

RESEARCH ARTICLE | NOVEMBER 28 2023

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AIP Conf. Proc. 2909, 030015 (2023)

<https://doi.org/10.1063/5.0181991>



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Understanding Behavioural Intention to use Telemedicine in Healthcare: Insights from Medical Practitioners

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Abstract. Research into the telemedicine adoption in the healthcare sector has largely focused on the perspective of patients, leaving the behaviour of doctors in the sector largely unexplored. Therefore, this study seeks to explore adoption behavior of doctors towards telemedicine. The “Unified Theory of the Acceptance and Use of Technology” model combined with personal innovativeness to form the basis of the study. Data from 122 doctors who are currently using telemedicine is used to validate the model. The findings suggest that effort expectancy, facilitating conditions, performance expectancy, social influence and personal innovativeness all affect the behavioural intention to adopt telemedicine. Implications for the healthcare sector are discussed. To improve telemedicine adoption by doctors, healthcare organizations should focus on providing comprehensive training and support to ensure that doctors are comfortable and confident in using the technology. Additionally, healthcare organizations should strive to make the technology as user-friendly as possible, with intuitive interfaces and easy-to-follow instructions. Furthermore, healthcare organizations should provide incentives for doctors to use telemedicine, such as reduced paperwork. Finally, healthcare organizations should ensure that telemedicine is integrated into existing workflows and processes, so that it is easy for doctors to incorporate into their daily practice.

Keywords: Telemedicine, UTAUT, Healthcare, Technology.

Article type: Research paper

INTRODUCTION

The usage of emerging technologies such as mobile apps, chatbot, modelling and simulation have altered the working of the healthcare sector (1). The use of such advanced technologies boosts the provision of healthcare and expands its reach to a growing population (2). The emergence of the COVID-19 has made the utilization of electronic health (eHealth) services more important than ever, prompting healthcare systems to rely more heavily on these services due to the need for social distancing (3). Due to the technological progress and innovations, internet communication has become more affordable, creating a great chance to incorporate telemedicine into healthcare services (4).

Telemedicine is the usage of information and digital communication technologies, including computers, mobile devices, and the internet, to provide medical services and health information to patients remotely (5). Telemedicine enables healthcare providers to remotely diagnose, treat, and monitor patients, eliminating the necessity for an in-person visit. Telemedicine can be used to provide a variety of services, including remote

consultations, remote monitoring, and remote education. Telemedicine can improve long-term health for people by making preventive treatment more convenient and easier (6). This is particularly applicable for those who are unable to access quality treatment due to financial or regional limitations. As a result of telemedicine, health care can become more effective, organized, and accessible.

The adoption of emerging technologies has been extensively researched in the literature. For example, contact tracing app (7), technology usage by humanitarian practitioners (8), information system acceptance at emergency operations centres (9), virtual reality (10), m-payment in GCC countries (11), chatbot-based services (12), Covid-19 contact tracing app (13), tourism blockchain (14), IoT in eHealth (1), primary care physicians (15). Despite the fact that healthcare sector is constantly looking for ways to improve the healthcare delivery, there is need for more research on this topic in multiple cultural context (1). Moreover, there also remains large gap in the empirical research in the area. Consequently, it is necessary to develop structural model that can be used to analyze the doctor's telemedicine usage behaviors in the context of healthcare delivery.

Research on telemedicine is still in its infancy, very little information is available about the perceptions of the stakeholders involved in the field. In particular, no study has captured the perspective of the doctors in improving the health delivery through the usage of the telemedicine in the healthcare sector. To address this gap in research, a study could be conducted to explore the perspectives of doctors on how telemedicine can be used to improve health delivery. Data has been collected from the sample of doctors to gain insight into their views on advancing our understanding on the factors impacting the telemedicine adoption. The study's results could then be used to inform policy and practice in the healthcare sector. Therefore, we seek to answer following research questions (RQ): RQ1 To what extent UTAUT model explain telemedicine adoption in the healthcare context?; RQ2 Does extending the UTAUT model with the personal innovativeness better explain the telemedicine adoption in the healthcare context?

The remaining paper is structured as follows: Section 2 delves into the hypothesis development, while Section 3 elaborates on the methodology employed in the research. Section 4 elucidates the outcomes derived from SEM. Lastly, Section 5 encompasses the study's conclusions along with its limitations.

HYPOTHESIS DEVELOPMENT

The “Unified Theory of Acceptance and Use of Technology (UTAUT)” is a widely acknowledged framework that aids in elucidating individuals' adoption and usage of technology in diverse contexts (16). In the context of healthcare, the UTAUT framework is particularly valuable in comprehending the elements that impact doctors' attitudes and adoption of telemedicine. Telemedicine, which involves the use of technology to provide remote medical consultations, has gained increased attention and adoption in recent years, particularly due to the COVID-19 (17). However, the successful implementation of telemedicine requires not only the availability of technology but also the acceptance and use of the technology by doctors.

The UTAUT framework can be applied in the telemedicine setting to comprehend the elements that impact doctors' attitudes and adoption of telemedicine. For example, if doctors perceive that telemedicine will improve their performance (performance expectancy), they are more inclined to accept and employ the technology. Similarly, if doctors perceive that telemedicine will be easy to use (effort expectancy), they are more inclined to accept and employ the technology. The UTAUT framework can also help to identify potential adoption barriers, such as a lack of resources or support (facilitating conditions) or negative opinions from colleagues or superiors (social influence). In summary, the UTAUT framework is important to understand doctors' perception towards telemedicine. This knowledge can inform the development of strategies and interventions to promote the implementation and adoption of telemedicine. A rich foundation of contemporary literature supports the hypotheses developed in the conceptual framework (See Figure 1).

Performance expectancy

Performance expectancy (PE) pertains to “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (16). In this study, PE refers to the belief that a technology will be able to deliver the service to the patients effectively and efficiently. If doctors believe that telemedicine will be able to deliver the same quality of care as an in-person visit, they are more likely to be motivated to use it. On the other hand, if doctor’s users believe that telemedicine will not be able to deliver the same quality of care, they are less likely to use it. Therefore, we propose the subsequent hypotheses:

H1: PE of doctors positively affects behavioural intention to use telemedicine in the healthcare sector.

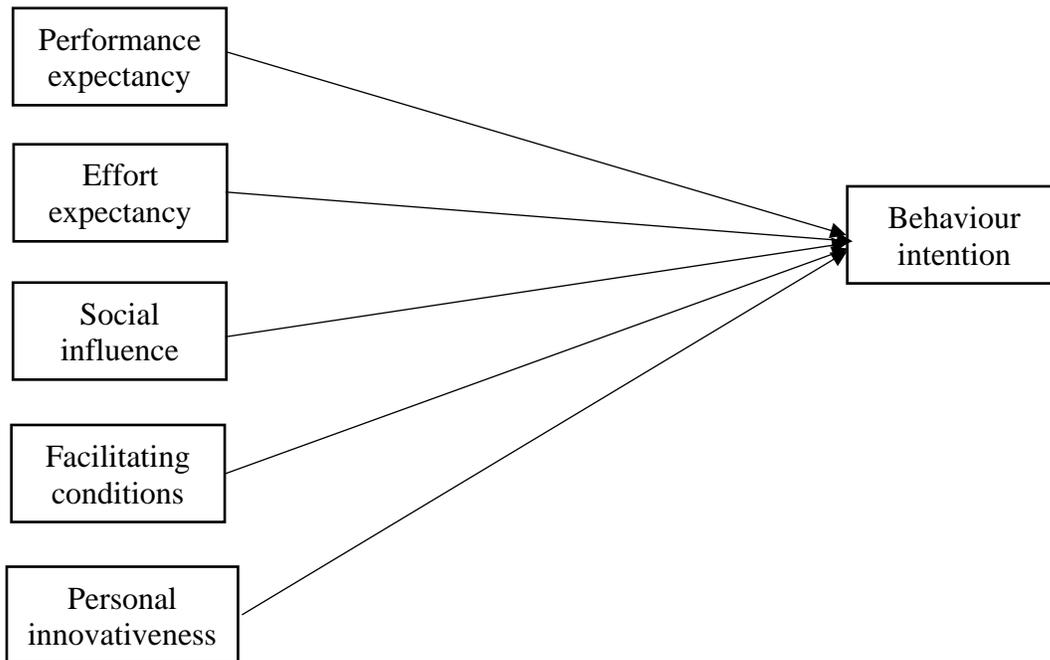


Figure 1: Conceptual framework

Effort expectancy

Effort expectancy (EE) pertains to “the degree of ease associated with IT usage in the supply chain” (16). In this study, EE refers to the perceived ease of use of the technology and the amount of effort required by the doctors to use it. Doctors are more likely to have a positive attitude towards the use of telemedicine if the perceived effort to use it is low. Conversely, if the perceived effort is high, the user is less likely to have a positive attitude towards the use of telemedicine. Therefore, we propose the subsequent hypotheses:

H2: EE of doctors positively affects behavioural intention to use telemedicine in the healthcare sector.

Social influence

Social influence (SI) pertains to the extent to which an individual is affected by the opinions of others concerning the adoption of a novel system (16). People are more inclined towards the usage of telemedicine if they perceive it to be socially acceptable and beneficial. If people in their social circle are using telemedicine, they are more likely to use it as well. Additionally, if people are exposed to positive messages about

telemedicine, they are more likely to have a favourable attitude towards it and be more likely to use it. Social influence can also be used to encourage people to use telemedicine, such as through campaigns and advertisements. Ultimately, social influence impact people's intention to use telemedicine. Thus, we posit the following hypotheses:

H3: SI positively affects behavioural intention to use telemedicine in the healthcare sector.

Facilitating conditions

Facilitating conditions (FC) pertains to “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (16). These conditions refer to the availability of resources, such as technology, infrastructure, and personnel, that enable the use of telemedicine. When these conditions are present, individuals are more likely to have a positive attitude towards telemedicine and be more likely to use it. For example, if telemedicine services are available in a person's area, they are more likely to use it than if it is not available. Additionally, if the technology is easy to use and understand, people are more likely to use it. Finally, if there are adequate personnel available to provide support and guidance, people are more likely to use telemedicine. Thus, following hypotheses is proposed:

H4: FC positively affects behavioural intention to use telemedicine in the healthcare sector.

Personal innovativeness

The concept of innovativeness has been widely studied in relation to a user's willingness to adopt a new product (18,19). Multiple studies have listed two types of innovativeness: general and domain-specific (in relation to a particular area or behavior). The literature on technology acceptance views personal innovativeness (PI) as a domain-specific variable, which pertains to "the willingness of an individual to experiment with new information technology" (20). People who are more innovative tend to be more open to trying new technologies, such as telemedicine. They are more likely to be willing to explore the potential benefits of telemedicine and to be more willing to take the risk of trying something new. Furthermore, people who are more innovative are more likely to be able to understand the technology and to be able to use it effectively. This increases the likelihood that they will use telemedicine and benefit from its advantages. Thus, following hypotheses is proposed:

H5: The personal innovativeness of doctors positively affects behavioural intention to use telemedicine in the healthcare sector.

METHODOLOGY

The study used survey research design approach for data collection, and a questionnaire was constructed based on existing scales (21). The data was collected from the doctors who have used the telemedicine approach for the treatment of the patients in India. To ensure that data were collected from regular users of telemedicine, we asked the screening questions like, “During the last six months, how many times did you use telemedicine for the patient treatment?” PLS based “Structural equation modelling” techniques was used to analyze the data and verify the proposed conceptual framework. The conceptual framework was analysed by partial least square (SEMinR, psych and Lavaan 0.5-23 and package) software in R language (version 3.3.0). Lavaan (Latent Variable Analysis) is a “free open source but commercial quality” R package for latent variable modelling (22). This study performed PLS-SEM using the plsmpm package (23). PLS-SEM is an alternate to covariance-based structural equation modelling (CB-SEM) and involves nonparametric statistical methodologies for modelling complex models having multivariable relationships (24).

RESULTS

The reliability and validity of the data and relevant items were assessed. Table 1 illustrates that all constructs had a values exceeding 0.70 for Cronbach's alpha and composite reliability (CR), indicating high reliability (25). To ensure content validity, an extensive examination of current literature was conducted. Convergent validity (CV) was confirmed through significant p-values and factor loadings (ranging from 0.720 to 0.868) of the items. Discriminant validity (DV) was demonstrated by the greater value of the square root of AVE for each construct along the diagonal compared to its correlation with remaining constructs (26) (see Table 2). Lastly, the model was analyzed to illustrate the connections between the hypothesized constructs in the conceptual model. Table 3 displays the outcomes of hypothesis testing, each of the five hypotheses (H1, H2, H3, H4, and H5) has been supported and validated.

DISCUSSION

The study findings indicate the positive impact of PE, EE, FC, SI and PI on behavioral intention of doctors to adopt telemedicine. Improving the performance expectancy of doctors to adopt telemedicine is crucial for its successful implementation. One way to achieve this is by emphasizing the benefits that telemedicine can offer. For instance, telemedicine enables doctors to reach a wider patient population, save time, and improve the quality of care. Highlighting the convenience and ease of using telemedicine platforms can also boost the performance expectancy of doctors. Additionally, providing adequate training and support to doctors on how to use telemedicine can increase their confidence in the technology, which can further enhance their performance expectancy. Overall, by emphasizing the benefits, convenience, and providing appropriate training and support, doctors are more likely to adopt telemedicine, leading to improved healthcare delivery. Effort expectancy is a critical factor in the adoption of telemedicine by doctors. To improve this expectancy, doctors need user-friendly telemedicine platforms that are easy to navigate and integrate seamlessly into their existing workflows. In addition, healthcare organizations should involve doctors in the design and selection of telemedicine platforms to ensure that they meet their needs and preferences. Doctors should also be provided with clear guidelines and protocols on how to use telemedicine effectively and efficiently. By addressing these issues, healthcare organizations can reduce the effort required to adopt telemedicine, leading to increased adoption and improved healthcare outcomes for patients.

TABLE 1. Measures for internal consistency

Construct	Cronbach's alpha	Composite reliability
Performance expectancy (PE)	0.73	0.83
Effort expectancy (EE)	0.81	0.86
Social influence (SI)	0.72	0.83
Facilitating conditions (FC)	0.73	0.82
Personal Innovativeness (PI)	0.68	0.73
Behavioural intention (BI)	0.82	0.88

TABLE 2. Correlation between constructs

Construct	PE	EE	SI	FC	PI	BI
Performance expectancy (PE)	0.738					
Effort expectancy (EE)	0.000	0.778				
Social influence (SI)	0.061	-0.194	0.786			
Facilitating conditions (FC)	0.098	-0.043	0.059	0.728		
Personal Innovativeness (PI)	-0.021	-0.069	-0.002	0.003	0.710	
Behavioural intention (BI)	0.266	0.142	0.202	0.148	0.111	0.803

TABLE 3. Hypotheses testing results

Hypotheses	Path coefficient	Result
H1: Performance expectancy (PE)-> Behavioural intention (BI)	0.243	Supported
H2: Effort expectancy (EE) -> Behavioural intention (BI)	0.198	Supported
H3: Social influence (SI) -> Behavioural intention (BI)	0.218	Supported
H4: Facilitating conditions (FC) -> Behavioural intention (BI)	0.119	Supported
H5: Personal Innovativeness (PI) -> Behavioural intention (BI)	0.129	Supported

Social influence is a critical factor in the adoption of telemedicine by doctors. To improve social influence, healthcare organizations should involve opinion leaders and early adopters of telemedicine in the implementation process. These opinion leaders can help to increase the visibility of telemedicine within the medical community and encourage their colleagues to adopt the technology. Healthcare organizations can also use case studies and success stories to demonstrate the benefits of telemedicine and how it has been successfully used in other healthcare settings. In addition, healthcare organizations can collaborate with medical associations and societies to promote telemedicine and its benefits. By increasing social influence, healthcare organizations can create a culture of acceptance and adoption of telemedicine among doctors, leading to improved healthcare outcomes for patients.

FC play a crucial role in the telemedicine adoption by doctors. Healthcare organizations should provide doctors with the necessary technological infrastructure, such as reliable high-speed internet and secure telemedicine platforms. They should also provide doctors with the necessary equipment and software, such as cameras, microphones, and video conferencing software, to enable them to conduct virtual consultations effectively. In addition, healthcare organizations should ensure that telemedicine is integrated seamlessly into their existing electronic health record systems to minimize administrative burden and reduce the risk of medical errors. Healthcare organizations should also establish clear policies and guidelines on the use of telemedicine, including reimbursement policies, data security and privacy, and legal and regulatory issues. By improving the facilitating conditions for telemedicine adoption, healthcare organizations can reduce barriers and create a supportive environment for doctors to adopt telemedicine, leading to improved healthcare outcomes for patients.

Personal innovativeness is a critical factor in the adoption of telemedicine by doctors. To improve personal innovativeness, doctors should be provided with opportunities for continuing education and professional development on telemedicine technology and its applications in healthcare. Healthcare organizations can also offer incentives for doctors who adopt telemedicine, such as increased compensation or reduced administrative burdens. Doctors should also be encouraged to experiment with telemedicine technology and provide feedback on their experience to inform the improvement of telemedicine platforms. In addition, healthcare organizations can foster a culture of innovation and experimentation by recognizing and rewarding innovative ideas and solutions. By improving personal innovativeness, doctors can become more open to new technologies and solutions, leading to increased adoption of telemedicine and improved healthcare outcomes for patients.

IMPLICATIONS

Telemedicine has become increasingly prominent in the healthcare sector as stakeholders are becoming more aware of its benefits. However, studies focusing on factors affecting telemedicine usage, especially in developing countries like India are limited. As a result, the study's theoretical contribution is significant to the limited literature on the adoption of telemedicine in the healthcare sector. Firstly, in the past studies, limited attention has been given on factors that influence telemedicine usage. Thus, the study is first in its kind to investigate the perceptions of the doctors towards telemedicine in the healthcare sector in the Indian context. In addition, no study has examined how personal innovativeness influences behavioral intentions to use telemedicine. Secondly, mostly previous studies on telemedicine usage focuses on developed countries. Despite the fact that telemedicine plays a significant role in healthcare sector and India is recognized as an IT hub, there have been relatively few studies to understand how

doctors use telemedicine in the healthcare sector. The study is first in its kind to examine the conceptual framework developed on the basis of UTAUT framework in the context of developing nation's such as India. Lastly, the study offers guidelines to the practitioners and policy makers to smooth the adoption of telemedicine in the context of healthcare sector.

CONCLUSION

The adoption of telemedicine by doctors is critical for the successful implementation of virtual healthcare services. Understanding the behavioural intention of doctors towards telemedicine is essential to develop effective strategies for adoption and implementation. This study is an attempt to investigate various factors that influence doctors' behavioural intention towards telemedicine. Addressing these factors can help healthcare organizations overcome barriers to telemedicine adoption and create a supportive environment for doctors to adopt and integrate telemedicine into their clinical practice. By doing so, we can harness the potential of telemedicine to transform healthcare delivery, improve healthcare outcomes, and enhance patient satisfaction. However, more research is required to further explore the perspectives of doctors further and to develop more effective strategies for telemedicine adoption and implementation.

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