# Physician's Acceptance of Teledermatology Services: An Empirical Study

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***Abstract*- The conventional focal point of health services research has been on non-information communication technology usages but now with the adoption of ICT, more physicians are able to access these telemedicine services in particular related to teledermatology system. In accumulation, such tele-services are stern for improving patient-to-doctor communication expediency and maintaining a excellent affiliation. The purpose of this study was to identify the factors that determine physician's acceptance of teledermatology services. In this study a research framework was examined to find out the applicability of the Technology acceptance model (TAM), in explaining physician's decisions to accept the teledermatology system, in the health care context. For this purpose, the original version of the TAM Model, which included perceived usefulness, perceived ease of use, attitude towards usage, and usage intentions, is taken into consideration. The results stress the special importance of attitudinal factors i.e. attitude towards usage and perceived usefulness in determining physicians' intention to use teledermatology systems. Physicians' perceived usefulness, perceived ease of use are factors affect the attitude towards the use of the teledermatology system. The findings of the study can provide insights and implications relevant to technology acceptance research and teledermatology management in general.**

***Keywords:*** **Information Communication technology, TAM Model, Telemedicine**

## I. INTRODUCTION

Telemedicine has been a technological takeaway for the developed countries. Even in the developing countries, it is increasingly being viewed as a tool for improving care and enhancing access to healthcare. Countries like India where the majority of the population lives in rural areas, where healthcare facilities are inefficient and inadequate, tools like telemedicine can contribute substantially in bridging the gap between the demand and supply. The study and practice of dermatology using interactive audio, visual, and data communications from a distance is teledermatology. A teledermatology tool refers to the technology or modality used to deliver dermatology care. The application of teledermatology tool to deliver dermatology care is called teledermatology practice. The objective is to reach the unreached for dermatology care in remote geographic regions. It involves good general practitioner and dermatologist interaction. The teledermatology system is a technological aid to primary health care services, and is expected to bring about a significant improvement in the quality of care practice and delivery. The implementation of technology is being acknowledged to have a positive influence on health care quality and efficiency. Increasing the use of the teledermatology system by physicians is generally recognized as an important facilitator of primary health care improvement in India. But, these physicians are experiencing heavy workloads as the ratio of physicians to care recipients in urban areas is very poor Because of this, taking on a new system appears burdensome to them in their already busy routine practice, hence promoting the teledermatology to these physicians and avoiding negative feedback is difficult and costly. It is unlikely that the full benefits of the system can be fully realized without the usage of teledermatology by physicians. Any single physicians resisting its use may impair care quality because the lack of updated information may result in misleading medical data in multiple sub-systems. Many health care organizations have experienced resistance to the implementation and the use of IT in the workplace. Telemedicine is the transfer of electronic medical data from the remote areas to a center where the experts or well-equipped hospitals are available. Taking advantage of telecommunication, medical electronics, and Information technologies, telemedicine acts as a potential source to reduce health care expense, to improve health care service in remote areas, and to support modern home health care etc.Telemedicine can deliver health-care services, where distance is the critical factor. Recent works in communication technologies have inspired the development of telemedicine to a large extent. There are many different disciplines in telemedicine, such as teleradiology, tele-monitoring, tele-consultation, tele-conference, and tele-psychiatry. The common problem met during the development of a telemedicine system is how to integrate the existing techniques to meet the requirements for telemedicine applications . The people in India, particularly in rural and remote areas are found struggling to access timely medical treatment .The region of the country is characterized by densely populated communities spread over vast distances; there is a lack of qualified personnel in certain sectors of the health service. Telemedicine has come originally to serve rural populations, or any people who are geographically dispersed -- where time and the cost of travel make access to the best medical care difficult. Nowadays, Telemedicine is forming a new architecture in health care services. By using information and communication technologies, the health care professionals in the specialized fields like cardiology, urology, oncology, psychiatry, surgery and many others, can access or exchange information for diagnosis, treatment and prevention

of disease. This new age concept also provides solutions for the continuing education and research among health care providers for improving the health of individuals and their communities. Thus, the Telemedicine ensures delivery of right medical advice at the right place at the right time using new computer-based communication technologies for medical purposes. Motivated by the need to further the understanding of physicians intentions to use teledermatology system, this study used the technology acceptance model (TAM) and theory of reasoned action (TRA) as a basis for investigating these. Health care professionals usually differ from general users in terms of their innovative adoption process; an extension of attitude within a framework for technology acceptance will be used to comprehensively understand the critical antecedents of physician's attitudes toward teledermatology usage. The rationale is that teledermatology is mostly in an early adoption stage, which makes it difficult to conduct a large scale investigation of user technology acceptance model on a specific telemedicine technology.

## II. LITERATURE REVIEW

Davis developed the technology acceptance model (TAM) to predict user acceptance of IT. The TAM posits that the main determinants of behavioral intention are perceived usefulness and perceived ease of use. The TRA, the TPB, and the TAM have provided the theoretical basis for many studies on understanding intention toward IT usage and even for researchers to integrate various theories into their individual behavioral model. In the TRA, attitude is the central construct in understanding and explaining behavioral intention. Compared with the effect of the subjective norm, the causal relationship of IT acceptance with a user's attitude is much stronger than that with the subjective norm in normal situations. The technology acceptance model proposed by Davis (1989) and Davis et al. (1989) is intended to explain the technological behaviour of users by examining the effect of perceived ease of use (PEOU) and perceived usefulness (PU). The former refers to the perception that the employment of a technology does not require additional effort, while the latter reflects the degree to which a user considers that such employment improves his or her results (Davis, 1989). The version formulated by Davis et al. (1989) includes attitude, as the intermediary between explanatory perceptions and behaviour. Attitude is defined as the inclination or feeling which produces a predisposition to react favorably or unfavorably to a stimulus. Bhattacherjee and Hikmet proposed a model to examine physicians' resistance to IT usage. The results indicated that resistance to change has a negative influence on IT usage. This resistance was caused by the physicians' worrying about losing control over their work through relying on the system. Chang et al, used the unified theory of acceptance and use of technology (UTAUT) to investigate the factors influencing physicians' acceptance of clinical decision support systems. The results showed that performance expectancy and effort expectancy have a significant impact on physicians' intention; however, the impact of social influence on intention was less significant. Pare et al. conducted a survey to understand physicians' acceptance of clinical information systems (CIS) .Chau and Hu decomposed the TPB and the TAM model to provide a basic framework for understanding physicians' acceptance of telemedicine. The results indicated that the causal link between attitude and behavioral intention was significant in all three models. However, the causal link between the subjective norm and behavioral intention was not significant in the TPB or the decomposed model. Yi et al. integrated the TAM, the TPB, and the innovation diffusion theory (IDT) to examine the factors that influence PDA acceptance by physicians. They found that perceived usefulness was the most significant determinant of physicians' intention to accept PDA.

More recently, an increasing number of studies have applied TAM (Davis et al., 1989) and extensions of this model (e.g., Venkatesh, Morris, Davis, & Davis, 2003) to explain the adoption and utilization of health IT systems and services (Yarbrough & Smith, 2007). Examples of such studies include those focusing on telemedicine (Chau & Hu, 2002), eHealth applications (Chismar & Wiley-Patton, 2002; Wilson & Lankton, 2004), and other health information systems (Tung et al., 2008). Using TAM constructs and causal relationships to explain the acceptance of EHCR systems, will contribute to understand the relative importance of two cognitive instrumental processes (perceived usefulness and perceived ease of use) and one attitudinal or affective dimension (attitude towards the use) in predicting physicians' intention to use health IT systems (Davis et al., 1989; Sheppard, Hartwick, & Warshaw, 1988; Venkatesh & Davis, 2000 . In previous TAM research, intentions mediate the effects of other potential antecedents of actual usage behavior (Davis et al., 1989; Taylor & Todd, 1995; Venkatesh et al., 2003). Using behavioral intention as the dependent variable, instead of actual usage, is particularly useful to examine the acceptance of technological systems at an early stage (Chau & Hu, 2002; Sheppard et al., 1988; Wu, Shen, Lin, Greenes, & Bates, 2008). Perceived usefulness consistently stands out as the main driver of technology adoption in organizational settings (King & He, 2006; Ma & Liu, 2004; Schepers & Wetzels, 2007).Perceived usefulness has also been proposed as a major determinant of physicians' acceptance of health information systems, suggesting that medical professionals hold a pragmatic view of technology (Chau & Hu, 2002; Jayasuriya, 1998; Yarbrough & Smith, 2007). Thus, physicians' acceptance of health IT systems such as EHCR should be highly dependent on the instrumental benefits (e.g., performance and efficiency improvements) associated with the adoption decision (Chismar & Wiley-Patton, 2002; Lee, Teich, Spurr, & Bates, 1996; Yi, Jackson, Park, & Probst, 2006). In health care, perceived ease of use may be of limited importance in predicting medical professionals' acceptance of health IT (Chismar & Wiley-Patton, 2002; Ganzach, 1998; Hu, Chau, Sheng, & Tam, 1999.The fundamental role of attitude in explaining technology acceptance is widely

acknowledged in the literature (Bobbitt & Dabholkar, 2001; Kim, Chun, & Song, 2009; Taylor & Todd, 1995; Yang & Yoo, 2004). Consistent with TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and the Theory of Planned Behavior (TPB) (Ajzen, 1991), attitude towards usage refers to a person's affective evaluation of the costs and benefits of using a new technology (Davis et al., 1989). Conversely, other research has identified attitude towards usage as a major determinant of the behavioral intention to use a system (Taylor & Todd, 1995), including studies focused on Internet applications (Bobbitt & Dabholkar, 2001; Suh & Han, 2003), and health professionals' acceptance of information technology (Chau & Hu, 2002).

## III. RESEARCH OBJECTIVES

1. To understand the antecedents of attitude and behavioral intention involving teledermatology usage by physicians.

## IV. RESEARCH METHODOLOGY

The research design involves descriptive research using survey method by a structured questionnaire to collect the information. The main purpose of descriptive research is that it describes data and characteristics. Primary data was collected from the physicians. They were given a self-administered structured questionnaire. The questionnaire used was a close ended one with multiple choices. Secondary data was collected by referring to websites, annual surveys, academic books, articles, journals and etc. The sample size of 100 was taken into consideration. The study has been conducted in Odisha covering different Govt and Private hospitals. The sample size for research project was 100, which comprised mainly doctors working in different Govt and private hospitals. For the purpose of data analysis a questionnaire was developed to collect the information from the doctors. The questionnaire was primarily structured. The collected were the result of direct interview with the respondents. It was a structural research made of data collection. The data collected through questionnaire was analyzed through frequency analysis and factor analysis.

*Factor Analysis*

Factor analysis can be used to identify the structure of relationships among respondents by examining the correlations between the respondents (or items). With the factor analysis, we can identify the separate dimensions of the structure and then determine the extent to which each variable is explained by each dimension. Once these dimensions and the explanation of each variable are determined, we can do summarization and data reduction. First, in order to assess construct validity and identify the unique dimensions of each construct, factor analysis with VARIMAX rotation was employed. Construct validity examines the extent to which a construct measures the variable of interest. In other words, it should demonstrate relatively high correlations between items of the same construct and low correlations between items of constructs that are expected to differ.

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .882 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 131.141 |
| | df | 120 |
| | Sig. | .000 |

The adequacy of the data is evaluated on the basis of the results of Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity.The KMO measure of sampling adequacy is .882 indicating that the present data are suitable for factor analysis. Bartlett's Test of Sphericity is significant ($p<.001$), indicating sufficient correlation exists, between variables for the factor analysis. The Bartlett's Test statistics is approximately distributed and is accepted.

**Total Variance Explained**

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 3.798 | 23.739 | 23.739 | 3.798 | 23.739 | 23.739 | 3.562 | 22.260 | 22.260 |
| 2 | 2.702 | 16.887 | 40.626 | 2.702 | 16.887 | 40.626 | 2.448 | 15.300 | 37.560 |
| 3 | 1.737 | 10.859 | 51.486 | 1.737 | 10.859 | 51.486 | 2.210 | 13.816 | 51.376 |
| 4 | 1.604 | 10.028 | 61.513 | 1.604 | 10.028 | 61.513 | 1.622 | 10.138 | 61.513 |
| 5 | .874 | 9.211 | 70.724 | | | | | | |
| 6 | .801 | 7.966 | 78.690 | | | | | | |
| 7 | .762 | 6.640 | 85.330 | | | | | | |
| 8 | .666 | 4.164 | 89.494 | | | | | | |
| 9 | .495 | 3.095 | 92.589 | | | | | | |
| 10 | .372 | 2.325 | 94.915 | | | | | | |
| 11 | .315 | 1.972 | 96.886 | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12 | .218 | 1.360 | 98.247 | | | | | | |
| 13 | .125 | .780 | 99.026 | | | | | | |
| 14 | .088 | .553 | 99.579 | | | | | | |
| 15 | .043 | .271 | 99.850 | | | | | | |
| 16 | .024 | .150 | 100.000 | | | | | | |

Extraction Method: Principal Component Analysis.

The first 4 components i.e. factors in the above table have an Eigen values over 1 and they account for about 62 percent of the observed variation in the critical success factors in accepting the teledermatology system. According Kaiser Criterion, only the first 4 factors should be used because Eigen values are more than one. The factors identified in successful acceptance of teledermatology system are perceived usefulness, perceived ease of use, attitude and behavioral intention to use. It was found perceived ease of use, perceived usefulness play a vital role toward the attitude formation and which leads to the behavioral intention to use the teledermatology system. Perceived usefulness was identified as a salient belief influencing physicians' attitude towards the use of systems. Perceived ease of use appears to be a secondary determinant of physicians' acceptance of systems.

## V. MANAGERIAL IMPLICATIONS

The traditional TAM factors of attitude towards usage and perceived usefulness appear to be strong predictive and mediating mechanisms in physicians acceptance of system. In addition, the current study contributes to theory by validating the TAM to evaluate the system. Physicians will play a crucial role in the diffusion and implementation of digital health systems and services. This study provides several practical implications to promote medical professionals' technology acceptance. The predictive power of attitude towards usage indicates the need to develop positive attitudes among physicians to ensure their acceptance and continued use of health IT applications. The successful management of physicians' attitude and usage intentions will also be highly dependent on the ability of public and private health organizations to clarify, demonstrate, and communicate the relative benefits of using systems

## VI. CONCLUSION

The research has focused on the TAM factors regarding the acceptance of the technology in health care. It also enhances the knowledge base of literature in the context of technology acceptance by physicians. Future work should consider the external factors and the demographics variables in determining the acceptance of technology.

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