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Clinically Online: Assessing Rural Physicians' Intention to Use Telemedicine in Philippine Healthcare through a Modified Technology Acceptance Model

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Abstract: Telemedicine is characterized by medical professionals as a form of alternative healthcare assistance through the use of technology. This is primarily achieved through consultations via online video conferencing platforms and other related Telehealth platforms. During the pandemic, the practice was characterized as a "first touchpoint" in diagnosing patients, with the prevalence and use of telemedicine only increasing after the pandemic. In addition, the practice became widespread in the Philippines, with papers citing its ability to assist and even fully replace face-to-face consultations during quarantine. In the context of diagnostic medicine, telemedicine has seen a considerable increase in use in the Philippines, even becoming the new normal during the height of the pandemic for basic medical checkups. As medical centers return to pre-pandemic conditions, this study assessed the intention of telemedicine use among rural physicians based in the Philippines. Data collected from 123 respondents were analyzed using a Partial Least Squares Structural Equation Modeling (PLS-SEM) and bootstrapping in exploring the five hypotheses in a modified Technology Acceptance Model. Results indicated that perceived ease of use positively influences perceived usefulness, perceived usefulness positively influences attitude, attitude positively influences behavioral intention, and social norms positively influence behavioral intention. However, the relationship indicating perceived ease of use positively influencing attitude to telemedicine technology was found to have no statistical significance.

Key Words: telemedicine, rural physicians, healthcare, PLS-SEM, TAM

1. INTRODUCTION

Telemedicine was first introduced to the Philippines in 1998, with the establishment of the National Telehealth Center (NTHC) originating as a project of the National Telemedicine Service (NTS) (Juban et al., 2022). This initiative was primarily aimed at linking various specialists and physicians from the Philippine General Hospital to patients located in various rural areas. However, this was not where telemedicine gained widespread use in the country. The uptick in the use of telemedicine occurred during the COVID-19 pandemic, as the surge of patients brought about by the pandemic contributed to hospitals being a hotspot of transmission (Lindsey et al., 2022). The risk associated with hospital visits necessitated the utilization of alternative healthcare delivery modes,

which saw a drastic global rise in their use during the pandemic. As people were required to follow public health quarantine orders to avoid transmission of COVID-19, routine care for non-COVID-19 patients, particularly those with pre-existing conditions requiring frequent hospital visits, switched to telemedicine (Ohannessian et al., 2020). Despite numerous studies on telemedicine worldwide, there is still a lack of studies on telemedicine in the Philippine context, especially among rural communities. As rural areas face more significant challenges when it comes to healthcare access, such as reduced assistance and resources due to their geographical locations (Dondonayos et al., 2023), it is crucial to investigate whether physicians will continue to perceive telemedicine as effective in bridging those gaps when online medical modality is no longer necessary.

This paper focused on rural-based physicians practicing in the Philippines. Specifically, it identified the factors that significantly influence telemedicine acceptance, limitations of telemedicine that may limit its acceptance, and trends in medical specialties on telemedicine utilization among physicians in the Philippines outside of the 33 Highly Urbanized Cities in the country (Annual Census of Population | Philippine Statistics Authority, 2020).

The direct beneficiaries of this study are patients, physicians, telemedicine platforms, and future legislation on telemedicine integration into Philippine healthcare. Considering that the aimed number of respondents of the survey was 100 to 200 rural physicians, the survey findings will help telemedicine platforms gain a better understanding of the positive and negative aspects of the service and assist future legislation in identifying the possible challenges that a wider telemedicine implementation may face. Telemedicine platforms will also benefit from this paper as it will enable them to further understand doctors' preferences in using the service.

Furthermore, this study determined the relationship between Perceived ease of use (PEU), Perceived Usefulness (PU), Attitude (ATT), Subjective Norm (SN), and Behavioral Intention (BI) when it comes to telemedicine perception amongst rural physicians. These hypotheses originated from the Technology Acceptance Model (TAM), initially proposed by Davis (1986), providing a framework for understanding user acceptance of technology through Perceived Ease of Use (PEU) and Perceived Usefulness (PU) as its primary factors influencing acceptance. PEU is the expectation that the use of a certain technology will be easy to navigate and use, while PU is defined as the extent to which a person believes technology may improve their work performance or output (Davis, 1989). Therefore, a certain technology that is perceived to be advantageous to the user and is free of effort to use is more likely to be accepted than a technology that is neither advantageous nor easy to use. A number of empirical studies support TAM where it has shown that PEU and PU influence attitudes towards technology (Hikmah et al., 2023; Porter & Donthu, 2006) Additionally, if a technology is deemed to be easy to use, users are more inclined to deem it as useful as they can utilize the technology more effectively with less effort. As such, it was found that PU is influenced by PEU in multiple studies (Bîlbîie et al., 2024; Walczak et al., 2022). This initial model of TAM has stemmed from multiple iterations to assist in furthering the understanding of how technology is accepted (Davis & Granic, 2024). This may be due to its effectiveness as a quantitative model to measure technological acceptance with ample empirical evidence to support it (Manis & Choi, 2019).

In addition, TAM has been shown to be an effective predictive model for assessing healthcare professionals' intention to use technologies. In the case of a study by Gagnon et al. (2012) on telemonitoring systems, TAM was used to determine the perceptions of physicians and managers in Quebec regarding the impact of telehealth on clinical practice and the organisation of healthcare services. Another example demonstrating the effectiveness and reliability of TAM as a research framework is a study by Alsyouf et al. (2023), which analyzed and predicted patients' usage of a Personal Health Record (PHR) system. Overall, this study had 389 Saudi Arabian respondents who were surveyed in a quantitative cross-sectional design, with the hypotheses then being analyzed using Structural Equation Modelling–Partial Least Squares (SEM-PLS).

With these studies in mind, this paper could further serve as evidence to support or disprove the results of previous studies on telemedicine, especially those that used the Technology Acceptance Model to identify factors that affect telemedicine's use among physicians. Thus, this study utilized a modified Technology Acceptance Model with the following hypotheses, as presented in Figure 1.

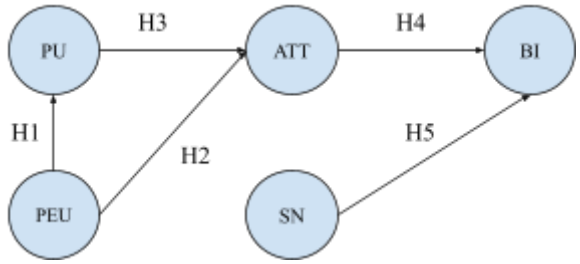

Fig. 1. Modified Technology Acceptance Model

H1: Perceived Ease of Use (PEU) positively influences the Perceived Usefulness (PU) of telemedicine technology among rural-based physicians.

H2: Perceived Ease of Use (PEU) positively influences rural physicians' Attitudes (ATT) toward telemedicine.

H3: Perceived Usefulness (PU) positively influences rural physicians' Attitudes (ATT) toward telemedicine.

H4: Attitude (ATT) positively influences Behavioral Intention (BI) to use telemedicine among rural physicians.

H5: Subjective Norms (SN) positively influence Behavioral Intention (BI) to use telemedicine among rural physicians.

2. METHODOLOGY

The study utilized an exploratory quantitative research approach. This approach helped ascertain the key topics needed to have a better understanding of rural telemedicine in the Philippines, specifically on factors that significantly influence telemedicine's continued use and acceptance, possible weaknesses that may inhibit its use in rural areas, and trends related to telemedicine depending on a physician's specialty. Ethical considerations were observed in collecting data, including informed consent, data privacy, and maintaining anonymity. Appropriate ethics clearance was granted for the collection of data.

Survey Modification (SM). A modified version of a survey used in a telemonitoring system study by Gagnon et al. (2012) is used for data gathering. Modifications include removing certain questions that do not align with the identified research objectives and adding details so that the questions cater to the rural physician demographic. This step was accomplished between October and November 2024.

Face Validation (FV). This process was fulfilled within December 2024 and involved a qualitative review of the paper's modified survey. This was conducted via recommendations from an initial group of physicians who answered the survey. Three to four physicians were approached to help assess the validity of the survey instrument prior to survey validation. This provided insight and recommendations on the survey, which helped in adjusting the survey accordingly.

Survey Validation (SV). The survey was validated by a group of at least 30 physicians who practice outside of the 33 Highly Urbanized Cities (HUCs) of the Philippines, which was intended to be 25% of the survey participants. The survey results were processed through a structural equation modeling software, SmartPLS, to determine if the questionnaires assess the accurate variables of the research model. This phase was projected to start after face validation and was accomplished within January 2025.

Data Collection (DC). The survey questionnaires were distributed to 100 to 200 rural physicians throughout the Philippines to collect data for the research variables, which were input into the research model. The distribution was done through snowball sampling from February 2025 to April 2025.

Data Analysis (DA). The collected data was analyzed using the same software in the Survey Validation phase to determine the target population's intention to use telemedicine.

Report Writing (RW). This included the documentation of all procedures during the entire research process, such as the reporting of research findings, their implications, and recommendations for possible future research that may be conducted.

2.1 Data Collection Method

The data for quantitative research was collected by means of a survey through Google Forms, which was distributed among 100 to 200 rural physicians nationwide. The form consisted of closed-ended questions lifted from a survey conducted in the past by

Gagnon et al. (2012) on telemonitoring systems in Spain. This survey has proved effective in the past by using the Technology Acceptance Model (TAM) in its framework. Once data collection was completed, all data was transferred to Google Sheets for data cleaning before data analysis.

An online survey was distributed to gather data from rural doctors who practice medicine in the Philippines. This data collection instrument is the modified version of a survey used in a previous study by Gagnon et al. (2012), which was used to screen participants' opinions on their attitudes towards telemedicine. The questions were divided into eight categories: Background of the Study and Informed Consent, Basic Information of the Physician, Physician Background on Telemedicine, PEU, PU, ATT, SN, and BI.

The data gathered in the study only included those from the target population, which were physicians who practice outside of the 33 HUCs listed by the Philippine Statistics Authority (n.d.). This population was chosen as it excludes physicians who practice in urban settlements, which assisted in achieving the paper's objective of assessing rural doctors' perspectives. The sampling method being conducted is the snowball sampling method, which is a type of purposive sampling where participants of a survey may suggest and gather more respondents (Ayhan, 2011). This method provides homogeneity in several qualities in the participants (Emerson, 2015), providing an understanding of how this specific group of people, doctors, perceive telemedicine while also taking note of their individual traits. The research intended to survey 100 to 200 participants who meet the aforementioned criteria, which, according to Memon et al (2020), will assist in broadening the demographic of physicians who will take the survey, thus yielding more accurate results.

2.2 Data Analysis

The data analysis of this study implemented a pilot stage that required ensuring that the survey instrument was validated through a face validity stage and a pilot test stage consisting of a small sample of 30 target participants. The PLS algorithm, or Partial Least Squares algorithm, which involves a sequence of regressions in terms of weight vectors (Ringle et al., 2024) was utilized by the group for data analysis. This is due to PLS-SEM's reliability and validity in previous studies, such as a study by Nesic et al. (2024), which used the PLS-SEM algorithm in determining the predictors of perceived healthcare professionals' well-being in work design.

The interpretation of the data results consisted of extracting values for Composite Reliability and Cronbach's alpha to establish values, which will include instrument reliability, instrument validity (Average Variance Extracted), and discriminant validity.

Once the results from the survey validation were collected and analyzed via SmartPLS, the full deployment of the survey began. Data analysis of the full survey deployment results also utilized the PLS algorithm that was used for survey validation. Once data for this had been collected, the results were placed into a structural model test (hypotheses) using SmartPLS with the added use of bootstrapping.

3. RESULTS AND DISCUSSION

3.1 Survey Validation

Three rural physicians, two pediatricians and one OB-GYN, were involved in conducting face validation. These physicians were interviewed and asked to give their input on the survey questionnaire, with these suggestions then being implemented into the survey. These suggestions included making the survey easier to access, removing certain sections the physicians found "difficult," such as the e-signature section, and finding alternate ways to distribute the survey.

To assess the reliability and validity of the research model and instrument, responses from 30 rural physicians were collected. This data was used to measure internal consistency, reliability, and convergent validity by obtaining Cronbach's alpha, Composite Reliability (rho a and rho c), and Average Variance Extracted (AVE).

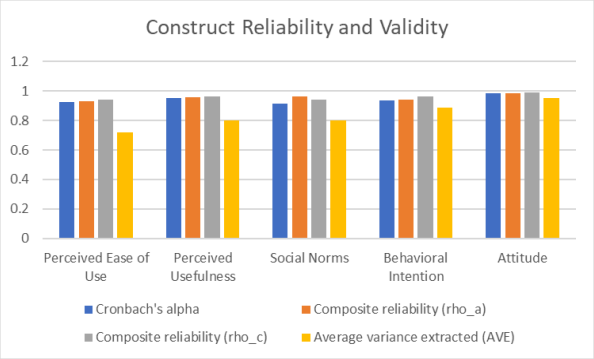

Fig 2. Construct Reliability and Validity

Cronbach's alpha and Composite Reliability of all constructs exceed 0.7, revealing internal consistency where the items for specific constructs are highly correlated (Tavakol & Dennick, 2011). The AVE of all constructs ranges from 0.719 for Perceived Ease of Use to 0.950 for Attitude. These values exceed the minimum acceptable AVE of 0.5 (Hair et al., 2021). Thus, it was concluded that the survey used to determine the factors that influence the continued use and acceptance of telemedicine is both valid and reliable, allowing the full deployment of the survey.

3.2 Data Analysis

The respondent demographic data results showed various insights into the 123 physicians who answered the survey. In terms of location, most doctors who responded were from areas in Luzon, such as Region 4A - Calabarzon (51.6%), Region 3 - Central Luzon (16.4%), and Region 4B - MIMAROPA (6.6%).

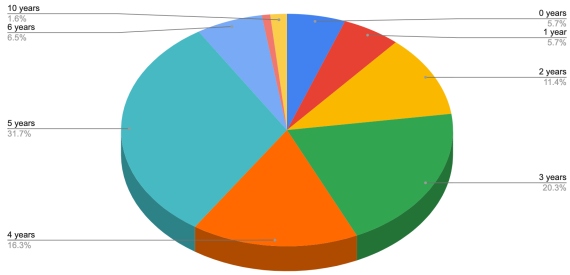

Fig 3. Respondent Demographics by Years of Telemedicine Use.

In terms of years of experience in telemedicine, most (31.7%) reported having around 5 years of experience. It can be observed on the chart that only a small portion of respondents reported having pre-pandemic experience in using telemedicine, with experience as far back as 6 years (6.5%), 7 years (0.8%), and 10 years (1.6%). This trend demonstrated that most physicians who responded to the survey started using telemedicine post-pandemic, likely as a result of lockdown regulations due to the COVID-19 pandemic (Cordioli et al., 2023).

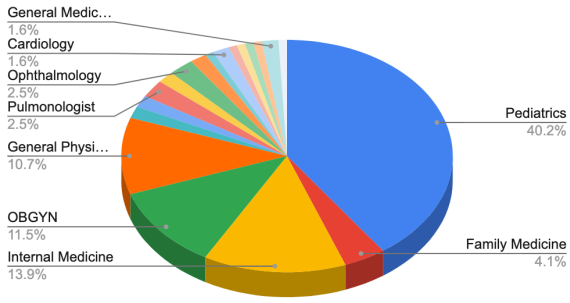

Fig 4. Respondent Demographics by Medical Specialty

As for the medical specialty of respondents, the data results revealed various insights into the physicians who responded to the survey. The majority of respondents were in clinical practice, with physicians

specializing in pediatrics responding the most (40.2%). On the other hand, a smaller portion of respondents specialized in surgical fields, such as physicians specializing in Obstetrics, General Surgery, and Surgical Oncology. These results show that while most survey respondents were non-surgical specialists focused on clinic work, many surgical practitioners who engaged in surgery and clinical work were also represented.

Hypothesis testing was conducted utilizing bootstrapping on a dataset collected from 123 rural physicians around the Philippines. The bootstrapping results from SmartPLS calculated the t-value and p-value of the five paths of the structural model. A minimum t-value of 1.96 was required to establish that the relationships between constructs were significant. As shown in Table 1, the t-values of H1, H3, H4, and H5 exceeded the minimum value, and the relationship of the variables in each hypothesis is significant and accepted. H2 did not meet the minimum value, and the relationship is not statistically significant, which led to the hypothesis being rejected.

These results provide insights into the relationships between the constructs. Firstly, Perceived Ease of Use positively influences perceived usefulness (21.283). This may be the case, as a technology that is perceived to be easy to use may be seen as beneficial, as users can utilize such technology to its potential without exerting too much effort. However, perceived ease of use was found not to be a good indicator of a physician's attitude to telemedicine (0.562). This may suggest that the effort required to use technology is not sufficient to shape the attitude toward such technology. This may be attributed to physicians having relatively high mental skills and abilities, allowing them to easily adapt and learn how to use a technology (Rouidi et al., 2022). It was also revealed that perceived usefulness positively influences attitudes towards telemedicine technology (8.953). This may be the case as a technology that is perceived to be useful may be viewed more favorably, for it may be associated with greater efficiency and convenience to their workflow. Attitude was also found to positively influence behavioral intention to use telemedicine (5.366). Physicians who view telemedicine positively are more likely to use telemedicine in their clinical practice, as positive attitudes may translate to greater willingness to adopt technology. Social norms were also found to positively influence behavioral intention to use telemedicine (3.128). A physician may be more inclined to use telemedicine if their peers use the technology as well.

Table 1. Structural Model Test

Hypothesis	Coefficient	t-value	p-value	Decision
H1: PEU → PU	0.829	21.283	0.000	Supported
H2: PEU → ATT	- 0.058	0.562	0.574	Not Supported
H3: PU → ATT	0.873	8.953	0.000	Supported
H4: ATT → BI	0.587	5.366	0.000	Supported
H5: SN → BI	0.347	3.128	0.002	Supported

4. CONCLUSIONS

In summary, this study establishes the applicability of the Technology Acceptance Model (TAM) as a robust theoretical framework to identify the factors (BI, PU, PEU, ATT, SN) that can encourage rural physicians to adopt telemedicine platforms. This study involved collecting the results of the full deployment of the validated instrument and analyzing it using the bootstrapping algorithm of SmartPLS V4. This statistical method identified that perceived ease of use positively influences perceived usefulness, perceived usefulness positively influences attitude,

attitude positively influences behavioral intention, and social norms positively influence behavioral intention. It identified that perceived ease of use may not be a good indicator of attitudes towards technology.

The results of this research should be interpreted with the constraints of the research design and inform future research endeavors. First, the quantitative design of this study may not necessarily cover other factors outside TAM that will positively influence telemedicine adoption in rural settings. This makes using a quantitative research approach overlook important and intricate details in the field of medicine. Future works may provide more depth in the interpretation of the anticipated results through a mixed-methods design. The overall objective of the study is to capture the factors that encourage physicians' adoption of telemedicine. The homogeneity of the sample may limit its applicability, especially considering how a significant proportion of respondents came from the CALABARZON region. Future research may compare the anticipated results with those who practice in urban settings to inform future policies and technology design to ensure a universal adoption of telemedicine. Moreover, the small sample size of the study limits the generalizability of the paper, and even though the application used for data analysis (PLS-SEM) is known for its strength in predictive accuracy, the paper's limited sample size is a significant limitation. This limitation can be addressed in the future by conducting a large-scale survey using random and representative sampling, which is beyond the scope of this study.

5. ACKNOWLEDGMENTS

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6. REFERENCES

Ayhan, H. Ö. (2011). Non-probability sampling survey methods. In M. Lovric (Ed.), *International encyclopedia of statistical science* (pp. 979-982). Springer. https://doi.org/10.1007/978-3-642-04898-2_41

Bîlbîie, A., Puiu, A.I., Mihăilă, V., & Burcea, M. (2024). Investigating Physicians' Adoption of Telemedicine in Romania Using Technology Acceptance Model (TAM). *Healthcare (Basel), 12*(15), 1531. https://doi.org/10.3390/healthcare12151531

Cordioli, E., Giavina-Bianchi, M., Pedrotti, C. H. S., & Podgaec, S. (2023). Brazilian Medical Survey on Telemedicine since the onset of COVID-19. *Einstein (São Paulo), 21*. https://doi.org/10.31744/einstein_journal/2023ae0428

Davis, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Doctoral dissertation. MIT Sloan School of Management.

Dondonayos G., Masukat H., Ochave M., Ulangkaya L., & Faller E. (2023). A Review of Challenges of Delivering Healthcare Service in Rural Areas of the Philippines. *International Journal of Research Publication and Reviews.* https://ijrpr.com/uploads/V4ISSUE1/IJRPR9315.pdf

Gagnon, M. P., Orruño, E., Asua, J., Abdeljelil, A. B., & Emparanza, J. (2012). Using a modified technology acceptance model to evaluate healthcare professionals' adoption of a new telemonitoring system. *Telemedicine Journal and e-Health, 18*(1), 54–59. https://doi.org/10.1089/tmj.2011.0066

Juban, N., Salisi, J., Mier, A., Mier-Alpano, J., & Ongkeko Jr, A. (2020). National Telehealth System, Philippines. [Online]. World Health Organization & UNICEF/UNDP/World Bank/ WHO Special Programme for Research and Training in Tropical Diseases, Geneva: Social Innovation in Health

Initiative, Available at www.socialinnovationinhealth.org

Lindsey, B. B., Villabona-Arenas, C. J., Campbell, F., Keeley, A. J., Parker, M. D., Shah, D. R., Parsons, H., Zhang, P., Kakkar, N., Gallis, M., Foulkes, B. H., Wolverson, P., Louka, S. F., Christou, S., State, A., Johnson, K., Raza, M., Hsu, S., Jombart, T., . . . De Silva, T. I. (2022). Characterising within-hospital SARS-CoV-2 transmission events using epidemiological and viral genomic data across two pandemic waves. *Nature Communications, 13(1).* https://doi.org/10.1038/s41467-022-28291-y

Memon, M. A., Ting, H., Cheah, J., Thurasamy, R., Chuah, F., & Cham, T. H. (2020). Sample size for survey research: Review and recommendations. J*ournal of Applied Structural Equation Modeling, 4*(2), i–xx. https://doi.org/10.47263/jasem.4(2)01

Nesic, D., Slavkovic, M., Zdravkovic, N., & Jerkan, N. (2024). Predictors of Perceived Healthcare Professionals' Well-Being in Work Design: A Cross-Sectional Study with Multigroup PLS *Structural Equation Modeling. Healthcare, 12*(13), 1277. https://doi.org/10.3390/healthcare12131277

Ohannessian, R., Duong, T. A., & Odone, A. (2020). Global Telemedicine implementation and Integration within health Systems to Fight the COVID-19 Pandemic: A Call to action. *JMIR Public Health and Surveillance, 6(2),* e18810. https://doi.org/10.2196/18810

Philippine Statistics Authority. (n.d.). 2020 Census of Population. https://rsso11.psa.gov.ph/2020-census-population

Porter, C. E., & Donthu, N. (2006). Using the technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics. J*ournal of Business Research, 59*(9), 999–1007. https://doi.org/10.1016/j.jbusres.2006.06.003

Rouidi, M., Elouadi, A. E., Hamdoune, A., Choujtani, K., & Chati, A. (2022). TAM-UTAUT and the acceptance of remote healthcare technologies by healthcare professionals: A systematic review. *Informatics in Medicine Unlocked, 32,* 101008. https://doi.org/10.1016/j.imu.2022.101008

Walczak, R., Kludacz-Alessandri, M., & Hawrysz, L. (2022). Use of Telemedicine Technology among General Practitioners during COVID-19: A Modified Technology Acceptance Model Study in Poland. *International Journal of Environmental Research and Public Health, 19*(17), 10937-. https://doi.org/10.3390/ijerph191710937