enrich the understanding of critical issues related to teleconsultation adoption.

2 LITERATURE REVIEWS

Although substantial efforts have been invested in trials and experiments of telemedicine services yet, surprisingly only few applications have continued beyond the initiatives, research and development phase (Berg 1999; Broens TH et al. 2007; Obstfelder et al. 2007). There are a number of examples around the globe where telemedicine has been introduced and rapidly abandoned, often because it has simply failed to be integrated into the circle of health and business environment (Yellowlees 1997). A review of telemedicine implementation in developing countries has suggested that technical barriers could complicate telemedicine implementation in those nations (Maarop & Win 2009). This also happened in developed nations like Canada and United States in which the diffusion of telemedicine is still limited (Gagnon et al. 2005; Bangert & Doktor 2005). Successful Information System (IS) in health care has many dimensions: efficiency, effectiveness, organizational attitude and commitment, worker satisfaction and patient satisfaction but yet none of these would be the most relevant to satisfy all stakeholders in and outside of the implementing organization (Berg 2001). Before any movement can be made to explore teleconsultation adoption and utilization factors in the adopting hospitals, there are important theoretical and contextual aspects need to be considered.

2.1 Technology Acceptance and Diffusion Theoretical Perspective

As most of prior health information technology (IT) studies concerning physicians' belief about using technology have focused on electronic health records (EHR) (Holden & Karsh 2010), a limited number of frameworks have been employed to explain the diffusion and adoption of telemedicine technology at both individual and organizational level. However, most of studies of telemedicine adoption were not based on theoretical ground suggesting to theoretical development limitation. A series of telemedicine adoption and acceptance published studies explaining how physicians' accept and adopt telemedicine have been explored primarily quantitative in nature by Hu et al. (1999; 2002) and Chau and Hu (2002) in health facilities in Hong Kong. Their studies were mainly based on Technology Acceptance Model (TAM) developed by Davis (1989) and the fundamental of the studies are found to be more explanatory in nature emphasizing framework (model) validation. However, their findings have implied that some aspects of TAM can be considered in this study. Diffusion of Innovation (DOI) (Rogers 1995) is another universal theory that has been used to explain factors influencing telemedicine success in New Zealand (Al-Qirim 2007). Both TAM and DOI attempt to explain innovation adoption by using perceived attributes of technology as the shared features as constructs employed in TAM are fundamentally a subset of the perceived innovation characteristics; explicitly, perceived usefulness and perceived ease of use are abstractly comparable to relative advantage and complexity of DOI (Yi et al. 2006). Although TAM was used fairly convincing in explaining physicians' acceptance and utilization of health IT, the actual barriers and facilitators to technology use were not covered suggesting a more rigorous research effort should be carried out to uncover specific, contextualized, and actionable constructs that may have existed in health IT diffusion (Holden & Karsh 2010). Therefore we have considered Unified Theory of Acceptance and Use of Technology (UTAUT) (Ventakesh et al. 2003), Model of PC Utilization (MPCU) (Thompson et al. 1991) and Theory of Interpersonal Behaviour (TIB) (Triandis 1980) to support the exploitation of facilitating conditions construct as one of the important predictors in teleconsultation adoption behaviour. Facilitating conditions construct was postulated in the study of telemedicine adoption on a national scale in Canada. However, the items selected for the use of questionnaire were claimed to be reasonably inadequate which has resulted in failure in testing the effect on the utilization (Gagnon et al., 2003). Conversely Hu et al. (1999) found that conditions such as proper training, technology access, and in-house technology expertise, were positively associated with behavioural intention to use telemedicine technology by physicians. UTAUT has been tested in a study examining factors influencing health IT adoption in Thailand's community health centres and the study has confirmed the validity of facilitating conditions and the model itself in developing countries' healthcare setting (Kijisanayotin et al. 2009).

2.2 Contextual and Organizational Perspective

Most of telemedicine studies are related to patients' acceptance of telemedicine, home telecare adoption, assessment of telemedicine technology and systematic reviews of effectiveness of telemedicine. Most telemedicine utilization research efforts appeared to be predominantly associated with studies on how patients adopt the technology rather than the physicians utilize the technology in the hospital per se. In addition, to the best of our knowledge, there was no similar study yet to be conducted in developing countries that have involved substantial empirical data and analysis. There are various issues emerged when adopting different types of teleconsultation and most literatures have focused more on video conferencing aspects particularly in developed countries whereas email and other low-cost teleconsultation are still credibly used in developing nations (Maarop & Win 2009). Telemedicine sessions can be conducted on several networking platforms e.g. public network (public email), intranet or virtual private network employing web technology. The choices of platforms used are rarely mentioned in the existing published studies. Since there is no fixed and standard technology that enables telemedicine, it is not possible to postulate diffusion of telemedicine as a whole (Grigsby et al. 2002) so the efforts should be based on specific diffusion study that consider the respective technological and context-dependent conditions. With regards to Malaysian context, the teleconsultation facility involves centralized application services and data repository operating over a nation-wide private telehealth MOH network. Since teleconsultations are held over MOH-owned

network and all participating users are the MOH recruits, therefore the concerns of reimbursement (between adopting hospitals) and licensure are not applicable in this study. As telemedicine application should be based on the need pull rather than technological driven in determining the adoption (Rigby 2002), aspects associated with the need for teleconsultation should not be overlooked. Findings of a review of telemedicine in developing countries have revealed that majority of the countries regard teleconsultation as a proxy to specialists' access thus the need for telemedicine is likely to be associated with the need for tele-specialists' consultation and second opinion (Maarop & Win 2009). Indeed, a lesson learned from telemedicine evaluation study is that the need for telemedicine technology should be in tandem with service requirements (Beach et al. 2001). Furthermore, based on triangulation of results involving nine case studies, Gagnon et al. (2005) suggested that it is essential to take into account the aspects of perceived need for the technology (service). The issues of legal concern and trust in medical technology should also be considered. Health care professionals who undertake telemedicine cautiously according to the respective law will minimize the possibility of legal complication (Stanberry 2006) thus physicians who engaged in professional misconduct could easily escape if they use the protocol in telemedicine (Nicolini 2006). Of late trust in technology has emerged as an important factor in medical research. Thus the notion of trust in technology should be taken into consideration in the context of teleconsultation adoption as it has evidently reduced the degree of perceived risk of EHR which would contribute hugely to clinicians' acceptance and continued use of health IT systems (Egea & González 2010). The aspects of trust which have been identified among others that can be employed for the development of trust in medical technology tools are confidence, reliability, security, safety and falsity (Montague et al. 2009). Little research has been done to elucidate the moderating effects of hospitals' characteristics and users' demographics on teleconsultation utilization. Since telemedicine operates beyond one dimensional environment, the context where the telemedicine is intended to commence must be examined carefully first (Whitten & Adams 2003). An investigation of hospitals' characteristics on telehealth adoption by Gagnon et al. (2005) underlined the significance of considering organizational characteristics and the dynamics of each of healthcare facilities. Based on the literature studies, we conclude that the ultimate success of teleconsultation adoption and diffusion requires substantial multidisciplinary efforts that entail various dimensions. In turn, all of these literatures are fundamental in justifying the conceptual framework that was used to probe the key respondents during the interviews to unveil the actual issues of teleconsultation adoption in the context of Malaysia.

3 METHODS AND ANALYSIS

Apparently there is a lack of guiding telemedicine adoption frameworks that can be employed generically in the context under study. In this study, the analyses of the data began with the identification of key issues and dimensions. Bazeley (2007) asserted that "the belief that an inductive approach to research requires that researchers come to their data without bringing any theoretical concepts to the research is generally no longer seen as realistic nor broadly supported". Furthermore if qualitative researcher started the investigation with theories, the researcher would already know what kinds of things can be captured from the data (Bazeley 2007). Hence, based on theory-driven and prior-research driven design qualitative method (Boyatzis, 1998) together with reviews of relevant MOH Malaysia annual reports from year 2006 to 2008, a conceptual framework comprising key issues of telemedicine utilization was developed as shown in Table 1. The framework puts emphasis on highlighted issues and organized into four tentative dimensions along with general basic start list that emerged from preliminary theories and literature reviews. Next, in order to confirm the relevancy of the issues that were highlighted in the conceptual framework, we undertook preliminary investigation of teleconsultation implementation and utilization by conducting interviews with three key stakeholders in the respective teleconsultation social system. The issues were discussed briefly with them before the actual data collection was performed and this involved user of the system, teleconsultation project manager and the system administrator. All of the issues were in essence found relevant in the context of teleconsultation adoption and utilization in Malaysia. Even though unstructured interview would provide broader qualitative information about issues under study but predetermined nature of structured interview can minimize interview errors (Fontana & Frey, 1994). For that reason, a semi-structured interviews scheme and guidelines was developed. A semi-structured

interview strategy was used because it can be used to explore the respondent’s ideas and at the same time the interviewer can switch to planned questions based on the identified key issues when the information elicited appears to be dying up (Cavana et al. 2001). Further, the guiding topics of a semi structured interview allow the researcher to be flexible in asking different participants in different ways thus interview guide approach is particularly appropriate when dealing with informants whose experience and expertise vary widely (Lindlof & Taylor 2002). A key-informant approach was used for primary data collection as it was proven advantageous in telemedicine adoption study in Hong Kong (Hu et al. 2002). The stance of the research was based on the philosophical assumption of interpretive epistemological tradition in which the researcher would seek patterns of meaning, understandings and definitions of the situations from a range of people (Grbich 2007). Furthermore in order to increase the understanding of critical issues related to computer-based information system in organization, interpretive methods of research was suggested by Walsham (1993) as the methods are "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context". The interviews were held based on purposive sampling involving departments of radiology, neurosurgery, dermatology and cardiology from March 2010 till June 2010. Data were gathered from different perspectives; by different group of people who reside within the teleconsultation utilization social system to elicit a range of interpretations of the phenomenon under study and these incorporated 28 participants comprised of:

1. The senders (N=10; A sender is an individual who sends teleconsultation cases e.g. medical officers and medical assistants at the referring hospitals)
2. The receivers (N=5; A receiver is an individual who receives and responds to teleconsultation cases e.g. specialists, consultant, medical assistants and doctors in particular disciplines at the consulting hospitals)
3. Teleconsultation champions (N=5; A champion is an individual who is nominated as champion of the technology)
4. Teleconsultation administrators (N=8; An administrator is an individual who is in charge in daily teleconsultation supports).

Ethics approval and consents were firstly obtained before proceeding to data collection since this involved study of human behaviour in health care environment. Research ethics were approved by Institute for Health Behavioural Research (IHBR) MOH Malaysia, MOH Research and Ethics Committee (MREC) Malaysia and Economic Planning Unit (EPU) Malaysia.

Dimension	Key Issues	Theoretical Background
1. Human Behaviour	Intention to use; Attitude	TAM and Literature Review.
2. Technology Attributes	Perceived usefulness; Perceived ease of use; Trust in Medical Technology	TAM, DOI and Literature Review.
3. Implementation Related	Facilitating Conditions	TIB, UTAUT, MPCU and Literature Review.
4. Telemedicine Environment and Health Care Context	Need Based; Legal Concern; User Demographics; Hospital Characteristics	Literature Review

Table 1. Conceptual framework for teleconsultation adoption

As the interviews were recorded and most of the participants responded in English, the tapes were transcribed and the free-nodes coding (Bazeley 2007) was performed as soon as the first interview was completed. The transcripts were checked iteratively against the audio tapes as to ensure better transcription accuracy. The free-nodes coding was performed based on the key concepts described by key informants and followed by axial coding (tree-nodes) (Bazeley 2007) in which the nodes were organized into hierarchical structure of parent and child nodes. In this study the free-nodes coding and data reduction were rather simplified by the preliminary key issues that were addressed in the

conceptual framework. The analyses involved a series of iterative coding and these were mainly facilitated by qualitative software namely QSR Nvivo 8.

4 RESULTS

The result from the cycles of coding is a list of core themes, sub-themes and categories concerning factors of teleconsultation utilization. Those key issues have been reorganized with proper labelling as to better describe the phenomenon and exhibit the interpretive qualitative concept of this research as shown in Table 2. Six main themes were found to be of great importance in answering the research question: “What are the critical determinants of teleconsultation utilization in Malaysia?”. The result indicated that there was no significant difference in responses among the key-informant groups. The details of related categories are further described according to the respective themes presented in Table 2.

Themes	Sub-Themes
1. Human Behaviour	Intention to use; attitude
2. Technology Attributes	Perceived benefit and usefulness; perceived ease of use
3. Concerns associated with using teleconsultation technology	Trust in technology; legal and guidelines concerns regarding technological use
4. Facilitating and Impeding Conditions	Network and infrastructure; resource conditions; alternatives and options; training and awareness program; role of head of department (HOD)
5. The need pull for teleconsultation	Actual service need
6. Moderating Effects	Hospital characteristics; user demographics

Table 2. Summary of themes and sub-themes

4.1 Human Behaviour

The majority of the key informants expressed that individual acceptance is not the only factor in determining the adoption of teleconsultation technology in MOH hospital in Malaysia. Majority of them have made an association between individual acceptance and technological deficiencies as such acceptance would not be an issue as long as the technology is well maintained and sustained, for example, one participant remarked:

“...It is not totally about user acceptance, this really depends on its technological part...how you actually maintain it and keep it...”

Even though teleconsultation technology had been introduced to some hospitals as early in year 2000; some in year 2006, but the maturity of service is still at the level of infancy as there were frequent service suspensions and transfers of teleconsultation equipment from majority of sites to new sites along with technology and infrastructure upgrades. The new teleconsultation system was installed in early 2010 and placed under vendor support for the next 3 years. In this regards, some key-informants ascertained that the users would definitely use the new teleconsultation more in future. Even though they know that the sustainability of the operation could be hampered by the unavailability of vendor supports after the expiry of the contract, they still hope for the continuance of the service, for example:

“...Hopefully after 3 years when the contract expires, this teleconsultation will continue in the operation...”

In terms of attitudes, most of the existing users’ feelings towards use are generally positive. Some participants expressed that they liked the system and even said “motivated to use it”, “it is a value added” and “I love using it”.

4.2 Technology Attributes

Applications of teleconsultation can definitely provide various benefits to health care providers, patients and other hospital staffs and assistants but it depends whether the users would make use of the technology or not. The result showed that benefits and usefulness of teleconsultation have been recognized and most of the participants have come to consensus that the benefits are found in the form of: 1. provide quick way to specialist access; 2. broaden specialist options; 3. improve documentation; 4. improve coordination between participating hospitals in patient management; 5. improve communication between doctor and consultant; and 6. improve learning process for the inexperienced doctors. Among others, teleconsultation definitely has improved work coordination and broaden specialist access. For example:

“...Not necessarily the one who picks up the case will attend the consultation. He or she might forward it to other consultant and specialist in the same tertiary hospital for more opinions.”

Majority of the users expressed that the technology is very user friendly and easy to learn. The participants have associated the technology use as “compatible”, “simple”, “not difficult”, “colourful”, “easy to use” and “convenient”. Most of the participants asserted that images displayed by the technology are clear and feasible for consultation. However, few participants complained about the technology complexity. However based on the analysis of transcripts, those complaints have been associated with cumbersome steps engaged in teleconsultation session and not the technology per se. For example, due to seamless integration between teleconsultation system and other system in the hospitals the referring users need to do some additional steps prior to tele-consult with specialists.

“... since we don’t have Hospital Information System in place; integrated in the module, so in that case the process involves more steps, e.g. hard copy of x-ray needs to be digitized before you can send. It is not really seamless transfer...”

Nevertheless, perceived benefits and usefulness as well as ease of use are found positive in the latest teleconsultation version particularly with the advantage of mobile technology alert configuration as an added value to alert the consultant about the case being sent to them. Mobile alert is certainly one of the great features in accelerating teleconsultation process and the alert system was appreciated by the majority of the users. For example:

“...whenever the sender sends teleconsultation case, teleconsultation system would send an indication message to receivers’ mobile phones and they can view the case immediately...”

4.3 Concerns associated with using teleconsultation

Apparently most of the literatures that addressed the issues of medical applications have highlighted the importance of medico legal and data protection. Therefore it is important for any governance to consider setting up their own policies to avoid litigation against the physician while practising telemedicine. Thus these policies should be compliant with national law and medico legal to avoid practice conflict. As teleconsultation in public hospitals in Malaysia is provided by MOH hence the operation and technology are compliant with medico legal and diagnostic quality and standard. Due to this reason, the majority of participants expressed their secure feeling towards the utilization of teleconsultation technology. In fact the utilization can be said encouraging because they feel safe about using it compared with using the improper alternatives. One said:

“...only staffs who are more concerned with medico legal would use teleconsultation for sending and retrieving cases and images rather than using the improper channel...”

For the same reason, the majority of participants were less concerned about the security of the system given that a dedicated login id with a password is provided to each user. For example:

“...two levels of access; first as the hospital’s computer user and second as the teleconsultation system user...”

Almost all of hospital applications and system run through MOH networking (MOHNET) including teleconsultation. Most of the participants expressed their confidence and trust in MOHNET. Technically, one said:

“...MOHNET and teleconsultation server have been fire-walled and there are 3 levels of fire wall and security...”

Many participants were less worried about the security, privacy, confidentiality and reliability issues when teleconsultation was held since the activities were wholly manned by the respective MOH division and the transmission was done over a secure network. The summary of trust aspects and concerns associated with teleconsultation utilization as resulted from the interviews are briefly presented in Table 3. In summary, it could be agreed that a high degree of trust in technology is important in determining the likelihood to use teleconsultation among the physicians. They can use any means to make a quick tele-consultation for example by using multimedia messaging system (MMS) entailing them to capture CT scan image using mobile phone photo facility and send it over to consultant but this might be leading to wrong diagnosis because the image is not represented in high end resolution format. Thus, there would be no proper systematic documentation for reporting if MMS is used. Furthermore the transmission of image will put at risk the confidentiality and the integrity of the unencrypted data and image sent over an open (third party) network. As teleconsultation can be made as simple as two doctors having a communication through fax and telephone without any transfer of image to assist the diagnosis but then the referring doctors might make wrong description of the case and as a result wrong advice would be obtained from the consultant. The participants emphasized the importance of having a very reliable technology in facilitating diagnosis with the repository system that is able to keep the patient confidential data safely thus can be accessed and retrieved at anytime. For example:

“...mobile communications were rarely documented. The consultant may decide about some direction in managing the patient. For example, either patient transfer should be done or just give further directive on patient management over the telephone. When the direction was not documented into the system, this may result in falsity if the direction was not understood and documented...”

Identified Categories	Affect towards utilization	Why?
Security	Less concern	Dedicated login id and password are given to each user. Some hospitals can have more than one access level to the system.
Reliability in executing medical tasks.	Fairly concern	Fairly this depends on the way image is captured and adequacy of information being entered into the system as well as the network speed.
Privacy and confidentiality	Less concern	System is monitored by administrator and data are kept safely in MOH server.
Falsity in communication between doctor and specialist.	Less concern	This normally depends on the attitude of personnel at the consulting site to document all necessary directives on patient management. However, the system is presented in a standard template and the user can merely choose from the available modules, so falsity can be greatly reduced.
Concern about medico legal.	No concern	MOH holds almost full responsibility of medico legal issues as the technology is administered by them.
Concern about guidelines and policy.	No concern	In terms of referral, it is the same as in the current conventional guidelines and therefore nothing much to consider.

Table 3. Trust in teleconsultation technology and legal concerns

4.4 Facilitating and impeding conditions

Facilitating conditions was defined in MPCU as “objectives factors in the environment that observers agree make an act easy to accomplish” (Thompson et al. 1991) and in regards to UTAUT, facilitating conditions are supports from organizational and technical infrastructure (Venkatesh et al. 2003) to accommodate adoption activities. The presence of facilitating and impeding conditions is significant in influencing teleconsultation utilization but some of the facilitators could be transformed into impediments when they failed to exist or sustained in the teleconsultation operation. The identified conditions and summary of responses are reported in Table 4.

Conditions	Subject(s)	Summary of Responses
Network and Infrastructure	Bandwidth	It is not satisfactorily to some referring hospitals. No standardization in bandwidth size among hospitals. However, most referral hospitals regard the bandwidth as adequate and this has led to encouraging usage.
Resource Conditions	Budget	It is a fixed entity as it is based on top management decision. It is important in determining service sustainability rather than utilization. In addition it can be the determinant in delivering best service as it can play a role in influencing the provision of better infrastructure and equipment.
	Manpower	Staff turnover is considerably high especially in suburban and rural areas. Transfer of technology should be done before a trained staff left. A dedicated stand-by staff is needed for teleconsultation operation.
	Technical Support	Presence of champion and administrator could possibly lead to encouraging utilization in the hospital. However, a 24/7 helpdesk from the vendor side is also needed.
	Equipment and Workstation	Single workstation in one hospital is claimed to be not so practical thus this could lead to discouraging utilization. This is because placement of workstation is convenient to only certain user groups. Hardware is under warranty so nothing much to worry since replacement can be done by the vendor within the 3-year contract.
Alternatives and Options	Alternative teleconsultation	The presence of other networks (e.g. MMS) could moderate teleconsultation usage. Even though the use of MMS is improper due to lack of transmission security but it is still being used as alternative to teleconsultation. Conventional teleconsultation was also used whenever teleconsultation is perceived as time consuming or whenever technical problems occurred while transmitting teleconsultation.
Training programs and Awareness Program	Training program	Training program is found helpful and significant. However, standard training module is needed. Periodic training is not necessary but is still important to ensure utilization sustainability which can be done on a request basis.
	Awareness program	Most of the awareness programs were only done inside the teleconsultation community. Therefore more programs should be held to promote the benefits of teleconsultation to other potential adopters. Seminar and teleconsultation workshops should be done more frequently.
Role of HOD	HOD influence	HOD influence could have the effect on staff training attendance, likelihood of teleconsultation utilization and motivation to use teleconsultation.

Table 4. Facilitating and Impeding Conditions

4.5 The need pull for teleconsultation

In Malaysia, the maldistribution of specialist services is not only seen in the rural but also in urban areas. Therefore the facilities incorporated in teleconsultation technology would address many of these concerns. In this phenomenon under study, we found that the need for teleconsultation appears to be rather objective (actual) than subjective (individual belief). The actual need for teleconsultation was environmental driven and as a result teleconsultation service was initiated on the basis for the

betterment of patient management and resources distribution. As a result we have identified the bases for needing the teleconsultation services which have made a great impact on the way teleconsultation is used and these are outlined in the followings:

- Broaden specialist access as to obtain faster consent concerning directive on patient management instead of only to get specialist advice.
- Better utilization of resources such as tertiary bed (especially emergency bed), ambulance and reduction of travel times and cost of the providers, other staffs and patients.
- Reduction of mortality and morbidity especially in emergency cases.
- Reduction of physical referrals from primary health centres to tertiary centres.

All of these were found as major reasons for the health care providers to use teleconsultation technology thus objective needs for the service was found to be the most significant factor in determining the adoption of teleconsultation in the context under study. For instance, one participant made this point very clear when he stated:

“...the need for the service must be there; either it comes from the hospital’s management or doctors. So when the doctors have less need for the service, the service will not take off at the hospital...”

4.6 Moderating effects

In this study, the potential moderators were found from both individual and organizational dimensions. Age and provider’s specialty would possibly moderate the effect on users’ attitude and objective need for the service respectively. Two examples are as follows:

“...most of the users are young and keen on teleconsultation...” and

“...the service is very demanding in neurosurgery because most of the cases are related to life threatening cases so the need is very clear ... to save the patient and time is limited...”

Many participants believed that type of hospital and distance between primary and tertiary referral hospitals could also potentially moderate the utilization of the new teleconsultation technology. There are four types of hospitals involved in the implementation of new teleconsultation and these are: state, district, IT and pilot. Apparently, state hospital has higher catchment area compared to district hospital. Therefore state hospitals are prone to have more acute cases and would likely to use teleconsultation more than others as they need to send relatively more tele-cases to tertiary hospital. Hospitals that have been exposed as pilot hospitals are likely to adopt new teleconsultation faster than inexperienced hospitals. IT hospital seemed to utilize teleconsultation seamlessly compared to non IT hospital. One said:

“... IT hospitals are already electronic so there is no need for the users to collect all the information and type it in, do the scanning, digitizing and this would create more works...”

In addition, hospitals that have their own IT department and in particular dedicated IT personnel who take charge of teleconsultation matter are more facilitated in using teleconsultation. For example:

“...our higher usage is due to our committed IT department and trained medical assistants who can be around whenever difficulties arise...”

Distance between referring and consulting hospitals could also be a factor and this is subject to location of tertiary hospital and condition of the transportation system at that area. For example:

“...for certain states that are small where the districts are close by there is less severe need for the service of teledermatology because patient can travel with the public transport to the specialist hospital when they are referred...”

5 CONCLUSION

This study helped to identify the main issues concerning teleconsultation adoption from the qualitative perspective. A conceptual framework was used to facilitate the data collection and analysis processes. The underlying framework derived from the consideration of integrated model of established technology acceptance and diffusion theories and also findings of published telemedicine and health studies. This study suggested that there should be a clear distinction between perceived and objective measures in the critical health care environment. As figured out from this study, objective need for technology has been part of the most important aspects in determining the preliminary uptake of teleconsultation technology. Trust in technology appeared significant in this study. Since the implementation of teleconsultation in the context under study was fully manned by the respective MOH body, the utilization of the technology has been in a trustworthy and reliable setting and control thus suggesting that perceived trust in technology can be proposed as a substitution for both perceived risk and perceived threat of technology in appropriate conditions. The subsistence of facilitating conditions has an important impact on the way teleconsultation is utilized in hospitals. The study also exhibited that organizational and technical infrastructure deficiencies would potentially pose great impediments to adoption process and they should be rectified and resolved beforehand. The potential moderating effects of organizational measures on technology utilization should also be taken into account in telemedicine and health IT adoption studies. Some cautions should be a matter of concern if the findings were to be generalized as the study was confined to public health care facilities in Malaysia thus conducted without the presence of magnitude of effects. Nevertheless some findings such as perceived usefulness and ease of use were found generally consistent with previous technology adoption studies. However the key issues appeared to be more focused on the significance of contextualized and actionable constructs such as actual need for the technology, trust in technology and the subsistence of facilitating conditions in the environment under study. Collective findings from our exploratory qualitative study can be used to conceptualize a more comprehensive teleconsultation adoption model for future studies that can be further validated using quantitative approach. The study has contributed to both telemedicine management and technology adoption research in hospitals.

References

- Al-Qirim, N. (2007). Championing telemedicine adoption and utilization in healthcare organizations in New Zealand. *International Journal of Medical Informatics*, 76(1), 42-54.
- Bangert, D.C. and Doktor, R. (2005). *Human and Organizational Dynamics in e-Health*. Radcliffe Publishing, Seattle, WA
- Bazeley, P. (2007). *Qualitative data analysis with Nvivo*. Sage, London.
- Beach, M., Miller, P. and Goodall, I. (2001). Evaluating telemedicine in an accident and emergency setting. *Computer Methods and Programs in Biomedicine*, 64(3), 215-223.
- Berg, M. (1999). Patient care information systems and health care work: a sociotechnical approach. *International Journal of Medical Informatics*, 55(2), 87-101.
- Boyatzis, R. (1998). *Transforming qualitative information: Thematic analysis and code development*. Sage, Thousand Oaks, CA.
- Broens, T.H., Huis in't Veld, R.M., Vollenbroek-Hutten, M.M., Hermens, H.J., Van Halteren, A.T., Nieuwenhuis, L.J. (2007). Determinants of successful telemedicine implementations: a literature study. *Journal of Telemedicine and Telecare*, 13(6), 303-9.
- Cavana, R.Y., Delahaye, B.L. and Sekaran, U. (2001). *Applied Business Research: Qualitative and Quantitative Methods*. John Wiley & Sons, Milton, Queensland.
- Chau, P. Y. K. and Hu, P. J. (2002). Examining a model of information technology acceptance by individual professionals: an exploratory study. *Journal of Management Information Systems* 18(4), 191-229.
- Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, 13(3), 319-340.
- Fontana, A. and Frey, J.H. (1994). Interviewing: The Art of Science. In Denzin, N. K. and Lincoln, Y.S. (Eds.). *Handbook of Qualitative Research*, p. 361-376, Sage, Thousands Oaks, CA.

- Gagnon, M.P., Godin, G., Gagné, C., Fortin, J.P., Lamothe, L., Reinharz, D. and Cloutier, A. (2003). An adaptation of the theory of interpersonal behaviour to the study of telemedicine adoption by physicians. *International Journal of Medical Informatics* 71(2-3), 103-115.
- Gagnon, M.P., Lamothe, L., Fortin, J.P., Cloutier, A., Godin, G., Gagne, and C., Reinharz, D. (2005), Telehealth adoption in hospitals: an organisational perspective. *Journal of Health Organization and Management*, 19(1), 32-56.
- Grbich, C. (2007), *Qualitative Data Analysis: An Introduction*. Sage, London.
- Grigsby, J. , Rigby, M., Hiemstra, A., House, M., Olsson, S. and Whitten, P. (2002). The Diffusion of Telemedicine. *Telemedicine and e-Health* , 8(1), 79-95.
- Holden, R. J., and Karsh, B-T. (2010). The Technology Acceptance Model: Its past and its future in health care. *Journal of Biomedical Informatics* 43(1), 159-172.
- Hu, P.J.-H, P.Y.K. Chau, O.R.L. Sheng and K.Y. Tam. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems*, 16(2), 91-112.
- Hu P. J.-H., Chau, P. Y. K., and Sheng O. R. L. (2002). Adoption of Telemedicine Technology by Health Care Organizations: An Exploratory Study. *Journal of Organizational Computing and Electronic Commerce* 12(3), 197-221.
- Kijsanayotin, B., Pannarunothai, S., and Speedie, S. M. (2009). Factors influencing health information technology adoption in Thailand's community health centers: Applying the UTAUT model. *International Journal of Medical Informatics*, 78(6), 404-416.
- Lindlof, T.R and Taylor, B.C. (2002). *Qualitative communication research methods*. Sage, Thousand Oaks, CA.
- Maarop, N. and Win, K. T. (2009). A Review of Telemedicine in Developing Countries: Introduction and Implementation Issues. In *Proceedings of 6th Conference on Asia Pacific Association of Medical Informatics*, p. 85, APAMI 2009, Hiroshima, Japan.
- Ministry of Health (2007), *Annual Report 2007*, Ministry of Health Malaysia, Kuala Lumpur, Malaysia.
- Montague, E.N.H., Kleiner, B.M. and Winchester, W.W. (2009). Empirically understanding trust in medical technology. *International Journal of Industrial Ergonomics*, 39(4), 628–634.
- Nicolini, D. (2006). The work to make telemedicine work: A social and articulative view. *Social Science & Medicine*, 62(11): 2754-2767.
- Obstfelder, A., Engeseth, K. H., and Wynn, R., (2007). Characteristics of successfully implemented telemedical applications. *Implementation Science*, 2(25), 309-326.
- Ortega Egea, J. M., and Román González, M. V. (2011). Explaining physicians' acceptance of EHCR systems: An extension of TAM with trust and risk factors. *Computers in Human Behavior* 27(1), 319-332.
- Rigby, M. (2002). Impact of telemedicine must be defined in developing countries. *BMJ*, 324, 47-48.
- Rogers, E.M.(1995). *Diffusion of Innovation*, fourth ed., The Free Press, New York.
- Stanberry, B. (2006). Legal and ethical aspects of telemedicine. *Journal of Telemedicine and Telecare*, 12(4), 166-175.
- Thompson, R.L., Higgins, C.A., and Howell, J.M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, 15(1), 125-143.
- Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior. In: Page, M. M. (Ed.). *Nebraska symposium on motivation*, 1979, pp. 195-259. University of Nebraska Press, Lincoln, NE.
- Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.
- Walsham, G. (1993). *Interpreting Information Systems in Organizations*. Wiley, Chichester.
- Whitten, P. and Adams, I. (2003). Success and failure: a case study of two rural telemedicine projects. *Journal of Telemedicine and Telecare*, 9(3), 125-129.
- Yellowlees, P., (1997). Successful development of telemedicine systems-seven core principles. *Journal of Telemedicine and Telecare*, 3(4), 215-222.
- Yi, M. Y., Jackson, J.D. Park, J. S. and Probst, J.C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management*, 43(3), 350-363.