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Determinants of Telemedicine Acceptance in Selected Public Hospitals in Malaysia: Clinical Perspective

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Abstract The purpose of this study is to explore the determinants of telemedicine acceptance in selected public hospitals in Malaysia and to investigate the effect of health culture on the relationship between these determinants and telemedicine acceptance. Data were gathered by means of a survey of physicians and nurses as the main group of users of telemedicine technology from hospitals that are currently using telemedicine technology. The results indicated that government policies, top management support, perception of usefulness and computer self-efficiency have a positive and significant impact on telemedicine acceptance by public hospitals in Malaysia. The results also confirmed the moderating role of health culture on the relationship between government policies as well as perceived usefulness on telemedicine acceptance by Malaysian hospitals. The results are useful for decision-makers as well as managers to recognize the potential role of telemedicine and assist in the process of implementation, adoption and utilization, and, therefore, spread the usage of telemedicine technology in more hospitals in the country.

Keywords Telemedicine · Health culture · Technology acceptance · Perceived usefulness · Perceived ease of use · Malaysia

Introduction

In response to the increasing demand for an improved healthcare system in Malaysia, the Ministry of Health (MOH), Malaysia, initiated the telemedicine system in 1997 [1], as this IT-based innovation has the potential to enhance the quality of care as well as to improve cost savings for health care institutions [2, 3]. Telemedecine is useful to exchange health information and provide health care services across geographical, time, social and cultural barriers through information technology [4] for different purposes, such as medical consultations, medical procedures, or examinations to overcome the distance between the partners involved [5]. Despite the great promise of telemedicine, to date, its implementation in Malaysia has achieved little success with low utilization.

Most early telemedicine projects failed to take off due to the unestablished infrastructure, unsophisticated technology, premature funding termination, and low acceptance [6]. Although substantial efforts have been invested in trials and experiments of telemedicine services, only a few applications have continued beyond the initiative, research and development phase [7–9]. 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 the health and business environment [10]. It is not always the software issue but the human side of the implementation cycle that will block the effective use of the system [11]. One of the major reasons leading to these failures is the inadequate knowledge and understanding of how and why individuals or organizations adopt the technology [12, 13]. Hence, acceptance by physicians is an increasingly critical contributor to the success of IT [14]. However, to date, factors that drive the telemedicine acceptance decision-making of Malaysia's physicians are still not clearly or fully identified [15]. Therefore, the current study investigates the driver factors of acceptance of telemedicine among Malaysian medical staff.

Although much effort has been invested in the trials and experiments of telemedicine services, most earlier telemedicine research focused on the deployment of technology and its practical feasibility [16–18]. In addition, the main focus of

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prior research relating to technology acceptance was only at the individual level or the testing of hypotheses formulated without sufficient theoretical foundation [16, 19, 20]; therefore, providing limited discussion of factors that may affect the hospitals' intention to accept and implement telemedicine technology. This is especially true in the Malaysian context. In addition, most of the telemedicine studies are related to the assessment of telemedicine technology and systematic reviews of its efficiency, acceptance of telemedicine by patients and physicians and home telecare adoption [21]. Although Straub et al. [22] claimed that culture influenced information technology transfer, acceptance, and utilization, little research, if any, has been done to elucidate the moderating effects of the perceived health culture in the hospitals on telemedicine adoption and utilization. In fact, the importance of cultural factors deepens in developing countries [23, 24].

Literature review

Theoretical foundation

In the current study, the potential drivers of accepting telemedicine technology among medical staff are investigated. In addition, the moderating effect of the perceived health culture on the proposed relationships were tested to investigate to what extent the health culture may strengthen the effect of the drivers of accepting telemedicine technology. Based on the meta-analysis the potential drivers of accepting telemedicine were categorized into four main groups; namely, environmental factors, organizational factors, technological factors, and individual factors. The sub-factors relating to environmental factors include government policy [25–28] and capability of external suppliers [29, 30]. Sub-factors under the organizational factors are identified as project team's capability [29] and top management support [16, 26, 28, 29, 31, 32], which relate to the acceptance of technology; namely, perception of usefulness and ease of use [33–35]. Last, but not least, are the sub-factors relating to the individual factors, which refer to individual attitude [36, 37] and computer self-efficacy [38, 39].

The literature on the adoption of technology promotes several dominant perspectives: managerial imperative [40–42], organizational imperative [43, 44], technological imperative [45], environmental imperative [46, 47], and interactionism [48, 49]. Generally, the first four focus on either the managers or the organization or the technology or the environment. The fifth approach – interactionism – allows for treatment of all these forces and their interaction in one dynamic framework. This assumes a co-influence among the forces for the adoption of technology [50]. A review of the literature reveals the explanatory power of the adoption models that are based on the interactionism perspective. For instance, Kuan and Chau [51] suggested a model for technology adoption based on a technology-organization-environment framework, while Mehrtens et al. [52] mixed the innovation, organizational, and environmental imperatives. Hence, in the current study we adopt the interactionism perspective to explore the drivers of telemedicine adoption.

While only a few studies have examined the impact of cultural factors in telemedicine acceptance, many researchers have determined the strong contextual influence of culture in IC transfer [23]. Hence, the effect of the healthcare organizational culture on the strength of the proposed relationships is investigated in the current study. A study by Burton-Jones and Hubona [53] suggested that age and job title have a direct effect on technology adoption. Also, a study by Goldfarb and Prince [54] on Internet adoption revealed that younger users are more likely to adopt and use Internet technology compared to the older people and the level of adoption increases for those with a higher level of education. This can be applied to this study since physicians may have a higher level of acceptance compared to the nurses in hospitals since they have a higher level of education compared to the nurses. Job tenure and work experience may reduce anxiety in telemedicine acceptance and usage [55]. In other words, users of a new technology or system may have little anxiety or stress when they have a higher level of job experience. Moreover, health care professionals, such as doctors and nurses might have more intention to accept IT when they have a high level of job tenure [56]. A plausible explanation for this could be that more experienced physicians and senior nursing staff might have a better understanding about technology benefits, which encourage them to accept it more easily. Therefore, in the current study, age, job tenure and job title were considered as control variables (Fig. 1) to control the variation of acceptance of telemedicine caused by these variables.

Hypothesis development

Governmental policies and regulations are critical in the adoption and diffusion of telemedicine technology, especially in developing countries [25–28]. Similar to other developing countries, one of the main challenges for Malaysian hospitals in the adoption and implementing of telemedicine is the lack of funds and IT expertise, which can be addressed by appropriate governmental policies [26]. In addition, the government has significant capacity for establishing telemedicine rules and regulations since they can develop the legal framework to deal with the issues, such as confidentiality, reliability, liability and cross-border authority once telemedicine services are implemented [57]. Therefore, the following hypothesis is developed:

H1 Government policy has a positive significant effect on the acceptance of telemedicine by hospitals.

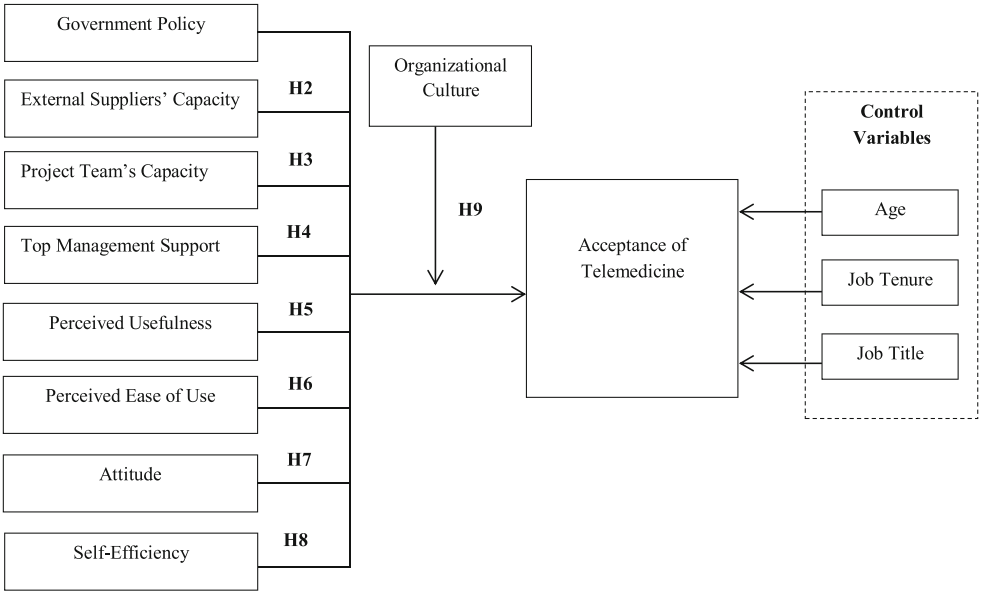

Fig. 1 Proposed Theoretical Model

The availability of hardware and software plays an important role in telemedicine adoption since finding capable suppliers and providers is a major concern for health care organizations and hospitals [29]. Hospitals need to find suppliers and vendors that can provide adequate equipment including software and hardware to facilitate the adoption process of telemedicine [30]. At the technology supplier level, delivering reliable equipment and integrating the requirements of stakeholders are the main determinants of a credible and trustworthy telemedicine technology supplier [58]. In most hospitals and professional health care organizations, large system integration suppliers or IT departments of medical institutions are usually responsible for the planning and execution of telemedicine implementation projects, which, in most situations, are supervised by the government or an institution commissioned by the government. Consequently, outsourcing to a professional supplier who has experience in implementing telemedicine is bound to become the main way of telemedicine acceptance [31]. The success of a telemedicine program not only depends on the ease of use and the quality of diagnostic devices, but also on the coordination and capability of external suppliers [59]. Hence, the following hypothesis is developed:

H2 The capability of external suppliers has a significant impact on the acceptance of telemedicine by hospitals.

The capability of the project team refers to the technical and interpersonal skills and abilities of the members of the telemedicine project team [31]. Sufficient support from the medical people in the project team as well as the employees readiness in accepting change in their working procedure are important factors in the successful implementation of telemedicine in a health care organization [29]. Therefore, an important consideration for the execution and planning of telemedicine implementation projects is a compatible integration between the project team and medical staff, especially their ability to provide fully appropriate solutions to any technological problems. Therefore, the following hypothesis is developed:

H3 The capability of the project team has a significant impact on the acceptance of telemedicine by hospitals.

According to prior research one of the key factors in adopting a new technology in a health care organization is that of top management support [16, 26, 28, 29, 31, 32]. In any professional organization, there are two primary sources of influence from managerial sites; the first is at the enterprise level, which refers to top management and the second refers to the management of the department unit to which the individuals belong. In most cases, top management indicate the importance of technology to the organization through their funding and resource allocation, and, thereafter, the department management impact on individual behavior by strengthening and clarifying the importance of signals emerging from organization management [60]. In fact, the day-to-day awareness and perception of organizational personnel are to some extent influenced by the messages and signals emanating from their department management as those imposed by top management. A study by Lewis et al. [60] suggested that top management support and commitment to new technology and personal innovativeness in an organization positively influence the usefulness and ease of use beliefs, which enhance the acceptance of a new system or technology in that specific

organization. Therefore, the following hypothesis is developed:

H4 Top management support has a significant impact on the acceptance of telemedicine by hospitals.

Ease of use is the degree to which a person believes that using a technology will be free of effort [34], while perceived usefulness refers to individuals' perceptions about a specific technology that will help them to perform their jobs better. Previous research has established that the perception of usefulness and perceived ease of use are important factors influencing user acceptance and usage behavior of a new technology [33–35]. From past studies, PU is found to be the most significant determinant of physician's behavioral intention to accept technology [16, 35, 61]. If the physician perceived that the use of technology would enhance their job performance and productivity, it would have a favorable influence on their intention to adopt technology. When one believes that technology will be free of effort, it will increase the behavioral intention of individuals to adopt the technology [62]. Due to the complex working environment and busy schedule, the physician will intend to adopt if they perceive that the technology is easy to control, understand, flexible and convenient to learn and operate. Therefore, the following hypotheses are developed:

H5 Perception of usefulness has a significant impact on the acceptance of telemedicine by hospitals.

H6 Perceived ease of use has a significant impact on the acceptance of telemedicine by hospitals.

Each user is unique and might have a different feeling and attitude towards a specific item [19]. If the physicians are aware of and have a favorable feeling towards the technology, they will have enthusiasm to adopt the technology [15, 21, 63]. Nevertheless, some researchers perceived that attitude did not contribute towards the behavioral intention to adopt technology [64]. However, Chau and Hu [36], Taylor and Todd [37], and Mathieson [65] found that attitude is a variable that influences the behavioral intention of healthcare physician in respect of technology acceptance. Researchers believe that when physicians have a positive attitude towards the technology, it will lead them to have greater commitment and enthusiasm towards the adoption of technology [36, 66]. As a result, the following hypothesis is tested:

H7 Attitude has a significant impact on the acceptance of telemedicine by hospitals.

According to Compeau and Higgins [67], computer self-efficacy refers to the judgment of one's ability to use a technology to accomplish a particular job or task. Some previous studies claimed that computer self-efficacy can enhance the acceptance of telemedicine by individuals and organizations [38, 39]. Hence, the study hypothesizes that:

H8 Computer self-efficiency has a significant impact on the acceptance of telemedecine by hospitals.

Organizational culture refers to the organizations' norms and values that may prevent members from applying a maximum effort or may encourage them to do so [68]. The role of organizational culture in new technology acceptance is important [69, 70]. Tuggle and Shaw [71] posited that organizational culture is the main barrier to the successful implementation of new technology. Bangert and Doctor [72] found that healthcare organizational culture is an important factor for the adoption of telemedicine technology. We expect that in healthcare organizations with low organizational culture, the effect of drivers of accepting telemedicine are strengthened. Therefore, the following hypothesis is developed:

H9 The organizational culture negatively moderates the effect of (a) government policy, (b) external suppliers' capacity, (c) project team's capacity, (d) top management support, (e) perceived usefulness, (f) perceived ease of use, (g) attitude, and self-efficiency on the acceptance of telemedecine by hospitals.

Research methodology

This study employed a quantitative survey using a structured questionnaire. All the items of the survey were constructed as agree-disagree statements on a five-point Likert scale. Content validity considers how representative and comprehensive the items are in creating the experimental constructs. To establish content validity, a common method used is the literature review to scope the domain of the construct [73]. The items tapping the theoretical constructs were developed based on an extensive literature review and adapted from Shaqrah [28], Hsiao et al. [27], Whitten et al. [74], Kifle et al. [39], Venkatesh [35], Chau and Hu [36], Straub et al. [22], thus satisfying content validity. The items in the survey questionnaire are shown in Table 1.

The respondents of this study were physicians and nurses from those hospitals currently using telemedicine technology. The reason that the study only targeted physicians and nurses is that patients are likely to use telemedicine if their healthcare providers (physicians and nurses) recommend it [3]. It means, the usage of the telemedicine system highly depends on its acceptance among physicians and nurses. In addition, each stakeholder group is motivated by different factors, which in turn influences their decision to adopt a new technology [75].

Table 1 Measurement model evaluation proposed theoretical model

Constructs	Items	Factor Loadings	CR	AVE
Government policy (GP)	The government influences the demand of telemedicine transfer.	0.851	0.920	0.794
	The government influences the supply of telemedicine transfer.	0.916		
	Government ICT policy specifically creates awareness and promotes the use of telemedicine.	0.906		
External suppliers' capacity (ESC)	There is sufficient technical support for telemedicine maintenance by the external supplier in my hospital.	0.704	0.906	0.766
	There is sufficient technical support for telemedicine development by the external supplier in my hospital.	0.950		
	The supplier of telemedicine gave adequate training to the staff members in my hospital.	0.948		
Project team's capacity (PTC)	In my hospital there is a formal and qualified project team for telemedicine.	0.976	0.968	0.885
	Staff responsibilities in the telemedicine program in my hospital are formally established.	0.921		
	The project team can understand the medical needs of the different departments.	0.933		
	The project team has a capable information system for the development of telemedicine.	0.931		
Top management support (TM)	The senior management of my hospital is a key factor in the buy-in, lending support and assistance to the program.	0.756	0.856	0.597
	In my hospital the use of telemedicine is supported by top management.	0.771		
	The ability of the top management to take the risk involved in the adoption of telemedicine is important	0.789		
	The commitment of the top management to provide adequate financial and other resources for the development and operation of telemedicine is important.	0.775		
Perceived usefulness (PU)	Using telemedicine in my job could improve the care I give to my patients.	0.877	0.922	0.704
	Using telemedicine in my job would increase my efficiency as a physician, nurse, or technician.	0.890		
	Using telemedicine in my job will make it easier to do my job.	0.773		
	Using telemedicine in my job would be an improvement in the area of my job.	0.882		
	Using telemedicine in my job increases my productivity.	0.764		
Perceived ease of use (EU)	Learning to operate the computer to use telemedicine would be easy for me.	0.934	0.956	0.846
	Learning to operate telemedicine would be easy for me.	0.952		
	I find the telemedicine system to be easy to use.	0.930		
	My interaction with the telemedicine system is clear and understandable.	0.860		
Attitude (A)	I am not in favor of telemedicine as it lacks the face-to-face interaction between patients and doctors.	0.945	0.969	0.886
	I am not in favor of telemedicine as it is complex for users and providers.	0.945		
	I am in favor of telemedicine since it is beneficial to my patient care and management.	0.978		
	I am in favor of telemedicine as it is fully integrated in providing patient care.	0.896		
Self-efficiency (SE)	I had seen someone else using it before trying it myself.	0.960	0.967	0.856
	I could call someone for help if I got stuck.	0.958		
	Someone else helped me get started.	0.876		
	Someone showed me how to do it first.	0.892		
	I had a lot of time to complete the job for which the software was provided.	0.935		
Acceptance of telemedicine (TA)	I will use telemedicine if my hospital implements this technology.	0.770	0.882	0.603
	I will increase my use of telemedicine technology in future.	0.850		
	I will recommend others to use telemedicine technology.	0.801		
	I will use telemedicine because the significance and prevalence of the problems to be addressed, and the information needed are available on a timely basis.	0.821		
	I will use telemedicine because telemedicine in my hospital is fully integrated in providing patient care.	0.617		
Organizational culture (OC)	Meaningful incentives that reward technology progress are in place.	0.977	0.862	0.618
	Employees are provided with adequate training on technology practices.	0.853		
	Work area management encourages work area employees to apply continuous improvement knowledge and skills of new technology.	0.589		
	The organization's senior managers are actively leading the deployment of new technology.	0.666		

CR Composite Reliability, *AVE* Average Variance Extracted

Therefore, physicians and nurses are the most important player in using the telemedicine system and study on the determinants of telemedicine acceptance among patients requires a different framework. The list of hospitals and medical centers was derived from the Malaysian Medical Council (MMC); however, the study only targeted those hospitals currently using this technology. The number of hospitals implementing and using telemedecine technology is very limited – only four hospitals – namely, Selayang Hospital, Kuala Lumpur Hospital, Sungei Buloh Hospital and Putrajaya Hospital in the Klang Valley area. Due to the limited number of hospitals currently using telemedicine in Malaysia, the data collection was personally administered. Out of 150 questionnaires sent out to the 4 main hospitals only 126 were collected, yielding a return rate of 84 %. Among them, 9 questionnaires were only partially completed, and, hence, not usable; therefore, the usable response rate was about 78 %.

This study applied Partial Least squares (PLS) using Smart PLS2.0 (Beta) M3 [76]. We then applied nonparametric bootstrapping [77, 78] with 5,000 replications, as suggested by Hair et al. [79]. This technique was used due to its appropriateness to the exploratory nature of this study in which some of the hypothesized relationships between the variables have not been previously tested. Furthermore, PLS is an appropriate method to avert the limitations of covariance-based SEM with reference to sample size, measurement model and model complexity, because it does not have any restriction concerning model complexity [78]. The required sample size for the study is dependent on the number of study variables and the statistical technique to be used. An often-cited rule of thumb, developed by Barclay et al. [80] and postulated by Chin [81], is based on the idea that the sample size depends on the number of predictors that are involved in the multiple regression model. Consequently, researchers look for (a) the largest number of formative indicators (b) the largest number of independent latent variables, and (c) the maximum number for both (a) and (b) multiplied by ten to obtain the minimum sample size. In the present study, the acceptance of telemedicine has the largest number of predictors (8), and, therefore, 117 samples is deemed more than sufficient.

Data analysis

Data distributions

The final sample consisted of 51 (43.6 %) physicians and 66 (56.4 %) nurses. The male respondents contribute 54.7 % and female respondents 45.3 %. There were 54 (46.2 %) between 35 and 44 years old, followed by 42 (35.9 %) respondents between 25 and 34 years old, and 21 (17.9 %) respondents above 45 years old. About 64 (54.7 %) Malay respondents dominated the survey, followed by Chinese with 32 (27.4 %) and 21 (17.9 %) Indian respondents. In terms of the education status of respondents, the sequence was degree (36.8 %), postgraduate degree (35.9 %), and diploma (27.4 %). The job tenure of 35.9 % of the respondents is less than 5 years and 64.1 % of them are above 5 years.

Common methods variance

According to Podsakoff and Organ [82], common method bias is problematic when a single latent variable accounts for the majority of the explained variance. The results of unrotated factor analysis indicated that the first normalized linear combination only explains 21.00 % of the total 82.48 % variance, indicating that common method bias was not a serious problem in the study.

Measurement model results

Reflective measurement models need to be assessed in respect of their reliability and validity. Igbaria et al. [83] suggested accepting items with loadings of at least 0.5. Since the loadings associated with each of the scales were all greater than 0.5 (Table 1), individual item reliability was acceptable. Traditionally, the reliability test, which examines the internal consistency within a construct, is carried out using Cronbach's Alpha (a). However, researchers recommend a different measure for PLS path models – the Composite Reliability (CR) – as Cronbach's alpha tends to underestimate the internal consistency reliability of the latent variables [84]. The composite reliability of each reflective construct exceeded the recommended threshold of 0.7 [85]. Convergent validity is demonstrated, as the average variance extracted (AVE) of all reflective constructs exceeded the threshold of 0.5 [86].

Discriminant validity was assessed to ensure that the reflective constructs differed from each other. When using the PLS CFA method to examine discriminant validity, Gefen and Straub [87] recommended that the measurement items on their assigned latent variables should have an order of magnitude larger than their loadings on other variables, which is satisfied. As per Fornell and Larcker [86], the correlations between items in any two constructs should be lower than the square root of the average variance shared by items within a construct. As shown in Table 2, the square root of the variance shared between a construct and its items (appearing in bold along the diagonal) was greater than the correlations between the construct and any other construct in the model, satisfying Fornell and Larcker's [86] criteria for discriminant validity. Given the above analysis, the scales used in this study demonstrated sufficient evidence of uni-dimensionality, internal consistency, and convergent and discriminant validity to be included in the structural model.

Table 2 Discriminant validity coefficients

	A	ESC	EU	GP	OC	PTC	PU	SE	TA	TM
A	**0.941**									
ESC	0.084	**0.875**								
EU	0.092	−0.046	**0.920**							
GP	−0.073	−0.307	0.006	**0.891**						
OC	0.094	0.192	−0.219	0.073	**0.786**					
PTC	0.048	0.684	−0.053	−0.487	0.170	**0.940**				
PU	−0.045	0.044	−0.078	−0.132	0.157	−0.047	**0.839**			
SE	−0.191	−0.451	−0.056	0.156	−0.266	−0.383	−0.058	**0.925**		
TA	−0.180	−0.344	0.165	0.290	−0.128	−0.384	0.139	0.439	**0.776**	
TM	0.068	0.106	−0.066	0.023	0.051	−0.007	0.083	0.069	0.226	**0.773**

Assessment of the structural model

With the satisfactory results in the measurement model, this study subsequently evaluated the structural model to confirm the relationships among constructs via the PLS (partial least squares) method. The explanatory power of the research model was examined in terms of the total explainable variation of the model. The results suggested that the model is capable of explaining 41.5 % of the explainable variation on acceptance of telemedecine. Besides estimating the magnitude of R^2, researchers have recently included predictive relevance developed by Stone [88] and Geisser [89], as additional model fit assessment. This technique represents the model adequacy to predict the manifest indicators of each latent construct. Stone-Geisser Q^2 (cross-validated redundancy) was computed to examine the predictive relevance using the blindfolding procedure in PLS. Following the guidelines suggested by Chin [90], a Q^2 value of greater than zero implies that the model has predictive relevance, and, in the present study, a value of 0.232 was obtained, which is greater than zero. We applied nonparametric bootstrapping [77, 78] with 5,000 resamples to test the structural model. The significance and relative strength of direct effects specified by the research model were evaluated (Fig. 2). The results revealed that government policy (β=0.291, p<0.01), top management support (β=0.205, p<0.05), perceived usefulness (β=0.207, p<0.05), and self-efficiency (β=0.288, p<0.01) have a significant effect on the acceptance of telemedicine. As such, H1, H4, H5, and H8 are supported whereas, H2, H3, H6, and H7 are not supported.

The product indicator approach (mean-centered) was employed to create the interaction construct [79]. The CR and the AVE of the interaction constructs met the criteria for reliability and convergent validity. The effect of the direct effects on the dependent variable are not reported in Table 3 as the interactions were done one by one and the direct effects value changed according to the different interactions. The results indicated that just the interaction of government support (β= −0.228, p<0.05) and perceived ease of use (β= −0.374, p<0.001) with health culture have a positive significant effect on the acceptance of telemedicine. As such, H9a and H9f are supported.

Figure 3 illustrates that security culture weakens the effect of government policy and perceived ease of use on the acceptance of telemedicine. This indicates, that government policy and perceived ease of use are more essential when the healthcare organizational culture is low.

Discussion and implications

The purpose of the current study was to identify the determinants of telemedicine acceptance in selected public hospitals in Malaysia from the clinical perspective and the effect of health culture on the relationship between these determinants and telemedicine acceptance. The empirical results testing the relationships between the determinants and telemedicine acceptance demonstrated that government policy, top management support, perception of usefulness and computer self-efficiency have a positive and significant impact on telemedicine acceptance by public hospitals in Malaysia.

The significant relationship between government policies and telemedicine is in line with the studies conducted by Datta and Mbarika [25], Li et al. [26], Shaqrah [28] and Liu [31] who claimed that government policies and regulations can enhance telemedicine adoption by health care organizations and hospitals. In Malaysia, some government-led projects, such as the pilot teleconsultation project (sponsored by World Care Health Malaysia), Malaysian Multimedia Super Corridor (sponsored by Ministry of Health) and personalized Lifetime Health Plan (LHP) (sponsored by Malaysian government) showed that supporting telemedicine, as the new economic platform and health care model, is a critical trend in the national policy and development of the country. Liu [31] suggested that although the serious commitment of system suppliers and IT, and the department of health care

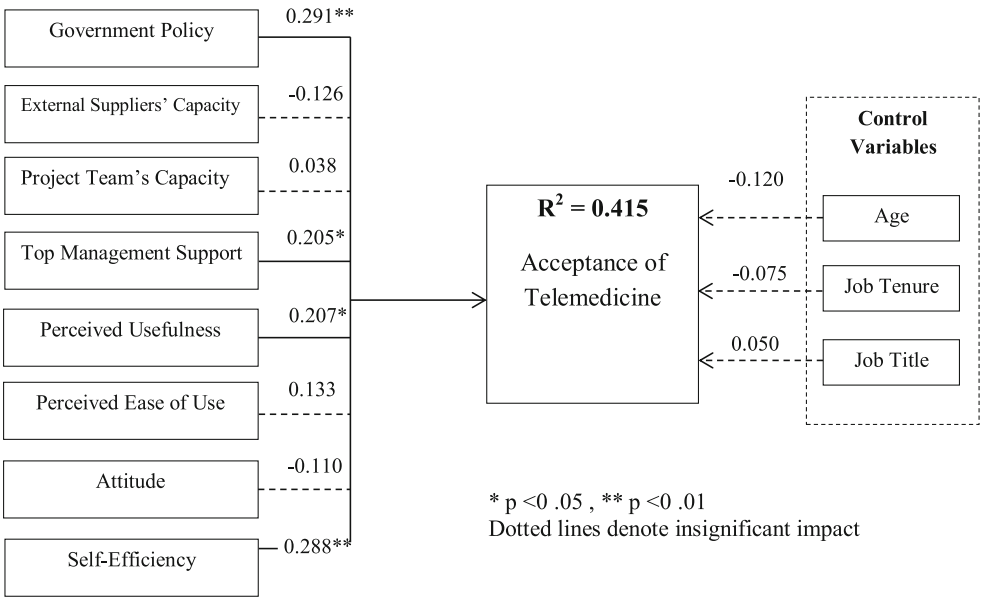

Fig. 2 Path Analysis

organizations are required for implementing and executing the telemedicine projects, the government (or an institution commissioned by the government) has the main responsibility for telemedicine administration and supervision.

Top management support was also significantly related to telemedicine acceptance, which is consistent with Judi et al. [29], Shaqrah [28], and Liu [31] as they suggested that top management support plays an important role in the successful implementation and diffusion of telemedicine technology in hospitals. In the implementation and adoption process of telemedicine, top management needs to consider the financial gains along with other advantages as it enables better cost control and the organizing of a successful business protocol [91]. Likewise, in health care organizations, managers not only need to support the system financially, but are also required to recognize and modify their hazardous attitudes, which influences the organizational adoption of a technology and affects their practices and services to the patients [16].

In addition, this study highlighted the role of the perception of usefulness concerning telemedicine acceptance by hospitals. This result is consistent with many other previous studies like Davis [34], Venkatesh [35] and Chintakovid [33], since they claimed that individual acceptance and usage behavior of a new technology is influenced by the perception of usefulness. This result implies that it is crucial for top managers to do the necessary work to enhance the perception of usefulness of the medical staff. This result can be explained by the fact that physicians and nurses will accept telemedicine technology more easily when they perceive that it will help them perform their job better. The significant association between the perception of usefulness and telemedicine acceptance in this study also shows that doctors and medical staff have an intention to focus on the usefulness of telemedicine in their daily function.

Moreover, the results also showed that computer self-efficiency has a significant impact on telemedicine acceptance

Table 3 Moderating effect of organizational culture

Hypothesis	Relationship	Path Coefficient	Std. Error	t-value	Decision
H9a	GP * OC - > TA	−0.228	0.123	1.857*	Supported
H9b	ESC * OC - > TA	0.063	0.133	0.475	Not Supported
H9c	PTC * OC - > TA	0.084	0.111	0.758	Not Supported
H9d	TM * OC - > TA	−0.071	0.204	0.349	Not Supported
H9e	PU * OC - > TA	0.029	0.124	0.232	Not Supported
H9f	EU * OC - > TA	−0.374	0.123	3.028**	Supported
H9g	A * OC - > TA	−0.132	0.106	1.246	Not Supported
H9h	SE * OC - > TA	0.177	0.167	1.062	Not Supported

*p<0.05, **p<0.01 (one tailed)

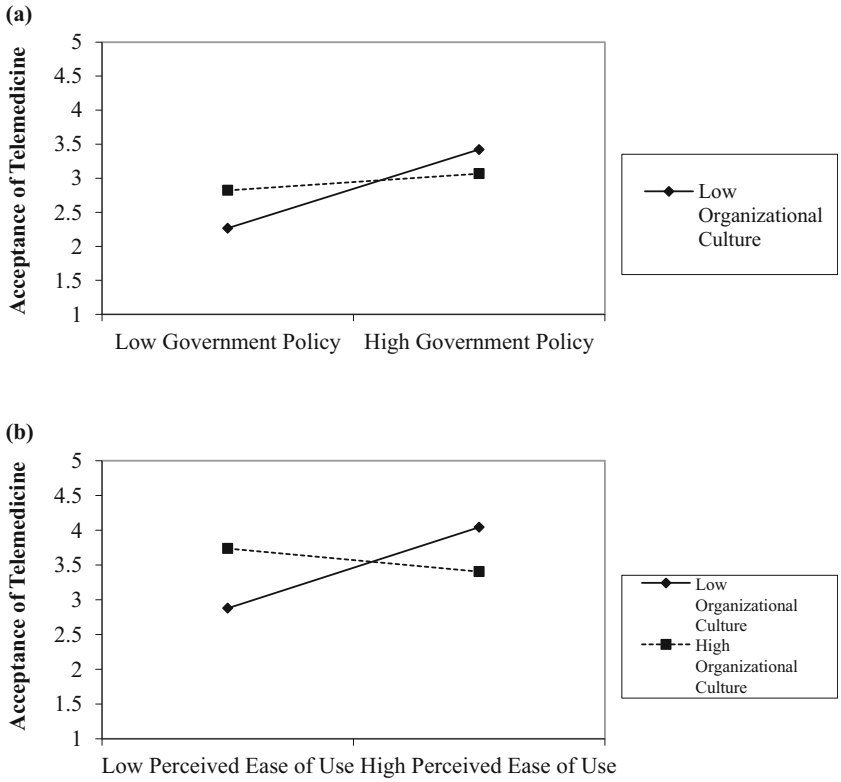

Fig. 3 Interaction Effect of Organizational Culture

by hospitals. This result is consistent with other previous studies, such as Croteau and Vieru [38], and Kifle et al. [39], that also found a significant relation between computer self-efficiency and telemedicine acceptance. Furthermore, according to Marakas et al. [92], computer self-efficiency is a composite of various factors in which each has a direct influence on the ultimate individual judgment and on the association of that judgment to the actual performance. Therefore, this study also supported their opinion and confirmed that doctors and nurses accept telemedicine technology and are willing to use it more if they find that they are able to use the telemedicine devices and informatics tools [63].

Finally, the moderating impact of health culture was only confirmed for the relationship between government policies and the perceived ease of use on telemedicine. This result suggests that the telemedicine acceptance will be applicable when the government enforces the medical representatives to apply it in their daily operation. Indeed, the health culture will be high when the government policy enforces the medical representative to comply with the regulation. These results also showed that medical representatives in hospitals and health care organizations with strong perceived ease of use are more willing to accept telemedicine technology when they have a high level of health culture in place.

Several implications for telemedicine management can be derived from these findings. First, the recognition of telemedicine acceptance will help those responsible for the public health in Malaysia to understand the factors leading to the sustainable, and successful implementation and diffusion of telemedicine in the medical practices. Then, they can adjust their strategies in order to encourage the medical and clinical staff, and especially physicians, to adhere to this technology. Also, it is essential for managers in hospitals or health care organizations to be cautious in evaluating the attitude of their clinical staff toward telemedicine technology and its incorporation in their schedule before executing resources for technology implementation and diffusion. In this connection, an organization that is interested in the acquisition and implementation of telemedicine, should educate their personnel (especially physicians) about the application and benefits of the technology including all the available documented efficiency or clinical results [16].

It can be deduced from the above discussion that the potential benefits and advantages of telemedicine technology have not been totally explored in public hospitals in Malaysia and that there is still a need to train and improve the awareness of medical representatives. In particular, physicians and nurses, who are the direct users of telemedicine, in order to realize the maximum benefits of telemedicine technology in modern health care. Moreover, the service given to the patients through telemedicine depends on the acceptance of physicians who must own the system; therefore, their participation is critical in the implementation and diffusion of telemedicine projects in hospitals.

Conclusion

Telemedicine as a new technology innovation in developing countries that has a great potential to bring about paradigmatic change to health care, can be consider as a significant service sector in both the national and global economy. Although telemedicine is relatively new in Malaysia and related government policies and regulation are still emerging, it has taken on a rising role in Malaysia's health care system, as clearly shown by a growing number of programs and services. In response to the importance of telemedicine technology and the far limited discussion regarding its acceptance by hospitals and health care organizations, the study developed a research model and evaluated its empirical validity and explanatory usefulness by using a survey study that involved selected Malaysian public hospitals which are currently using telemedicine technology. The study's overall data analysis results support the research model, which showed reasonable statistical significance and classification accuracy. Moreover, findings of the study suggest that government policies, top management support, perception of usefulness and computer self-efficiency have a significant impact on telemedicine acceptance by public hospitals in Malaysia. The results also confirmed the moderating role of health culture on the relationship between government policies as well as perceived usefulness on telemedicine acceptance by Malaysian hospitals. In summary, the finding indicates that the telemedicine acceptance and adoption process by hospitals is an interesting area of research and practice which requires further survey to understand the contribution and effect of this technology on the quality of the health care service delivery to patients.

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