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Investigating the Adoption of Telemedicine Services: An Empirical Study of Factors Influencing Physicians' Perspective in Pakistan

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ABSTRACT

Telemedicine services are increasingly becoming an integral part of health care system of many countries around the globe. However, despite its emergent proliferation its acceptance hasn't been strikingly popular in clinical settings of developing countries, where shortage of practicing medical professionals is prevalent. The objective of this research study is to develop a theoretical model based on Technology Acceptance Model (TAM) and then empirically testing it for determining the key factors influencing doctors' intention to adopt and use Telemedicine Services in clinical settings of a developing country. The partial least square model obtained from data of 220 doctors reflects that Perceived Usefulness (β = 0.30) and Perceived Ease of Use (β = 0.26), are the most significant drivers for doctors to use Telemedicine services in their practice, confirming the validity of original TAM constructs. In addition, new predictive constructs including Legal and Ethical Concerns ((β = -0.23) and Response Cost (β = -0.15) are found to have significant negative effects on usage intention of doctors. The survey findings reflect that telemedicine services are still in its infancy in Pakistan. Rigorous awareness and training programs are required to increase its acceptance among medical professionals. Effective financial and legal solutions also need to be devised leading physicians to uptake the adoption of telemedicine service.

1. Introduction

Information and communication technology has helped in improving the quality and delivery of health care services resulting in: (1) enhanced efficiency of physicians and (2) reduced healthcare costs for hospital management systems. Electronic health (e-health) is described as the integration of healthcare industry with information and communication technologies [1-3]. E-health has spread across various facets of health delivery services, including telemedicine, mobile health, and electronic medical record [4]. Telemedicine can be described as the utilization and application of electronic information communication technology and internet for the provision of healthcare services when patients are located remotely [5].

A rightful medium of collaboration among patients and doctors, telemedicine incorporates the application of various technologies for supporting every possible aspect associated with medical care. Telemedicine services are quite efficacious and have major influence when medical experts are not easily available and distances are enormous [6, 7]. Recent evidence reflects that applications of telemedicine are increasing beyond the domains of chronic health management and prescription compliance [8].

A comprehensive literature review on telemedicine highlights that it is currently being used in clinical settings of pediatric, diabetes management, cardiovascular treatments, retinopathy, nutrition trials and hypertension [9, 10]. However, its applications aren't limited to above mentioned domains only, literature has also highlighted that tele-monitoring and teleconferencing have myriad of potential applications for surgical operations benefiting post-surgical patients from virtual appointments with a mobile or computer based device [11]. The research study reported that surgical operations can benefit extensively from telemedicine as the clinical visual assessment marks the basis to diagnose and treat traumatic injuries, burns, wound and the treatment for trans-operative care [5]. By employing tele-monitoring softwares, surgeons now have the ability to assist and coordinate with other doctors from remote locations including watching, advising and directing a procedure by digitally drawing on remote monitor screen and resulting image can be seen locally [12]. Hence, it is safe to say that for people present in different remote geographic areas, telemedicine offers a reliable mode of medical consultation, diagnosis and training. Based on statistics of WHO [13], more than one-fourth of countries around the globe including Pakistan have acute shortage of healthcare force. Telemedicine offers an effective and affordable solution for improving health care outcomes in countries like Pakistan where shortage of resources prevails and a significant proportion of population is located in remote areas [14].

The health system of Pakistan is marked by huge disparities, specifically, in rural territories. Around 75% of Pakistani population resides in rural areas and facilities of health care in these underdeveloped areas remain far from sufficient [15]. Unavailability of health care units and lack of qualified medical staff are the primary issues of rural healthcare system of Pakistan. However, during last decade, telecommunication sector of Pakistan has undergone a major transformation, bringing remarkable social and financial benefits [16, 17]. The number of subscribers have also skyrocketed from 0.3 million back in 2000 to 34.5 million in 2006. According to indictors presented by Pakistan Telecommunication Authority (PTA), internet usage is increased from 22% to 76.5% in 2014 [18]. It is important to

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mention that Pakistan has secured 4th position among rapidly expanding broadband network countries with a growth rate of 46.2% in 2013 [18].

This signifies the existence of opportunities for Telemedicine as a sustainable solution for overcoming the vast differences of healthcare delivery system among rural and urban areas of developing countries including Pakistan. In recent given scenario of improved telecommunication network in Pakistan, there are rich opportunities to develop and strengthen telemedicine initiatives and interventions for improving the outcomes of healthcare system.

It has been widely acknowledged in literature that telemedicine systems are capable of increasing the accessibility to healthcare services in remote areas thus enhancing the quality of healthcare, leading to improved satisfaction of both patients and the doctors [4, 19, 20]. Nevertheless, the actual potential benefits of telemedicine aren't still acknowledged and integrated into the stream of national healthcare system by many developing countries including Pakistan [21].

Despite acknowledged benefits of telemedicine and its initiatives, recent literature suggests that its adoption remains insignificant among physicians and medical professionals of developing countries including Pakistan [22-24]. It can be seen that although considerable efforts have been made for successful implementation of various telemedicine projects. However, there are only handful of telemedicine applications which are currently being used among physicians and continued beyond initial phase of development and implementation [25]. Various examples can be presented (from across the world) to testify the failure of telemedicine projects and how promptly they are abandoned by physicians as they have failed to sustain economically in business environment of healthcare [26].

Literature highlights that physicians represent the primary users and stakeholders of telemedicine services and physicians' acceptance of telemedicine services is predicted to have a significant influence on its adoption [27]. Conversely, it can be understood that resistance among medical professionals is common whenever a new technological system is implemented. Given that, telemedicine contradicts from the traditional approach of face to face interaction with medical health care providers, it is understandable that physicians will not readily embrace it and might perceive it as a threat to their expertise. Research has shown that apprehension of physicians to use telemedicine is embodied in several reasons such as anxiety of job security and the fear that it will not be an effective medium of communication between patients and doctors [28].

Hence, telemedicine services can only be proven useful in Pakistan when medical professionals begin to use it actively and therefore their attitude towards telemedicine services will be a major factor for its successful adoption. Additionally, medical professionals being the primary stakeholder of health care setting will play a decisive role to encourage and increase its adoption in patients as well. Therefore, it becomes equally important to examine the factors affecting acceptance of telemedicine among doctors in healthcare settings including Pakistan [29].

Although research regarding the issue of telemedicine in developed countries is essential, many research studies have primarily focused on this domain only and little attention has been offered to analyze its acceptance among physicians in perspective of a developing country. Research indicates a lack of empirical evidence to understand and determine the factors underlying as to how medical professionals in developing country might view and intend to use telemedicine services [30]. Now a days most of the studies on telemedicine services have focused more on the issues related to life style changes, privacy and security, user interface and design and less emphasis has been offered to understand its perceived value and acceptance among medical professionals of developing countries [31]. Technology Acceptance Model (TAM) has been widely used for determining the acceptance of new technology [32, 33], even so its use to understand physicians' acceptance of telemedicine services is restricted.

A study analyzing technology acceptance model [34] suggested that TAM serves as a good predictive basis to understand the intention of physicians for acceptance of telemedicine technology. Another study presented a modified model of TAM for health care managers to aware them from the barriers that hinder the acceptance of new technologies among physicians [35].

Most of these studies, based on research framework of TAM, offer a very limited understanding of socio technical perspective of physicians' acceptance of telemedicine services. Research suggests that few studies have utilized TAM to investigate acceptance of telemedicine among physicians in clinical settings of developing countries including Pakistan, Bangladesh and Kenya [36]. Moreover, previous studies have primarily adopted the basic TAM model with constructs such as perceived ease of use, perceived usefulness and implemented the research model in context of developed nation with little focus on legal, ethical and cost related issues of telemedicine for developing countries [37, 38].

Based on above discussed literature, this study aims an attempt to investigate the adoption of telemedicine services based on legal and cost based consequences among doctors of a developing country such as Pakistan. This lead to the formulation of following research question of this study:

What are the main predictive factors influencing the adoption of telemedicine services among medical specialists of a developing country?

For this purpose, a theoretical model based on TAM is developed with inclusion of few more variables from previous qualitative studies on TAM. The inclusion of additional constructs has been made on the basis of their importance for the developing countries. The model is then validated by empirical testing and relationship among various constructs was determined.

2. Materials and Methods

2.1 Theoretical Background for Proposed Research

TAM instigated from the domain of social science and psychology is frequently used to understand and analyze the perspective of users in terms of behavioral intention. It has been used in numerous studies frequently to understand the acceptance of a new technology [1-35, 39-41]. TAM is primarily composed of constructs such as: perceived usefulness (PU), perceived ease of use (PEOU), facilitating conditions, subjective norms and behavioral intentions [42].

Perceived usefulness of technology is defined as the extent to which the performance of an individual increases. Likewise, perceived ease of use highlights the extent of belief of a user that how much effort he/she has to do to adopt that technology. Facilitating conditions generally represent the presence of an environment around a person which helps him/her in adopting the technology [43].

Although TAM has been widely used in various studies, researchers have identified some limitations regarding its applications under specific conditions. Hence, Technology Acceptance Model should incorporate some external constructs allowing researchers to analyze the influence of primary determinants of TAM along with these added variables on behavioral intention [44].

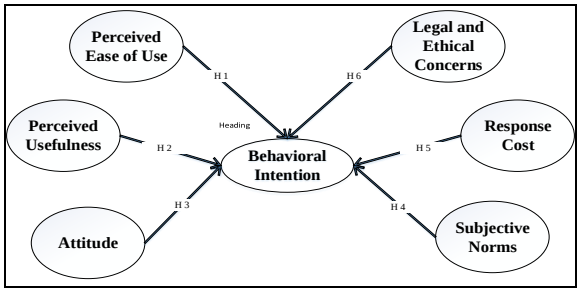

Fig. 1: Proposed research model.

Based on empirical evaluation of TAM's utilization in health care studies, this study undertakes widely used factors of TAM in health related research. Fig. 1 describes the research model exhibiting causal relationship between various factors. Factors from previous studies on TAM, as acknowledged by literature relevant to physicians' perception and willingness are combined in this model.

Previously conducted TAM related researches demonstrates that Perceived usefulness, perceived ease of use, and behavioral intention have the most support level. Fig. 1 highlights that perceived usefulness, perceived ease of use, attitude and subjective norms act as the direct determinants of usage intention.

A major difference in this proposed model in comparison with previous models is the inclusion of additional constructs which are: (1) attitude, (2) subjective norms (from theory of planned behavior), (3) legal and ethical concerns and (4) response cost.

In this proposed research model, behavioral intention to use telemedicine is a dependent variable which can be considered as the acceptance of telemedicine by our target group. The population targeted in this study was mainly comprised of doctors in ambulatory care. Due to vast difference in their respective daily routine, this group can't be considered as homogenous.

The following section explains the hypotheses developed for factors which will influence the adoption of telemedicine.

2.1.1 Perceived Ease of Use and Perceived Usefulness (PEOU and PU)

It has been widely acknowledged in various studies of TAM that PEOU and PU are significant determinants of acceptance of technology [45-47].

Previously conducted studies in various fields of Information Communication Technologies (ICT) also verified the applicability of TAM and noteworthy effect of PEOU and PU on the usage intention [48-50]. Hence, these two factors become equally important for determining the acceptance of healthcare provider for telemedicine. PEOU is the extent of ease a person attributes towards using a system [51].

Perceived usefulness is believe of the provider that how much it would help in accurate remote monitoring of patients and offers better quality of medical care [52]. Physicians who lack adequate experience with internet and software will be reluctant towards telemedicine system. Hence, it can be assumed that physicians would use telemedicine when they will perceive it to be easy and effective. The following hypotheses are proposed in this regard:

H1: Perceived ease of use positively influences the intention to use telemedicine.

H2: Perceived usefulness positively influences the intention to use telemedicine

2.1.2 Attitude (ATT)

Attitude is defined as the feeling of positivity or negativity an individual attributes while using a new technology. Attitude differs from behavioral intention (BI) in a sense that BI indicates the plan of a user to perform some specific behavior in near future. Hence, it is safe to say that attitude is a measure for determining the desirability of an individual to use a technology [51, 53].

It has been identified in various studies that attitude is a substantial factor which influences behavioral intention. Physicians with a positive attitude towards telemedicine systems can have a more strong intention to accept and employ it [53, 54]. Attitude has been identified as a critically significant predictor of behavioral intention to adopt health information systems [55, 56]. Hence we propose:

H3: A positive relation exists between attitude of a physician (towards using telemedicine) and behavioral intention.

2.1.3 Subjective Norm (SN)

The perception of an individual that important people around him/her will approve or disapprove a certain behavior is termed as subjective norm. Subjective norm is included in TAM2 to analyze the effects of social influence on users in adopting a technology [57].

The more others (friends, acquaintances and colleagues) would want a person to adopt a technology according to his/her perception, the greater he/she will be motivated to adopt the new technology [58].

Studies have identified significant effects of subjective norms on behavioral intention [34]. In context of this study, it is proposed that perception of a physician regarding opinions of peer support as to whether adopt telemedicine or not imparts substantial effect on the behavioral intention. Hence it is proposed:

H4: Physician's perceived extent of subjective norm positively affects the behavioral intention of using telemedicine system.

Response cost is defined as the cost that an individual has to bear for receiving a certain recommended response [59]. Previous studies have shown that response cost generally imparts negative effects on behavioral intention of using a technology in context of healthcare [60].

Similarly, response cost has shown to impart negative effect in the studies related to information systems as well [3]. For this research, response cost is considered in context of time and money spent by the doctors to use telemedicine services. Building on that it is proposed that doctors will less likely to accept telemedicine services if the cost associated with telemedicine services will exceed the usual expenses for medical services.

H5: Higher level of response cost will negatively affect the behavioral intention to use telemedicine.

2.1.5 Legal and ethical concerns

Legal concerns can be illustrated as rule of actions formally enforced by authorities. Different dimensions of legal concerns include privacy, reliability and liability [61, 62]. The primary users of healthcare system are concerned whether the existing laws cover these three building blocks of legal concerns.

If individuals are given control over their health information, encouraged to use telemedicine and malpractices are reduced in regards with privacy invasion, legal concerns of users are likely to be diminished [63]. Likewise, legal concerns for the adoption of telemedicine services among physicians should be addressed and protected by law.

For instance, is it guaranteed that quality of health care will improve by incorporation of telemedicine services? In case of mishap or if a certain violation has occurred on part of physician while using telemedicine system, will the issue be protected by law? Should there be any compensation plan for patients in case of the injury and who will be responsible for paying the compensation cost (doctor, hospital management, and insurance company)? Will patient be able to take the claim to court? Does the local law protect it ?

Ethical concerns are the given set of standards for a behavior as to what is right or wrong beyond the limitations of legal concerns [62].

Telemedicine system requires collection of healthcare information from patients. Therefore, the flow of information needs to be controlled and paid close attention to as to what kind of information will be gathered, who will have access and to what extent. In case of damage, which is to be held responsible and how the costs will be recovered? Based on it we propose:

H6: Ethical and legal concerns will negatively affect the intention to use telemedicine system.

2.3 Survey Instrument and Participants

This research is aimed at identifying the attributes of telemedicine services and how the attitude of physicians affects their usage intention. Fig. 1 represents the research model of current study. The determinants of the research model were adapted from prior studies on healthcare and technology acceptance.

Table 1: Construct items for factors.

Factors	Items	References
Perceived ease of use	4-items	[13, 64]
Perceived usefulness	4-items	[51, 65]
Attitude	3-items	[66, 67]
Subjective Norm	3-items	[68]
Response Cost	4-items	[69]
Legal and Ethical Concerns	4-items	[70]

The number of questionnaire items for each factor is shown in Table 1. In order to empirically test the research model, data collection based on field survey design was

employed. Various health care related topics including importance of IT in health care settings, significance of response cost, legal and ethical concerns were investigated. All items of the questionnaire were developed based on literature review of previous studies [71, 72].

The constructs were evaluated using a five-point Likert scale, ranged from strongly agrees to strongly disagree. Characteristics of medical professionals such as gender, age, living environment, medical working environment, practicing experience were used as control variables.

The ethical approval for this study was sought by the Board of Post Graduate Studies at the University of Engineering and Technology, Taxila, Pakistan. For data collection, survey was conducted from doctors practicing in 55 private clinics and 10 hospitals in Islamabad, Pakistan.

The Hospitals where researchers were granted permission to collect data include PIMS (Pakistan Institute of Medical Sciences), Federal Government Service Hospital, CDA Hospital (Capital Hospital), National Institute of Health, Nuclear Oncology and Radio Therapy Institute, Polyclinic Hospital, Children Hospital, Federal Government Health Centre, Bilal Hospital and Ahmed Medical Complex. The population of Islamabad comprises people from various parts of the country thus making it very suitable for field testing.

Since the actual population of doctors practicing in Islamabad was unknown, hence, a method based on random sampling was employed to obtain an adequate sample for this study. Survey questionnaire prepared in English was first validated by conducting a pilot survey among twenty physicians and ten medical students.

Based on the feedback received from pilot study, some adjustments were made such as improvement of definition of some constructs for providing more clarity to the respondents. The final version of the questionnaire was comprised of three main parts. Part-1 was comprised of introductory information regarding telemedicine, Part-2 contained demographic information and questions exploring basic internet usage and awareness of respondents regarding telemedicine.

Questionnaires were personally distributed by the researchers and respondents willing to participate were asked to read a consent form and then sign it. Introductory information available in Part-1 of the questionnaire clearly stated that respondents can withdraw and stop participating at any point in research study if they are not comfortable. The research population for this research study was consisted of medical specialists, surgeons and general physicians. The participants were informed before meeting and a brief 15-minute session was conducted with each doctor to provide information regarding telemedicine and purpose of research study.

Survey was conducted over a period of three months extending from September 2017 to November 2017. Of the 220 distributed questionnaires, 210 responses were collected, yielding a response rate of 95 percent. 10 questionnaires were excluded as they were incomplete; hence, total 200 valid responses were left for investigation.

2.4. Data Analysis

For the purpose of data analysis, PLS (Partial Least Square) method which can be used for structural equation modeling (SEM) is employed [73].

Previous research has exhibited the extensive use of SEM for modeling the complex relationship among endogenous and exogenous variables to overcome the limitations that generally occur in first generation analysis. Hence, for the modeling of complex variables and mathematical models, SEM is a suitable option [74].

2.4.1 Demographic analysis

Table 2 summarizes the characteristics of the respondents participating in this study; we note that most of the respondents participating in this research study were male physicians. It can be seen that age of respondent

Table 2: Demographics of respondents.

Variable	Frequency	Percentage
Gender		
Male	124	62
Female	76	38
Age		
Between 20 to 30 years	20	10
Between 30 to 40 years	154	77
Between 40 to 50 years	14	7
50 years or above	12	6
Qualification		
Specialist	40	20
surgeon	32	16
physicians	128	64
Medical Group		
Clinical	90	45
Basic	46	23
Surgical	64	32
Practicing Time		
Less than10 years	148	74
Less than15 years	16	8
More than 15 years	36	18
No. of Patients		
Between 20 to 30	135	67
More than 30	65	33
Organization Type		
Clinics	142	71
Hospitals	58	29

varied from twenty to fifty years. The highest frequency of respondents was observed in the age group ranging between thirty to forty years.

Occupational department of respondents are as follows: approximately forty five percent of the respondents represented clinical group, twenty-three percent of the respondents represented basic group respondents belonging to surgical group were in total of thirty-two percent. Participants' medicine practicing period is as follows: 74% of the total respondents had practicing period of less than ten years, 8% of the respondents had practicing period of less than fifteen years and 18% had more than fifteen years of practicing period. It can be seen that 71% of the participants were employed in hospitals and 29% were serving in clinics.

Table 3 summarizes the relevant questions respondents were asked regarding the basic information of telemedicine services. Respondents were questioned as to whether they have access to internet? From the statistics it can be seen that 88% of the respondents had access to internet and only 12% of the respondents had no access to internet services. Respondents were asked about their usage of internet to access medical information.

Table 3: Awareness and familiarity with telemedicine.

Response	Frequency	%
Do you have access to internet?		
Yes	175	88
No	25	12
Usage of internet for medical information?		
Yes	159	80
No	41	21
Familiarity with telemedicine services?		
Yes	134	67
No	66	33
Familiarity with telehealth software and applications?		
Yes	47	24
No	153	76
Learning to use telehealth applications and software would be an easy task?		
Yes	111	56
No	89	45
Are there any current programs available at your hospital for telemedicine		
Yes	-	-
No	200	100
Availability of Adequate Infrastructure at your hospital for telemedicine?		
Yes	38	19
No	162	81
Telemedicine will aid physicians to improve self-efficacy?		
Yes	149	75
No	51	26
Using telemedicine could improve the access to healthcare for remote patients?		
Yes	161	80
No	39	20

Results mentioned below reflect that approximately 8% of the respondents access internet for acquiring medical information. Further respondents were asked regarding their familiarity with telemedicine services and it can be seen

more than 65% of physicians were already familiar with telemedicine services. Familiarity of respondents with telehealth software and applications was also inquired and it can be seen that approximately 76% of the respondents had no familiarity with telehealth software and applications. Results reflect that according to 56% of the respondents learning to utilize telehealth applications and software will not be difficult. Moreover, there was not any current program offering telemedicine services to patients. It is also quite apparent that adequate structure for telemedicine is not available commonly at hospital facilities in Pakistan. 75% of respondents agreed that telemedicine will improve the efficacy of physicians. 80% of the respondents agreed that usage of telemedicine services can improve the access of health care service to people in remote areas.

2.4.2 Assessment of measurement model

Table 4 represents the reliability and validity of the model. It is based on Cronbach's-alpha, all internal consistency and reliabilities exceeded 0.7, indicting sufficient internal consistency of the data [75].

Table 4: Measurement model.

Constructs	CR	AVE	CronBach's alpha	Itemloadings
PEOU	0.891	0.671	0.761	0.766-0.865
PU	0.883	0.661	0.758	0.747-0.927
ATT	0.841	0.646	0.774	0.785-0.894
SN	0.863	0.678	0.748	0.793-0.862
RC	0.857	0.667	0.796	0.742- 0.879
LEC	0.895	0.739	0.720	0.820-0.884
BI	0.874	0.698	0.782	0.874-0.823

The convergent validity was used to determine the validity of the data. The validity was determined according to following criteria: (a) the values of item loading for all the constructs should be above 0.7, (b) composite reliability for all constructs should exceed 0.80, (c) average variance extracted should be greater than 0.5 [76].

Table 5 shows the correlation matrix of the data and discriminant validity. The values indicate acceptable levels for all the given measures of reliability and validity. Criterion for determining the discriminant validity was that square root of average variance of every construct should be larger than its corresponding correlation with the rest of constructs. The square root of average variance extracted

(AVE) for each construct was greater than its corresponding correlation with other constructs as shown in Table 5 confirming the discriminant validity of data.

Table 5: Discriminant validity of model.

Constructs	PEOU	PU	ATT	SN	LEC	RC	UI
PEOU	1						
PU	0.39	1					
ATT	0.20	0.49	1				
SN	0.33	0.19	0.17	1			
LEC	0.18	0.15	0.11	0.37	1		
RC	0.26	0.13	0.13	0.14	0.11	1	
UI	0.57	0.56	0.43	0.45	0.34	0.4	1

Table 6: Hypothesis testing.

Hypothesis	Path relation	Path coefficient	T-values	Conclusion
H1	PEOU(+) → BI	0.26	2.74>1.96	Supported
H2	PU(+) → BI	0.30	3.42> 1.96	Supported
H3	ATT(+) → BI	0.17	1.99> 1.96	Supported
H4	SN(+) → BI	0.18	2.62>1.96	Supported
H5	RC(-) → BI	-0.15	2.15> 1.96	Supported
H6	LEC(-) → BI	-0.23	2.05> 1.96	Supported

2.4.3 Results

The results of hypothesis testing in PLS are presented in Table 6. The structural model for this study to examine the relationship between exogenous and endogenous variables was developed using PLS. Physicians' intention to use telemedicine system was mutually predicted by perceived ease of use, perceived usefulness, attitude, subjective norms, response cost, legal and ethical concerns. Together these variables explained (R^2 = 62%) variance in intention to use telemedicine services. T-statistics and path coefficient were used to test the developed model. According to Hypothesis-1, perceived ease of use would have a positive effect on behavioral intention. A positive path coefficient for PEOU supported the proposed hypothesis (β = 0.267, $p < 0.001$). This shows that Pakistani doctors are willing to incorporate telemedicine systems in health care management, if operating it won't require much effort on their part. If doctors perceive telemedicine to be unproblematic, their intention to use it will be enhanced. These outcomes are reliable, considering the findings of previous research [77]. According to hypothesis-2, perceived usefulness will positively impact the usage intention of telemedicine, hypothesis-2 was also supported with value of path coefficient value (β = 0.307, $p < 0.001$).

This reflects that Pakistani doctors will contemplate to use telemedicine only if they'll have a strong and concise understanding its potential profits for healthcare and clinical diagnosis. These results are consistent with previous studies regarding acceptance of telemedicine [72, 78]. The results however aren't in line with the findings of a study [79], according to which perceived usefulness and immense benefits of telemedicine aren't suffice for clinicians to use telemedicine systems.

Nevertheless, a study [80] determining the acceptance of telemedicine among healthcare workers highlighted the findings equivalent to the results in our study. Hence, perceived usefulness can be seen as an integral factor for adoption of telemedicine. Hypothesis-3 stated that attitude will positively impact the intention of using telemedicine which was supported in hypothesis testing (β= 0.177, $p < 0.001$). Subjective norms were hypothesized to have a positive relationship on intention of using telemedicine which was also supported by positive path coefficient SN (β= 0.189, $p < 0.001$).

Response cost was hypothesized to have a negative effect on intention of using telemedicine and it was also confirmed by path coefficient (β= -0.156, $p < 0.001$). The outcome is consistent with a previous study by Jung et al. [29], advocating that appropriate payment mechanism must be devised to enhance the incorporation of telemedicine in clinical practices.

This illustrates that the doctors in Pakistan view telemedicine as an additional workload which may not prove to be cost effective. Hence, there is an urgent need to review reimbursement policies for using telemedicine. Finally, it was proposed that legal and ethical concerns will negatively affect the intention to use telemedicine which was verified (β= -0.234, $p<0.001$).

3. Discussion

In view of the perspective of medical specialist's acceptance of telemedicine, this research undertook an attempt to investigate the awareness and attitude regarding acceptance of telemedicine among doctors in Pakistan. In order to investigate the determinants which may militate or encourage the behavioral intention of doctors, a research model based on TAM was developed with inclusion of additional factors including response cost, legal and ethical concerns in the context of telemedicine adoption among physicians of a developing country. Based on explaining more than half of models variance (R^2 = 62%) to predict the adoption of telemedicine services, it is safe to conclude that these factors hold significant predictive power.

Perceived usefulness and perceived ease of use were found to be the strongest factors influencing the usage intention of physicians which is in line with the findings of previous studies of TAM [58]. Physicians appeared to be rationally and sanely settling on their adoption choices by analyzing the values and effectiveness of telemedicine services [53]. Elevated levels of PU and PEOU urge the doctors for having an uplifting disposition towards telemedicine. Accordingly, structure of telemedicine services ought to be designed in an easier manner to understand as to how it will remain compatible with current needs and level of acceptance physicians have for

technology. The findings suggest that Physicians who can utilize telemedicine services with ease will develop a more inspirational attitude towards using the system.

Attitude was another influential determinant of healthcare professionals usage intention of telemedicine, which was as per previous findings [43, 64]. Nevertheless, its impact was smaller in comparison with PU and PEOU.

The positive impact of attitude signifies the importance of attitude in acceptance of telemedicine system for healthcare professionals and the role it can play for successful implementation of telemedicine services in health care settings. The government therefore should be focused on building a secure facilitating clinical environment for physicians according to their need and requirements, leading them to exhibit a positive attitude of acceptance towards telemedicine.

This study identified the positive impact of subjective norms on the intention of using telemedicine systems which is similar with the findings of previous studies [64, 71]. Inspite of professional autonomy, healthcare professionals decision to adopt telemedicine services will be greatly influenced by opinions of their peers. These findings are consistent with solid acculturation occasionally associated with the profession of medical care [71]. This simply calls for Government to design strategies that promote the importance of peer support and role modeling, to enhance the acceptance of telemedicine services among doctors [81].

The findings of response cost confirm the proposed hypothesis. Physicians will be worried regarding the negative outcomes of cost associated with the system. Therefore, it becomes important for hospital management authorities to offer cost effective incentives initially and provide the required technical support to medical specialists which will ensure that using telemedicine services will lead to positive outcomes [82]. Research studies have shown that effective implementation of telemedicine services is an evolutionary process leading to improve workloads at both ends of the platform, reduce patient length of-stay and eventually helping to improve the hospitals business plan [83, 84]. However, the clinicians and hospital administration sometimes don't see the benefits of population-based care immediately because they are so focused on the individual patient, that's why offering financial incentives to medical professionals willing to offer telehealth treatments is important as it will help to start the uptake of this service among medical professionals [85].

Research has indicated that telemedicine service is not a reimbursable service leading hospital management and practitioners to not accept it [85, 86]. In order to address this issue both government legislatures and private payers need to recognize the expansion of telehealth services by enacting parity laws and efficiently leveraging our limited health resources. In many cases cost telemedicine might become an additional burden for a medical facility [87]. In order to overcome this issue Government along with the aid of health policy makers need [88] to devise reimbursement models and certain criteria for practitioners to receive this reimbursement. Health Grants from Government entities, private payers and must be aimed to devise adequate financial schemes and programs for medical specialists serving in public hospitals where cost of health care services provision is kept to minimum [89].

Aside from offering financial incentives awareness campaigns and training programs should be devised encouraging medical professionals to use telemedicine. Awareness campaigns need to be focused as to how with the emergence of innovations the cost of technology is continuing to gradually go down with increase in efficiency [90]. Awareness programs should also be designed to create awareness among general public that by delivering care on demand, patients don't have to delay visits or treatment. In some cases, this can help prevent more serious complications and ultimately cut costs [91].

With the aid of health education, medical professionals can be made aware to use technological convenience of telemedicine, based on high definition visual and audio facilities, which can improve the treatment and diagnosis options for remote areas. Comprehensive training and information campaigns can help medical professionals to develop better understanding regarding the potential of using telemedicine such as to facilitate more patients, improved treatment efficiency during non-traditional hours without expansion for utilities, elimination of travel cost and rescheduling of appointments. Along with adequate cost mechanisms, reimbursement models and training programs, a positive impact can be seen on future adoption of telemedicine.

Research findings have indicated the significant influence of legal and ethical concerns on usage intention of telemedicine services. The present study confirms the proposed effect of ethical and legal concerns on usage intention of telemedicine services [88]. This suggest that standardization, and process orientation of telemedicine adoption procedure significantly affects the willingness of physicians [91, 92].

The negative effect of legal and ethical concerns validates that a physician with significantly low tolerance for these concerns will not be willing to adopt telemedicine services. Similarly, in a developing country like Pakistan where lack of detailed and viable legal procedures prevails in the existing health care system, the uptake of telemedicine services by physicians will remain low until or unless these concerns are directly addressed.

The findings of this study contribute to the existing body of knowledge regarding the design and development of telemedicine services and how this entire process can be make more effective for its adoption among the people of

developing countries. Further research is necessarily required which can provide useful insights regarding acceptance of telemedicine in rural and urban environments of low and middle resource income countries.

Currently, the findings don't entirely support a bright future for telemedicine services targeting medical specialists, unless the design for such services is kept user friendly, seen to be cost effective and bundled with full legal support. The outcomes encourage researchers to improve the efficiency of telemedicine systems by proposing effective legal mechanisms by analyzing and understanding the role of technologically empowered institutional systems for facilitating and promoting telemedicine exchange relationship in health care settings.

4. Conclusions

Telemedicine services are still in its infancy in Pakistan. The promotion and acceptance of telemedicine is still unclear among medical specialists and professionals. For existing healthcare system of Pakistan, telemedicine can be deemed as a blessing in disguise for improving healthcare performance. In summary, current study highlights the determinants influencing physicians' intention to adopt telemedicine services in context of a developing country and how improved health care services can be provided to people using telehealth interventions.

Utilizing technology acceptance model, it was revealed that perceived ease of use and perceived usefulness are significant factors for predicting willingness of physicians for telemedicine services. It was also identified that legal and ethical concerns and response costs are crucial factors affecting the acceptance of telemedicine services.

These variables are of primary concerns for Pakistani physicians. Consequently, these predictive factors can aid in design and establishment of initiatives to engage medical professionals in information technology based health stream. In accordance with the results, it is suggested that new education-support programs and development initiatives should be introduced to encourage doctors for acceptance of telemedicine services. However, this shouldn't be restricted only to development of evidence based telemedicine interventions and formulation of recommendations and guidelines. The integration of telemedicine services into circle of professional norms can only be achieved by inclusion of ICT into ongoing developmental training programs targeting experienced medical specialists. Strategies focusing on collaborating with well-known medical specialists will be likely to foster the acceptance of telemedicine services.

This research has some limitations. The acceptance of telemedicine services hasn't prevailed on a scale it should have been among the masses in Pakistan. Given the fact that not every hospital is facilitated with the access of internet, hence, few characteristics of this research have some limitations to generalize for other countries.

Secondly, the prime respondents of this study were doctors only, despite involvement of many other occupational entities in healthcare system. Further studies are essentially required to explore other significant determinants of usage intention of respondents.

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