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## Understanding demographics influence on Teleconsultation acceptance in hospital: A mixed-method study

### Abstract

The aim of this study is to explore and understand the influence of demographic factors on teleconsultation acceptance in Malaysian government hospitals. The materials of this study are based on an exploratory mixed-method study involving semi-structured interviews with key informants and questionnaires survey of health care providers. The prominent influence of demographic aspects over the acceptance of teleconsultation technology from the mixed methods standpoint is further discussed. The findings of both results provide evidence to suggest that teleconsultation acceptance differs across the types of hospital, distance between referring and referral hospital, role of teleconsultation, and user's computer ability. Interestingly, user's age, user's experience, urgency of case and presence of alternatives were not present as strong factors to influence teleconsultation acceptance in Malaysian government hospitals. In respect to theoretical development and future work, the categories that were generated from these studies may be used for the testability and development of demographics measures in exploring acceptance and adoption of technology in health care environment.

### Keywords

study, method, mixed, understanding, hospital, demographics, acceptance, influence, teleconsultation

### Disciplines

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# Understanding Demographics Influence on Teleconsultation Acceptance in Hospitals: A Mixed-Method Study

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**Abstract**—The aim of this study is to explore and understand the influence of demographic factors on teleconsultation acceptance in Malaysian government hospitals. The materials of this study are based on an exploratory mixed-method study involving semi-structured interviews with key informants and questionnaires survey of health care providers. The prominent influence of demographic aspects over the acceptance of teleconsultation technology from the mixed methods standpoint is further discussed. The findings of both results provide evidence to suggest that teleconsultation acceptance differs across the types of hospital, distance between referring and referral hospital, role of teleconsultation, and user's computer ability. Interestingly, user's age, user's experience, urgency of case and presence of alternatives were not present as strong factors to influence teleconsultation acceptance in Malaysian government hospitals. In respect to theoretical development and future work, the categories that were generated from these studies may be used for the testability and development of demographics measures in exploring acceptance and adoption of technology in health care environment.

**Index Terms**—teleconsultation, telemedicine, demographics influence, technology acceptance, healthcare IT

## I. INTRODUCTION

One of the most emerging applications that are proven to be beneficial to hospital management [1] and has improved patients' health outcome is teleconsultation [2]. Teleconsultation is defined as the integration of information telecommunication, human-machine interface technologies and health technologies to deliver health care, to promote health status of the people and to create health [3]. With regard to Malaysian context, telemedicine is an umbrella term that includes

teleconsultation, health online, continuing professional development and lifetime health record service [4]. A review of telemedicine implementation issues revealed that many developing countries were introduced to telemedicine in only late 1990s [5]. Teleconsultation uses extensive Information and Communication Technology (ICT) and involves various stakeholders (e.g. administrative staff, physician, specialist, policy maker, telemedicine vendor, and ICT maintenance team). In Malaysia, this includes consultation and referral over electronic platform (web-based technology) which takes place between health care providers at primary (also secondary) and tertiary health care facilities. Apart from exploring other direct determinants of IT adoption in hospital, this study intends to address the importance of demographics factors in moderating IT acceptance of healthcare technology. Hence, the objective of this study is to explore and understand the influence of demographic factors on teleconsultation acceptance in the case of government hospitals in Malaysia.

## II. LITERATURE REVIEW

In regard to IS theories and models, Unified Theory of Acceptance and Use of Technology (UTAUT) [6] has made an immense contribution towards technology acceptance research by acknowledging the effects of moderators (in the form of demographics attributes) in IT adoption apart from identifying important constructs as the resultant of the combination of several theories. These include gender, age, experience and voluntariness of use [6]. Hence, UTAUT has been used to justify the importance of demographics influence on technology acceptance. Accordingly, even though younger physicians tend to use Internet more in their works [7], a study in healthcare setting found that age and experience have not significantly impacted caregivers on using health IT application [8].

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Another example of demographic effect was a study examining health IT acceptance in health care organization which in turn has found that the influence of perceived usefulness and perceived ease of use of the system was stronger when employees perceived themselves to have wider autonomy concerning their own work [9]. Also, the influence of perceived usefulness on system use was stronger when employees perceived their organization to be adaptive to new things [9]. Further, size and localization of hospitals, and sub-units size are found as potential determinants of telehealth adoption in hospitals [10]. Indeed, based on the preliminary results of teleconsultation adoption from an organizational perspective involving in-depth interviews with three stakeholders, hospital characteristics are found important in determining how technology is adopted in the hospital [11]. The result revealed that some hospital characteristics have made a major distinct in determining the likelihood of teleconsultation adoption [11]. Amongst hospital characteristics being addressed as factors of teleconsultation adoptions are size of hospital, location of tertiary hospital (receiving), location of teleconsultation workstation and the presence of visiting specialist [11]. Moreover, a study that employed semi-structured interviews with seven recognized telemedicine programs' administrators involving 18 sites in average for each program disclosed the relevant findings related to telemedicine utilization, this being, efforts were seen to be focused more on specialist rather than stimulating demand upon whom the system depends for system referrals (physicians) [12].

Further, the service should be disseminated more among those who do not require comprehensive of patient examinations, who do not have sufficient access to specialist and those in need and prefer such service [13]. Likewise, there is a tendency that teleconsultation is appropriate in scarce specialty service in the emergency setting [11]. Another example of the moderating effect can be seen in between primary care and secondary care. Consequently, the acceptance of technology was evident to be the one of the components determining success of telemedicine in both primary and specialized care [2]. Nevertheless, at the same time, the primary care is often more concerned about workflow and acquisition of photographic images whereas specialised care is more concern about quality of images and diagnostic certainty [2].

In a normal circumstance, the centralized health care system is in parallel with 'domain-defensive' strategy whereas decentralized health care system is much associated with 'domain-offensive' organization [14]. With different structures of health care as well as the location of health centre, telemedicine support can be dissimilar [15]. Further, Lehoux et al. [12] indicates that medical disciplines depending on either thorough physical examinations or specialised investigative techniques are unlikely to restructure their work routines to accommodate teleconsultation thus specialities that primarily exploit images or numerical data tend to perceive teleconsultation as more useful.

Based on the literature studies, we conclude there is a need to explore and understand the demographics influence over the acceptance of teleconsultation technology in Malaysia. These include both user and hospital demographics. In turn, all of these literatures are fundamental in justifying topics of concern that were used to ask both the key informants in the semi-structured interviews and survey respondents participated in this study. To the best of our knowledge, there was no similar study have yet been conducted in developing countries involving substantial empirical data and mixed method approach.

### III. METHODOLOGY AND METHODS

This study was based on mixed method convergent design and a one-phase approach [16], in which the quantitative data were embedded into qualitative data and serviced as supplemental and triangulation evidence within the overall research design. The rationale for this approach was that quantitative data and subsequent appropriate analyses would provide a strong understanding to the overall interpretation of the results [16]. Therefore the main description of this study was based on the overall qualitative interpretation. In line with deductive research approach, the research began with literature reviews. For this reason, provisional start list or template prior to commencing field work was developed [17]. In this study, the potential demographics factors were found from both individual and organizational dimensions. In this regard, the generation of start-list of code for demographics factors was based on Table I.

TABLE I. START-LIST OF CODES OF DEMOGRAPHICS FACTORS

Code	Dimension	Description
ID1	Individual	Age group (Based on year of service)
ID2	Individual	Computer ability
ID3	Individual	User Experience
OD1	Organization	Specialty based on Urgency (Discipline, e.g. Neurosurgery, Dermatology, Radiology and Cardiology)
OD2	Organization	Distance (Between referring and specialist hospital)
OD3	Organization	Type of Hospital (e.g. state, district, and pilot)
OD4	Organization	The presence of alternative (e.g. conventional ambulance, mobile- messaging)
OD5	Organization	Hospital Role and Function (Referring or Referral Hospital)

The interviews were held based on purposive sampling involving 28 key informants and convenience sampling was used for a survey among health care providers who worked in the participating hospitals. As the interviews were recorded and most of the participants responded in English, the tapes were transcribed as soon as the first interview was completed. The transcripts were checked iteratively against the audio tapes as to ensure the accuracy in the transcription. Subsequently, 72 respondents returned the completed survey and helped provide triangulation to the qualitative information.

#### IV. RESULTS

The findings reported in this study were based on the responses of the participants serving in 11 participating hospitals. As the study was conducted on the basis of mixed-method study, the profile of respondents is divided into two as follows:

- Qualitative data (N=28): Semi-structured interviews with 17 users of the technology from referring sites and 11 users of the technology from consulting sites.
- Quantitative data (N=72): A survey was distributed to only existing users of the system and those personnel who have attended teleconsultation seminar and training to help describe aspects of concern. The survey involved 43.1% medical officers, 25% of specialists (consultants) and 31.9% of medical assistants and radiographers.

In regard to qualitative data analysis, thematic analysis considering the strength of excerpts and narratives coupled with frequency of codes were used to attest the influence of demographics items on the acceptance of teleconsultation in the phenomenon under study. In regard to quantitative data analysis, the computation of Mann-Whitney U test and cross-tabulation were performed. The overall conclusion can be made by answering three questions addressed by Creswell and Clark [16], these being: (i) to what extent do the questions in the survey support the qualitative results? (ii) to what extent the same data types concerning theme confirmation corroborate with each other?, and (iii) what are the similarities and differences between two datasets?. As a result of data merging, the study was able to answer the mixed methods questions using this triangulation design.

##### A. Qualitative Excerpts

The examples of narratives and interview excerpts coded as significant findings are as follows:

- "...for younger generation it is not a problem at all to use technology..." (Participant-13, Code:ID1)
- "...most of the users are now the younger generation and IT savvy so there should be no trouble to catch up..." (Participant-21, Code: ID1; ID2)
- "... Although some of us have some years of experience dealing with teleconsultation, the maturity of service is still at the level of infancy. That is because there was no proper study to actually look at how to do about it, to adopt it at the most. Implementation was done across the country. In the previous implementation, there was no study about the landscape of the need in terms where we actually need to put the service and there was no study after..." (Participant-3, Code: ID3)
- "...in radiology it is very hard to define anything wrong with chest X-ray, so they are not so keen in referring cases. In addition, most cases do not deal

with life and death, unlike neurosurgery cases...whenever they do the CT scan, it is very easy to define any bleeding in the brain. Any abnormality is easily defined through the CT scan ... once it is defined TC case will need to have second opinion or consultation from neurosurgeon..." (Participant-10, Code: OD1)

- "...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..." (Participant-3, Code: OD2)
- "...this area has higher population which leads to more MVA (Motor Vehicle Accident) cases. In addition, this hospital also accommodates walk in patients from some other districts. So the range of health care coverage is high and we definitely use more..." (Participant-28, Code: OD3)
- "...alternatively, sometimes in a desperate situation, we have to use MMS in order to send the image and case report. However, if we send it using MMS, it is against medico legal as the transaction is not properly recorded..." (Participant-12, Code: OD4)
- "...too many cases were sent to us (specialists). The consulting medical officer or specialist is very busy to attend to all cases immediately..." (Participant-2, Code: OD5) "...but in this new implementation, we (specialists) are given black berry mobile so in this case we as the receivers can view the film from the mobile..." (Participant-8, Code: OD5)

##### B. Quantitative Results

The actual population was lopsided in nature. Such that, most of the users were using teleconsultation technology for neurosurgical purpose which accounted for 58.3% of sample and most of these neurosurgical cases fall under emergency that require urgent attention. Due to those facts, some demographic factors were measured by the dichotomous scale and were analyzed based on the frequency of responses. The results of quantitative analyses using dichotomous scale and Mann Whitney U-Test are shown in Table II and Table III respectively.

Apart from that, cross tabulation was performed to explore the distribution between users' age and level of use. Active users were found in two age groups and these are those who are less than 28 years and more than 40 years old whereas the result demonstrates that those who are between 28 – 40 years old are less active users. In relation to that, there is no strong evidence to demonstrate that younger age group would use teleconsultation more actively than users who were above 40. Likewise, cross tabulation analysis was performed to explore the distribution between current ability to use computer in general and the level of use. It study found that the active users of teleconsultation service were those who have good and excellent computer ability.

TABLE II. DICHOTOMOUS QUERY

Question	Percentage		
	Y	N	NS
1. Do you think that the use of teleconsultation technology in Malaysia is affected by type of discipline? (e.g. Users seeking for neurosurgery advice would tend to use teleconsultation technology more than other disciplines)	81.9	12.5	5.6
2. Do you think that the distance between referring and receiving hospitals may affect the tendency to use of teleconsultation technology? (e.g. The closer the referring hospital to the specialist hospital, the more teleconsultation may be used)	63.9	11.1	25.0
3. Do you think that type of hospital may affect the tendency to use of teleconsultation technology? (e.g. State hospital may use teleconsultation technology more than other type of hospitals)	80.6	13.9	5.6
4. Do you think the presence of visiting specialist may affect the tendency to use of teleconsultation technology? (e.g. Users would tend to use less teleconsultation technology when visiting specialist is present)	79.2	1.4	19.4
5. Do you think the presence of alternatives to teleconsultation may affect the tendency to use of teleconsultation technology? (e.g. Users would tend to use less teleconsultation technology when MMS alternative is present)	56.9	41.7	1.4

Note: N = 72; Y =Yes; N =No; NS=Not Sure

TABLE III. COMPUTATION OF MANN-WHITNEY U-TEST

Subject	Setting	N 72	Mean Rank	Asymp. Sig	
Acceptance	Environment	Emergency	42	37.67	.561 (NS)
		Non- Emergency	30	34.87	
	Hospital	Referring	43	41.15	.049 (S)
		Referral	29	30.09	
	Exposure	Less Experienced	31	37.61	.993 (NS)
		Experienced	41	35.66	
	Level of Use	Active	36	38.29	.979 (NS)
		Non-active	36	34.71	

Note: N Asymp. Sig. (2-tailed), confidence level (95%),  $\alpha$  (.05).  
S = Significant Difference, NS = No Significant Difference

C. Merging and Triangulation of Results

The overall results of both qualitative and quantitative analysis are shown in Table IV whereas the concluding results are shown in Table V.

Subsequently, the results provide evidence to suggest that teleconsultation acceptance differs significantly

across types of hospital, distance between referring and referral hospital, role of teleconsultation, and user's computer ability. Interestingly, user's age, user's experience, urgency of case and presence of alternatives were not appeared as strong factor to influence teleconsultation acceptance.

TABLE IV. COMPARISONS OF THE INFLUENCE OF DEMOGRAPHICS FACTORS ON THE ACCEPTANCE OF TELECONSULTATION: QUALITATIVE VS QUANTITATIVE

Code	Qualitative N=28 (Based on Strength of Excerpts)	Quantitative N=72 (Based on Frequency and Group Comparison)
ID1	Strongly Relevant (acceptance level is overwhelming for young users)	Not relevant. (No significant difference among age group)
ID2	Strongly Relevant (acceptance level is overwhelming for IT savvy)	Relevant. (Significant result yielded when comparison made between active and non-active users. The active users were those with good and excellent computer ability)
ID3	Moderately Relevant	Not relevant. (No difference between the experienced and non-experienced users)
OD1	Relevant	Not relevant. (Insignificant result yielded when comparison made between emergency and non emergency case).
OD2	Strongly Relevant (Acceptance is subject to location of tertiary hospital and condition of the transportation system at that area)	Relevant (Agreed by 63.9 % of respondents)
OD3	Strongly Relevant (State and Pilot Hospitals are likely to use teleconsultation)	Relevant (Agreed by 80.6% of respondents)
OD4	Moderately Relevant	Not Relevant (Weak majority as only agreed by 56.9 % of respondents)
OD5	Strongly Relevant - (Acceptance is higher at the referring hospital)	Relevant. (Significant result yielded when comparison made between referring and referral hospital)

TABLE V. CONCLUDING MIXED-METHODS RESULT

Code	Mixed-Methods Interpretation	Concluding Result
ID1	The results of both data are not consistent. Age may not present as a strong determinant to teleconsultation acceptance. This is because most users at the specialist hospitals are older than those in the referring hospitals. The use level may not differ.	Age is significant
ID2	The results of both data are consistent. User's computer ability is relevant and may influence teleconsultation acceptance.	Computer ability is significant
ID3	The results of both data are fairly consistent. User experience may not present as a strong determinant to teleconsultation acceptance. Although the users at the pilot hospitals (that have been exposed to teleconsultation in earlier years) were likely to adopt new teleconsultation faster than the new hospitals, users at the new participating hospitals were also ambitious in using it as a tool for patient consultation.	User Experience is not significant
OD1	The results of both data are not consistent. Urgency of case may not present as a strong determinant to teleconsultation acceptance because each discipline may have different stringent of principle (mandatory VS voluntary) imposed by the respective head of discipline.	Specialty based on Urgency is not significant
OD2	The results of both data are consistent. Distance between referring and consulting hospitals is relevant and may influence teleconsultation acceptance particularly in non-emergency case.	Distance (Localization of hospital) is significant
OD3	The results of both data are consistent. Type of hospital is relevant and may influence teleconsultation acceptance.	Type of hospital is significant
OD4	The results of both data are fairly consistent. The presence of alternatives may not present as a strong determinant to teleconsultation acceptance.	Presence of alternative medium is not significant
OD5	The results of both data are consistent. Role in consultation is relevant and may influence teleconsultation acceptance.	Role in consultation is significant

## V. CONCLUSION

This study helped to acknowledge the presence of demographics factors which may bear potential relevancy in influencing teleconsultation technology acceptance in hospitals. The potential demographic influence covering hospital characteristics and user demographic on technology acceptance and utilization appeared significant in this study. These include age of the user, computer ability, type of hospital, distance between hospital and role in teleconsultation. Interestingly, the users at the referring hospital were likely to accept and adopt teleconsultation than users at the referral hospitals. Thus, there was no difference in the acceptance of the technology between emergency and non-emergency setting. In respect to theoretical development and future work, the results generated from this mixed-methods study may be considered for the applicability and development of demographics measurement tools in exploring acceptance and adoption of teleconsultation technology in other context or related healthcare environment.

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