A Study on the Factors Affecting the Adoption of Telemedicine to the Rural and Underserved Population in India

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ABSTRACT

A Study on the Factors Affecting the Adoption of Telemedicine to the Rural and Underserved Population in India

This study investigates the factors influencing the adoption of telemedicine in rural and underserved populations in India, aiming to identify key barriers and enablers. Using data from 750 respondents, the study utilizes PLS-SEM to assess the impact of technological, socio-economic, cultural, and infrastructural factors on telemedicine acceptance. The findings highlight the significance of effort expectancy and social influence in driving telemedicine adoption, emphasizing the necessity for user-friendly platforms and community engagement. Conversely, perceived severity and perceived susceptibility negatively impact adoption, suggesting that heightened awareness of health risks may deter usage due to fear and mistrust.

The study underscores the importance of enhancing digital literacy and infrastructure to bridge the digital divide and improve telemedicine accessibility. Recommendations include simplifying telemedicine interfaces, providing multilingual support, engaging community leaders, and implementing targeted training programs. The study also advocates for integrating telemedicine with existing healthcare services and conducting awareness campaigns to address psychological barriers.

Ethical considerations, such as data privacy and patient confidentiality, are critical in the telemedicine context. The study calls for robust regulatory frameworks and policy support to ensure the safe and effective implementation of telemedicine services.

Future research directions include exploring the long-term impact of telemedicine on healthcare outcomes, assessing the effectiveness of different training and engagement strategies, and examining the role of emerging technologies like AI in enhancing

telemedicine services. This study provides comprehensive insights and actionable recommendations to improve telemedicine adoption and healthcare delivery in rural and underserved areas of India, aiming to create a more inclusive and efficient healthcare system.

Keywords: Telemedicine, Rural Healthcare, Adoption Barriers, Digital Literacy, Healthcare Accessibility.

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Chapter 1 – Introduction

1.1 Introduction

The practice of providing healthcare remotely via digital technologies is known as telemedicine. Through the use of mobile devices, the internet, and other communication tools, telemedicine allows patients to consult with medical professionals from the convenience of their own homes. This method of providing healthcare has become increasingly popular, especially after the COVID-19 pandemic made it clear that solutions for distant and easily accessible healthcare were needed. Applications for telemedicine are numerous and include remote monitoring, telepsychiatry, teleradiology, virtual consultations, and chronic illness management. Virtual consultations eliminate the need for in-person visits by providing patients with medical advice, diagnosis, and treatment plans via video calls or chat services. Wearable technology is used in remote monitoring to continuously follow patients' vital signs and health problems, allowing for early abnormality detection and action. For example, tele-radiology entails sending X-rays and MRIs to experts who can analyze them remotely, while tele-psychiatry provides mental health services to people who live in underprivileged or distant places where access to psychiatric care may be limited.

Emerging business models in telemedicine reflect the evolving landscape of healthcare delivery, driven by technological advancements and changing patient expectations. One such model is the subscription-based service, where patients pay a monthly or annual fee to access a range of telemedicine services. This model offers convenience and predictability for both patients and providers, ensuring continuous access to healthcare without the constraints of traditional appointment scheduling. Another emerging model is the on-demand service, where patients can access healthcare services as needed, paying per consultation or service rendered. This model is particularly appealing to individuals who require sporadic medical attention

and prefer the flexibility of pay-as-you-go healthcare. Additionally, hybrid models that combine in-person and telemedicine services are gaining popularity. These models provide a comprehensive healthcare experience, allowing patients to choose between virtual and physical visits based on their needs and preferences. This approach not only enhances patient convenience but also optimizes healthcare providers' efficiency by reducing the burden on physical facilities.

The integration of telemedicine with advanced technologies such as artificial intelligence (AI) and machine learning is also shaping new business models. AI-powered telemedicine platforms can offer personalized health recommendations, predictive analytics for disease prevention, and automated administrative tasks, enhancing the overall efficiency and effectiveness of healthcare delivery. For instance, AI algorithms can analyze patient data to predict potential health issues and suggest preventive measures, thus shifting the focus from reactive to proactive healthcare. Moreover, partnerships between telemedicine providers and traditional healthcare institutions are creating synergistic business models that leverage the strengths of both sectors. Such collaborations can enhance the quality of care, expand service offerings, and improve patient outcomes by combining the reach and convenience of telemedicine with the comprehensive care capabilities of traditional healthcare systems.

In conclusion, telemedicine is revolutionizing healthcare delivery by making it more accessible, efficient, and patient-centered. Its applications are vast, ranging from virtual consultations to remote monitoring and specialized services. Emerging business models, driven by technological innovations and patient needs, are reshaping the telemedicine landscape, offering new opportunities for growth and improved healthcare outcomes. As telemedicine continues to evolve, it holds the promise of transforming the healthcare industry, making quality healthcare accessible to all, regardless of geographical barriers.

India, with its vast geographical expanse, houses a significant proportion of its population in rural areas. According to the World Bank, nearly 65% of India's population resides in rural regions. These areas, often characterized by low-resource settings, have long been challenged by inadequate healthcare infrastructure and limited access to quality medical services. Such disparities in health service access between urban and rural areas can lead to significant health outcome differences among these populations.

Enter telemedicine – a transformative approach that merges technology with healthcare. It offers the prospect of delivering medical consultations, health education, and monitoring services remotely, transcending geographical limitations. In an increasingly digital age, telemedicine has emerged as a beacon of hope for addressing some of the health inequities faced by rural and underserved populations. Especially in a country like India, where mobile technology adoption rates are skyrocketing, telemedicine could potentially serve as a key tool in democratizing healthcare access.

However, despite its immense potential and the technological advancements available, the adoption rate of telemedicine in India's rural areas remains disappointingly low. Preliminary observations and smaller studies have pointed to a myriad of challenges, from infrastructural hurdles and lack of digital literacy to deep-seated cultural beliefs and regulatory complexities. There's a pressing need to understand these challenges in depth, not just individually but in their interconnectedness, to devise effective strategies for change

The recent global health crisis, COVID-19, posed a significant challenge to healthcare delivery. However, it also inadvertently catalyzed the growth of telemedicine in India. Agarwal et al. (2020) highlighted how telemedicine emerged as an essential tool during this period, with government policies and healthcare entities advocating for its adoption. Dash, Aarthy, and Mohan (2021) provided a comprehensive examination of the new telemedicine

policies introduced during the pandemic, shedding light on their potential benefits while also drawing attention to the challenges in their implementation.

Beginning with the rudiments, Mishra, Kapoor, and Singh (2009) provided an insight into the state of telemedicine during its formative years in India. Their study highlighted the need for integrating technology into healthcare to cater to the remote and inaccessible areas. Ganapathy and Ravindra (2009) further shed light on this by discussing the success story of Apollo, one of India's leading healthcare chains, in integrating telemedicine into its service offerings.

Chellaiyan, Nirupama, and Taneja (2019) assessed “the current state of telemedicine in India”. They identified key challenges, including issues with data privacy, lack of awareness among patients and healthcare providers, and resistance to changing from traditional methods. Similarly, Chandwani and Dwivedi (2015) acknowledged these challenges, adding that regulatory hurdles and infrastructural inadequacies have further impeded the widespread adoption of telemedicine in India.

While challenges are aplenty, telemedicine also presents myriad opportunities for India. Brindha (2013) discussed the emerging trends in the field, suggesting that with improved technology and a conducive regulatory environment, telemedicine could bridge the urban-rural health divide. Pal et al. (2005), in their study, focused on the diffusion of telemedicine in developing countries, with a specific focus on India. They identified that, despite the challenges, the potential for telemedicine in India is immense, given its demographic and geographic peculiarities.

1.2 Research Problem

The burgeoning field of telemedicine promises a transformative approach to healthcare delivery, especially relevant for a diverse and expansive “country like India, where a significant portion of the population resides in rural and underserved areas”. Despite the evident potential of telemedicine to bridge the healthcare divide, its adoption in these regions remains suboptimal. This dichotomy underscores a pressing need for an in-depth exploration into the factors influencing telemedicine's adoption. Firstly, rural India presents unique challenges, from infrastructural constraints, intermittent internet connectivity, to a lack of devices and technological tools essential for telemedicine. Additionally, there's the complex tapestry of sociocultural beliefs where, often, traditional medical practices are deeply rooted and trusted over more modern or remote interventions. Understanding the extent and nuances of these beliefs is crucial to creating effective telemedicine awareness campaigns tailored for these communities. Furthermore, the landscape of digital literacy in these regions is uneven. Without adequate knowledge and comfort with digital tools, telemedicine might remain an underutilized resource, even if available. Then there's the policy and regulatory framework; while strides have been made at the national level, the on-ground implementation in rural areas demands scrutiny. Moreover, with the COVID-19 pandemic catalysing a global surge in telemedicine adoption, it becomes even more pertinent for India to understand its barriers and facilitators in the rural context. An in-depth study can offer actionable insights, helping policymakers, healthcare providers, and tech developers design strategies that cater specifically to the needs, apprehensions, and aspirations of the rural and underserved populations. Without such a study, we risk missing an opportunity to democratize healthcare access through telemedicine, leaving a substantial part of its populace further behind in the healthcare continuum.

Telemedicine stands as a formidable solution to surmount the healthcare access barriers that plague rural and underserved populations in India. However, realizing its full potential is intrinsically tied to unravelling and addressing the multifaceted challenges that impede its widespread adoption. The amalgamation of infrastructural inadequacies, lack of digital literacy, deeply ingrained cultural beliefs, and policy implementation gaps paints a complex narrative that necessitates a comprehensive and nuanced exploration.

"The research problem for the study is the identification and analysis of the key barriers and enablers that influence the acceptance and utilization of telemedicine services among rural and underserved communities in India". Despite the potential of telemedicine to bridge the healthcare gap in these areas by providing accessible, cost-effective, and timely medical consultations, its adoption remains suboptimal. Factors such as limited digital literacy, infrastructural deficiencies, socio-cultural dynamics, and varying levels of trust in digital healthcare solutions pose significant challenges. Understanding these factors is crucial to developing effective strategies and interventions that can promote telemedicine adoption and improve healthcare access for these populations. This study seeks to address these challenges by examining the interplay of technological, socio-economic, and psychological factors that affect telemedicine adoption, with the ultimate goal of enhancing healthcare delivery in rural and underserved regions of India.

1.3 Need and Significance of the Study

The need and significance of the study stem from the pressing healthcare disparities faced by rural and underserved populations in India. Despite the advancements in telemedicine technology and its potential to provide accessible, cost-effective, and timely healthcare, these populations continue to experience significant barriers to its adoption. These barriers include

limited digital literacy, inadequate infrastructure, socio-cultural factors, and a lack of trust in digital health solutions.

Addressing these barriers is critical for several reasons. First, rural and underserved areas in India suffer from a shortage of healthcare professionals and facilities, making it difficult for residents to access necessary medical care. Telemedicine can bridge this gap by connecting patients with healthcare providers remotely, thus ensuring timely medical consultations and interventions. By understanding and mitigating the factors that hinder the adoption of telemedicine, this study can contribute to improving healthcare accessibility and equity in these regions.

Second, the study is significant because it will provide valuable insights into the specific needs and preferences of rural populations regarding telemedicine. This information is crucial for designing user-friendly telemedicine platforms and developing targeted interventions that resonate with these communities. It will also help policymakers, healthcare providers, and technology developers tailor their strategies to effectively promote telemedicine adoption.

Moreover, the findings from this study can inform broader public health strategies aimed at enhancing digital health literacy and infrastructure in rural areas. This is essential for creating a sustainable telemedicine ecosystem that can support long-term healthcare delivery and resilience, especially in the face of future health crises similar to the COVID-19 pandemic.

In addition, the study has the potential to contribute to the academic and practical understanding of telemedicine adoption by integrating insights from technology acceptance theories, socio-cultural dynamics, and healthcare delivery models. It can serve as a foundation for further research on telemedicine and digital health innovations in similar contexts globally.

Ultimately, this study is significant because it addresses a critical gap in healthcare access and aims to develop actionable recommendations to improve the adoption of telemedicine in rural and underserved populations in India. By doing so, it supports the broader goals of enhancing healthcare equity, improving health outcomes, and advancing the digital transformation of healthcare services.

1.4 Research Purpose and Research Questions

The purpose of this study is not just to enumerate these challenges but to delve deeper, illuminating the underlying currents that shape them. By doing so, a more granulated, context-specific, and actionable understanding can be achieved, catalyzing the formulation of tailored strategies that are both pragmatic and effective. In an era where technology and healthcare are becoming increasingly intertwined, ensuring that this confluence is equitable and accessible becomes paramount. Each finding of this study has the potential to be a catalyst for systemic change, serving as pivotal reference points for policy refinements, technological innovations, healthcare delivery modifications, and community engagement strategies.

Furthermore, as the global health landscape evolves, characterized by the emergence of new challenges like pandemics and the increasing burden of non-communicable diseases, telemedicine could morph from being a complementary mode of healthcare delivery to a critical one. Ensuring its seamless integration and acceptance in rural and underserved areas today could pre-empt and mitigate future healthcare crises, fostering a more resilient, inclusive, and responsive healthcare ecosystem for India.

“This study aims to comprehensively explore the factors influencing the adoption of telemedicine services among rural and underserved populations in India”. It seeks to understand the interplay between various factors shaping the decision to use telemedicine in

the rural and underserved sections. The focus is on unravelling how these multifaceted factors collectively impact the willingness to adopt telemedicine, with the goal of enhancing healthcare accessibility and efficacy in these communities.

1. How do expectations about the benefits and usability of telemedicine, along with societal influences, shape the adoption decision in rural and underserved areas of India?

2. In what ways do infrastructural support and digital proficiency influence the willingness to adopt telemedicine services in these communities?

3. How do perceptions of health risks, potential threats, and the seriousness of health issues impact the decision to use telemedicine services?

Chapter 2: Literature Review

2.1 Introduction

“The healthcare” landscape has been undergoing a significant transformation over the last decade, with technology playing a central role in its evolution. Telemedicine, often interchangeably used with terms like 'telehealth' or 'e-health', “refers to the utilization of telecommunication and information technology to provide clinical health care from a distance”. This shift towards digital health platforms was further catalyzed by the emergence of the COVID-19 pandemic, making remote healthcare not just an option, but in many instances, a necessity.

The rise of telemedicine can be attributed to several factors. Technological advancements have made it possible for healthcare providers to offer high-quality care remotely (Alt & Zimmermann, 2021). This capability is especially beneficial in areas where access to healthcare is limited, whether due to geographical distances, lack of infrastructure, or other socio-economic constraints (Bavafa, Savin, & Terwiesch, 2021). Moreover, the proliferation of “smartphones and high-speed internet access has democratized the reach of telemedicine” services, making it accessible to a larger portion of the population (Bhattacharyya, Rupainwar, & Kumar, 2021).

The pressing circumstances “of the COVID-19 pandemic underscored the significance of” telemedicine. “With” lockdowns and concerns about virus transmission, traditional in-person consultations became challenging, if not impossible, in many regions. This scenario “created a conducive environment for the rapid adoption and acceptance of telemedicine (Baudier et al., 2021)”.

However, while the potential benefits of telemedicine are considerable, it is also crucial to understand its challenges, the perceptions of “both patients and healthcare providers, and the”

factors influencing its widespread adoption. The following literature review delves deep into these aspects, “providing a comprehensive overview of the current state of” telemedicine and its future prospects.

2.2 Adoption and Acceptance of Telemedicine

Understanding “the drivers and barriers associated with the adoption and acceptance of telemedicine is pivotal in” determining its widespread integration into mainstream healthcare systems. As highlighted by multiple studies, the acceptance of telemedicine is influenced by a complex interplay of technological, socio-economic, cultural, and infrastructural factors.

Technological advancements “play a fundamental role in the adoption of telemedicine”. The capacity to deliver high-quality healthcare remotely is contingent on the availability and accessibility of robust telecommunication technologies, reliable internet connectivity, and sophisticated medical devices (Bhattacharyya, Rupainwar, & Kumar, 2021). As such, regions with advanced technological infrastructures tend to have higher adoption rates.

However, technology alone does not dictate the success of telemedicine. Socio-economic factors, including levels of education, socio-cultural attitudes towards technology, and the financial affordability of digital health platforms, significantly impact acceptance levels (Alviani et al., 2023; Kautish et al., 2023). For instance, in developing nations or in socio-economically disadvantaged regions, there might be resistance or hesitation towards relying on technology for critical health services due to unfamiliarity or trust issues (Khodadad-Saryazdi, 2021; Bhattacharyya & Mandke, 2022).

Cultural attitudes also “play a crucial role. The trust in” healthcare systems, the doctor-patient relationship, and perceptions about the efficacy of remote consultations versus in-person visits can either promote or hinder “the acceptance of telemedicine (Bentahar et al., 2021)”.

In certain cultures, the preference for face-to-face interactions, particularly in healthcare settings, might present barriers to the uptake of telemedical solutions.

Infrastructure, both technological and healthcare-specific, is another critical determinant. While technology can facilitate telemedicine, a lack of healthcare infrastructure, such as limited training for professionals, absence of policy frameworks, or lack of awareness campaigns, can stifle its growth "(Serrano et al., 2021)".

"It is also worth noting that while the COVID-19" pandemic pushed telemedicine to the forefront as an alternative to traditional consultations, the crisis also illuminated some of the existing barriers. Despite the urgency, some regions "faced challenges in" transitioning to "virtual healthcare due to a combination of the above factors (Baudier et al., 2021)".

"The adoption and acceptance of" telemedicine are multifaceted, influenced by an intricate blend of technological capability, socio-economic conditions, cultural attitudes, and infrastructural readiness. As the healthcare sector continues to evolve, understanding these factors is crucial for policymakers, healthcare providers, and technologists alike.

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Technological advancements "play a fundamental role in the adoption of telemedicine". The capacity to deliver high-quality healthcare remotely is contingent on the availability and accessibility of robust telecommunication technologies, reliable internet connectivity, and sophisticated medical devices. Regions with advanced technological infrastructures tend to have higher adoption rates. However, technology alone does not dictate the success of telemedicine. Socio-economic factors, including levels of education, socio-cultural attitudes

towards technology, and the financial affordability of digital health platforms, significantly impact acceptance levels. In developing nations or socio-economically disadvantaged regions, there might be resistance or hesitation towards relying on technology for critical health services due to unfamiliarity or trust issues.

Cultural attitudes also “play a crucial role. The trust in” healthcare systems, the doctor-patient relationship, and perceptions about the efficacy of remote consultations versus in-person visits can either promote or hinder the acceptance of telemedicine. In certain cultures, the preference for face-to-face interactions, particularly in healthcare settings, might present barriers to the uptake of telemedical solutions. Infrastructure, both technological and healthcare-specific, is another critical determinant. While technology can facilitate telemedicine, a lack of healthcare infrastructure, such as limited training for professionals, absence of policy frameworks, or lack of awareness campaigns, can stifle its growth.

It is also worth noting that while the COVID-19 pandemic pushed telemedicine to the forefront as an alternative to traditional consultations, the crisis also illuminated some of the existing barriers. Despite the urgency, some regions “faced challenges in transitioning to virtual healthcare due to a combination of” the above factors. “The adoption and acceptance of” telemedicine are multifaceted, “influenced by” an intricate blend of technological capability, socio-economic conditions, cultural attitudes, and infrastructural readiness. As the healthcare sector continues to evolve, understanding these factors is crucial for policymakers, healthcare providers, and technologists alike.

2.3 Impact of COVID-19 on Telemedicine

The onset of “the COVID-19 pandemic brought about unprecedented challenges for the global healthcare system. With” strict lockdowns imposed and the looming threat of virus transmission, traditional face-to-face medical consultations became not just challenging, but

in many scenarios, risky. This global health crisis presented both a compelling need and an opportunity for telemedicine to shine as a primary care delivery method.

“Baudier et al. (2021) conducted a cross-national study that highlighted the” shift in patients' perceptions towards teleconsultations during the pandemic. As hospitals became overwhelmed and patients grew wary of visiting medical facilities for fear of contracting the virus, teleconsultations became an attractive alternative. Many who were previously reluctant to consider virtual medical appointments found themselves relying on them. This not only reduced the strain on in-person medical services but also ensured that patients received timely medical advice without risking potential exposure.

Additionally, aside from the purely medical benefits, telemedicine played a pivotal role in addressing psychological challenges faced during the pandemic. As Cheng et al. (2021) indicated, telemedicine had an "empowering role," especially in alleviating feelings of isolation and anxiety among patients. With lockdowns forcing individuals to remain confined within their homes, telemedical platforms provided a lifeline, “allowing patients to interact with healthcare professionals and receive the assurance and” care they needed. This highlighted another dimension of telemedicine, beyond just clinical care – its role in ensuring emotional and psychological well-being during challenging times.

“However, it's essential to recognize that while the pandemic magnified the” importance of telemedicine, it also underscored certain limitations and disparities. Not all regions or communities were equipped to transition seamlessly to virtual healthcare, with barriers such “as lack of access to technology, unreliable internet connectivity, and lack of familiarity with digital” platforms becoming more pronounced (Hiller et al., 2022; Bhattacharyya & Mandke, 2022).

“The COVID-19 pandemic significantly amplified the role and importance of telemedicine in” global healthcare. While it showcased its potential as a robust alternative to traditional medical consultations, it also highlighted areas that require further development and investment “to ensure that telemedicine is accessible and effective for all (Baudier et al., 2021)”.

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The shift in patients' perceptions towards teleconsultations during the pandemic was significant. As hospitals became overwhelmed and patients grew wary of visiting medical facilities for fear of contracting the virus, teleconsultations became an attractive alternative. Many who were previously reluctant to consider virtual medical appointments found themselves relying on them. This not only reduced the strain on in-person medical services but also ensured that patients received timely medical advice without risking potential exposure.

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“However, it's essential to recognize that while the pandemic magnified the importance of telemedicine, it also underscored certain limitations and disparities”. Not all regions or communities were equipped to transition seamlessly to virtual healthcare, with barriers such as “lack of access to technology, unreliable internet connectivity, and lack of familiarity with digital” platforms becoming more pronounced. The disparities in technological infrastructure and digital literacy levels meant that while some populations could easily adapt to telemedicine, others were left struggling.

“The COVID-19 pandemic significantly amplified the role and importance of telemedicine in global healthcare”. While it showcased its potential as a robust alternative to traditional medical consultations, it also highlighted areas that require further development and investment “to ensure that telemedicine is accessible and effective for all”. As we move forward, there is a critical need to address these barriers and disparities to build a more inclusive telemedicine infrastructure that can withstand future health crises and continue to provide reliable healthcare services “to everyone, regardless of their location or socio-economic status”.

2.4 Challenges and Barriers in Implementation

The promise of telemedicine is undeniable, offering the potential for more accessible, efficient, and patient-centric care. However, its implementation is not without challenges. Several studies have pinpointed the multifaceted barriers faced by healthcare systems and providers in integrating telemedicine into their offerings.

One of the primary challenges highlighted by Khodadad-Saryazdi (2021) is the technological infrastructure. While advanced economies may possess the technological backbone to support

high-quality telemedical consultations, many developing regions lack reliable internet connectivity or access to necessary devices. Even in technologically advanced regions, inconsistencies in bandwidth or technical glitches can impede the quality of care.

Moreover, the healthcare sector, traditionally steeped in face-to-face interactions and physical examinations, requires a significant paradigm shift to embrace telemedicine fully. Cannavacciuolo et al. (2023) underscored the organizational changes that are often necessary. Implementing telemedicine might necessitate retraining healthcare professionals, establishing new protocols, and even overhauling certain established practices.

Beyond the technical and organizational aspects, there are also socio-cultural barriers. Patients and practitioners, especially those accustomed to traditional healthcare interactions, might be resistant or skeptical about the efficacy of virtual consultations (Bentahar et al., 2021). Building trust in a digital healthcare system, ensuring patient privacy, and maintaining the quality of doctor-patient interactions are all challenges that need to be addressed.

Regulatory hurdles also present significant challenges. As Cobelli, Cassia, and Burro (2021) indicated, the swift adoption of future technologies in healthcare, including telemedicine, might be hampered by regulatory constraints. The medical field, given its critical nature, is heavily regulated, and telemedicine introduces new complexities regarding licensing, cross-border consultations, and data protection.

Lastly, economic barriers cannot be overlooked. The initial investment required for setting up telemedical platforms, training staff, and ensuring compliance with regulations can be substantial. For some healthcare providers, especially in resource-limited settings, this economic hurdle can be a significant impediment (Khodadad-Saryazdi, 2021). While telemedicine presents a promising avenue for revolutionizing healthcare delivery, its implementation is fraught with challenges. From technological and organizational hurdles to

socio-cultural, regulatory, and economic barriers, a holistic approach is required to address these challenges and ensure that telemedicine can fulfill its potential (Cannavacciuolo et al., 2023).

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“One of the primary challenges is the technological infrastructure”. While advanced economies may possess the technological backbone to support high-quality telemedical consultations, many developing regions lack reliable internet connectivity or access to necessary devices. Even in technologically advanced regions, inconsistencies in bandwidth or technical glitches can impede the quality of care. This disparity in technological readiness creates significant “barriers to the widespread adoption of telemedicine”.

Moreover, the healthcare sector, traditionally steeped in face-to-face interactions and physical examinations, requires a significant paradigm shift to fully embrace telemedicine. Implementing telemedicine often necessitates retraining healthcare professionals, establishing new protocols, and even overhauling certain established practices. These organizational changes can be daunting and require substantial effort and resources. The need to align telemedicine practices with existing healthcare workflows and systems adds another layer of complexity.

Beyond the technical and organizational aspects, there are also socio-cultural barriers. Patients and practitioners, especially those accustomed to traditional healthcare interactions, might be resistant or skeptical about the efficacy of virtual consultations. Building trust in a digital healthcare system, ensuring patient privacy, and maintaining the quality of doctor-

patient interactions are all challenges that need to be addressed. Overcoming these socio-cultural barriers requires effective communication, education, and reassurance about the safety and effectiveness of telemedicine.

Regulatory hurdles also present significant “challenges. The swift adoption of future technologies in healthcare”, including telemedicine, might “be” hampered by regulatory constraints. The medical field, given its critical nature, is heavily regulated, and telemedicine introduces new complexities regarding licensing, cross-border consultations, and data protection. Navigating these regulatory landscapes requires coordinated efforts between healthcare providers, policymakers, and regulatory bodies to develop frameworks that support safe and effective telemedicine practices.

Lastly, economic barriers cannot be overlooked. The initial investment required for setting up telemedical platforms, training staff, and ensuring compliance with regulations can be substantial. For some healthcare providers, especially in resource-limited settings, this economic hurdle can be a significant impediment. Ensuring that telemedicine is economically viable requires careful planning, investment, and potentially, financial support from governments or other funding bodies.

While telemedicine presents a promising avenue for revolutionizing healthcare delivery, its implementation is fraught with challenges. From technological and organizational hurdles to socio-cultural, regulatory, and economic barriers, a holistic approach is required to address these challenges and ensure that telemedicine can fulfill its potential. Stakeholders across the healthcare spectrum must collaborate to develop solutions that overcome these barriers and “pave the way for” “the successful integration of telemedicine into mainstream healthcare systems”.

2.5 Innovations in Digital Healthcare

The digital transformation of the healthcare sector extends beyond just traditional telemedicine, with an array of innovations poised to redefine patient care, healthcare delivery, and medical infrastructure.

A significant highlight in the realm of innovative digital healthcare solutions is the design and development of telemedicine networks utilizing drones. Fong et al. (2021) provided insights into the potential of low-altitude telemedicine drone networks. These drones can be especially beneficial in hard-to-reach areas or during emergencies, enabling swift delivery of medical supplies, real-time data collection, and even remote patient monitoring.

Furthering the concept of connectivity and data exchange, Jha et al. (2021) explored the intricacies of communication networks designed specifically for metropolitan e-health applications. Such networks are geared towards ensuring seamless data flow between various healthcare entities, from hospitals to clinics and even home-based care setups. Such interconnectedness can optimize patient care, facilitate real-time monitoring, and enable a more personalized approach to treatment.

Moreover, as the world grapples with mental health challenges, there's an increasing emphasis on digital interventions for conditions like schizophrenia. Chivilgina, Elger, and Jotterand (2021) presented a descriptive review of digital technologies for schizophrenia management, highlighting the potential for tech-driven interventions in managing and mitigating the effects of such disorders.

Beyond disease-specific innovations, the very fabric of healthcare delivery is undergoing a transformation. Oborn, Pilosof, Hinings, and Zimlichman (2021) emphasized the evolving institutional logics during crises like the pandemic. Telemedicine, in this context, was viewed

as a form of digital 'PPE', reflecting the potential of digital platforms to act as safeguards, both in terms of protecting healthcare workers and in ensuring uninterrupted patient care.

The concept of value in healthcare is also witnessing a shift, with a focus on sustainability and long-term patient outcomes. Oderanti, Li, “Cubric, and Shi (2021) explored business models that prioritize sustainable commercialization of digital healthcare innovations”. Such models aim to strike a balance between economic viability and long-term patient benefits, promoting innovations that are both impactful and sustainable.

The digital healthcare landscape is rife with innovations that go beyond mere teleconsultations. From drone networks and specialized communication infrastructures to disease-specific interventions and new business models, the realm of digital healthcare is continuously evolving, promising better outcomes, increased accessibility, and more personalized care for patients “(Fong et al., 2021; Hsu et al., 2021; Jha et al., 2021; Jordan et al., 2021)”.

The digital transformation of the healthcare sector extends beyond just traditional telemedicine, with an array of innovations poised to redefine patient care, healthcare delivery, and medical infrastructure. A significant highlight in the realm of innovative digital healthcare solutions is the design and development of telemedicine networks utilizing drones. These drones can be especially beneficial in hard-to-reach areas or during emergencies, enabling swift delivery of medical supplies, real-time data collection, and even remote patient monitoring.

Furthering the concept of connectivity and data exchange, communication networks designed specifically for metropolitan e-health applications are being explored. Such networks are geared towards ensuring seamless data flow between various healthcare entities, from hospitals to clinics and even home-based care setups. This interconnectedness can optimize

patient care, facilitate real-time monitoring, and enable a more personalized approach to treatment.

Moreover, as the world grapples with mental health challenges, there's an increasing emphasis on digital interventions for conditions like schizophrenia. Tech-driven interventions are being developed to manage and mitigate the effects of such disorders, highlighting the potential for digital technologies to address complex mental health issues. Beyond disease-specific innovations, the very fabric of healthcare delivery is undergoing a transformation. During crises like the pandemic, telemedicine has been viewed as a form of digital 'PPE,' reflecting the potential of digital platforms to act as safeguards, both in terms of protecting healthcare workers and ensuring uninterrupted patient care.

The concept of value in healthcare is also witnessing a shift, with a focus on sustainability and long-term patient outcomes. “New business models prioritize sustainable commercialization of digital healthcare innovations”. These models aim to strike a balance between economic viability and long-term patient benefits, promoting innovations that are both impactful and sustainable.

The digital healthcare landscape is rife with innovations that go beyond mere teleconsultations. From drone networks and specialized communication infrastructures to disease-specific interventions and new business models, the realm of digital healthcare is continuously evolving, promising better outcomes, increased accessibility, and more personalized care for patients. These advancements underscore the dynamic nature of digital healthcare and its potential to revolutionize the way medical services are delivered and experienced.

2.6 Healthcare Startups

The healthcare sector has witnessed a surge in startups, especially with the emergence of healthtech and the global thrust towards digital transformation. Raj (2021) highlights the crucial role physicians play in healthtech startups, particularly in India. By bridging the gap between medical expertise and technological innovation, physicians can drive more relevant and effective healthtech solutions, aligning startups more closely with patient needs and the realities of healthcare provision (Raj, 2021).

Startups often introduce innovative methods of healthcare delivery. As Sadrul & Noushin (2021) discuss, alternative models, especially in digital domains, can increase accessibility, affordability, and effectiveness of healthcare services, reflecting the disruptive potential startups bring to the sector.

The trend of remote patient monitoring, as highlighted by Sensmeier (2021), is a testament to the role startups play in evolving patient care models. Such technologies enable real-time patient data tracking, enhancing preventive care and personalizing treatment strategies (Sensmeier, 2021). Steinhauser (2021) discusses the challenge established players face in integrating potentially disruptive digital innovations. Startups, due to their agility and innovation-first approach, can navigate and implement these innovations more readily, underscoring their transformative potential in regulated contexts like healthcare.

Teece (2021) touches upon the importance of technological leadership, using the context of 5G patent portfolios. Startups with a clear technological lead can set industry standards and influence healthcare delivery paradigms, especially as the sector increasingly relies on advanced technologies. Wan et al. (2023) emphasize the importance of integrating offline and online channels in healthcare. Data-driven approaches, often championed by startups, ensure seamless patient experiences, enhancing both service quality and operational efficiency.

Zimmerling & Chen (2021) explore how external challenges, like the COVID-19 pandemic, can be catalysts for innovation. Startups, due to their flexible nature, can rapidly adapt and introduce novel solutions, such as “in the production of personal protective equipment or the integration of digital” technologies in healthcare. Zobair et al. (2021) delve into the determinants of telemedicine adoption in emerging economies. Startups targeting these markets must understand and address specific socio-cultural and infrastructural challenges to ensure the successful deployment and acceptance of their solutions.

Healthcare startups, with their innovative approaches and technological prowess, are reshaping the healthcare landscape. Their agility, combined with a deep understanding of emerging trends and challenges, positions them “at the forefront of” healthcare transformation. However, understanding “the intricate dynamics of healthcare delivery”, especially in diverse and regulated contexts, remains crucial for their sustained success.

The healthcare sector has witnessed a surge in startups, especially with the emergence of healthtech and the global thrust towards digital transformation. Physicians play a crucial role in healthtech startups, particularly in India, by bridging the gap between medical expertise and technological innovation. Their involvement ensures that startups develop solutions that are more relevant and effective, aligning closely with patient needs and the realities of healthcare provision.

Startups often introduce innovative methods of healthcare delivery, which can increase accessibility, affordability, and effectiveness of healthcare services. These alternative models reflect the disruptive potential startups bring to the sector. One significant trend is remote patient monitoring, which enables real-time tracking of patient data, enhancing preventive care and personalizing treatment strategies. This evolution in patient care models demonstrates the critical role startups play in advancing healthcare technology.

Established healthcare players often face challenges in integrating potentially disruptive digital innovations due to their size and bureaucratic processes. In contrast, startups, with their agility and innovation-first approach, can navigate and implement these innovations more readily. This agility underscores their transformative potential in regulated contexts like healthcare, allowing them to introduce new technologies and processes swiftly.

Technological leadership is another area where startups can significantly impact the healthcare sector. Startups with a clear technological lead can set industry standards and influence healthcare delivery paradigms, particularly as the sector increasingly relies on advanced technologies such as 5G. Integrating offline and online channels in healthcare is crucial for ensuring seamless patient experiences. Startups, often champions of data-driven approaches, enhance both service quality and operational efficiency by ensuring that these integrations are smooth and effective.

External challenges, like the COVID-19 pandemic, have been catalysts for innovation, and startups have shown remarkable flexibility in adapting to these challenges. They have introduced novel solutions rapidly, such as producing personal protective equipment and integrating digital technologies in healthcare. The pandemic highlighted the ability of startups to respond swiftly to emerging needs and develop solutions that address immediate and critical healthcare challenges.

In emerging economies, the determinants of telemedicine adoption are shaped by specific socio-cultural and infrastructural challenges. Startups targeting these markets must understand and “address these challenges to ensure the successful deployment and acceptance of” their solutions. This understanding is crucial for tailoring their offerings to meet “the unique needs and constraints of different regions”.

Healthcare startups, with their innovative approaches and technological prowess, are reshaping the healthcare landscape. Their agility, combined with a deep understanding of emerging trends and challenges, positions them at the forefront of healthcare transformation. However, to ensure sustained success, startups must continually adapt to the intricate dynamics of healthcare delivery, especially in diverse and regulated contexts. By doing so, they can continue to drive significant improvements in healthcare accessibility, quality, and efficiency.

2.7 Patients' and Practitioners' Perspectives

In the evolution of telemedicine and digital healthcare, the perspectives of its primary stakeholders - patients and practitioners - are of paramount importance. Their experiences, expectations, and concerns shape the trajectory of telemedical solutions and influence their adoption and effectiveness.

From the patient's vantage point, telemedicine brings forth a blend of convenience and apprehensions. Kaissar et al. (2023) explored the satisfaction levels of physicians with teleconsultations in France, highlighting that, when implemented correctly, virtual consultations can offer a comparable, if not superior, experience to traditional in-person interactions. Factors such as reduced waiting times, the comfort of one's environment, and the elimination of travel play into this satisfaction.

However, Lu et al. (2021) emphasized that various determinants influence patient satisfaction in teleconsultations. Elements such as the ease of technology use, the clarity of communication, perceived security and privacy, and the ability to establish a personal connection in a virtual environment are crucial. This suggests that while telemedicine offers immense potential, its execution needs careful attention to detail to ensure patient satisfaction.

On the other hand, the practitioner's perspective offers a nuanced view of the telemedical landscape. For many healthcare professionals, telemedicine represents a paradigm shift, requiring them to adapt to new modes of patient interaction, unfamiliar technologies, and different diagnostic approaches (Bentahar et al., 2021; Pierre-Louis, 2021). This transition, while promising, can be fraught with challenges. The practitioner's comfort with technology, concerns about the quality of care they can deliver remotely, and potential medico-legal implications are significant considerations.

Cannavacciuolo, Capaldo, and Ponsiglione (2023) further shed light on the organizational changes accompanying telemedicine implementation, indicating that healthcare institutions need to support their practitioners during this transition. This includes providing adequate training, ensuring robust technological support, and creating frameworks that allow for seamless integration of telemedical practices into existing care paradigms. While telemedicine promises a revolution in healthcare delivery, its success hinges on the experiences and perceptions of both patients and practitioners. A symbiotic relationship between technology providers, healthcare institutions, and end-users is essential to ensure that telemedical solutions are not just technologically advanced but also resonate with the needs and expectations of those they aim to serve (Kaissar et al., 2023; Lu et al., 2021).

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While telemedicine promises a revolution in healthcare delivery, its success hinges on the experiences and perceptions of both patients and practitioners. A symbiotic relationship between technology providers, healthcare institutions, and end-users is essential to ensure that telemedical solutions are not just technologically advanced but also resonate with the needs and expectations of those they aim to serve. This collaborative approach will help address the practical and psychological barriers to telemedicine adoption, ensuring that both patients and practitioners can “fully realize the benefits of digital healthcare” innovations.

2.8 Ethical Considerations

“The integration of telemedicine into healthcare practice is expanding rapidly”, fuelled by technological advancements and shifts in healthcare delivery paradigms. While the benefits are evident, the rise of telemedicine has ushered in an array of ethical considerations. Borscheva et al. (2021) emphasized the potential “of telemedicine to enhance the quality of medical care, especially in” regions with limited resources. However, with the advantages come concerns about ensuring that telemedicine meets or exceeds the standard of traditional face-to-face consultations in terms of quality, accuracy, and comprehensiveness (Borscheva et al., 2021).

Teletriage, as elucidated by Çakıcı & Mills (2021), has been instrumental in managing healthcare demands. However, the reliance on technology-based triage systems may pose ethical dilemmas, especially when making decisions about patient priorities based solely on digital data without human clinical judgment. Cobelli et al. (2023) explored pharmacists' intentions to adopt telemedicine and highlighted potential ethical issues related to privacy and data protection, given that healthcare providers might be hesitant to use systems they perceive as non-secure. Patient confidentiality and data protection remain paramount in any healthcare interaction, and telemedicine introduces additional complexities in this domain.

“Dos Santos Silva et al. (2021) discussed the cost-effectiveness of healthcare”, indirectly addressing the ethical challenge of ensuring telemedicine is not just cost-effective but also accessible. The emphasis on cost-effectiveness should not overshadow the ethical duty to ensure equitable “access to quality healthcare services. Telemedicine is seeing the development of new platforms for delivery”, such as the telemedicine drone networks proposed by Fong et al. (2021). These innovative approaches might raise questions about the readiness of regulations and guidelines to address ethical issues they might introduce.

The study by Mishra (2021) shed light on the dynamics of patients seeking medical advice on social media platforms. This highlights a significant ethical concern about the boundaries of professional patient-doctor relationships and the potential risks of misinformation or breaches of confidentiality in such informal settings. The works of Nadig et al. (2021) and Pierre-Louis (2021) “on the development of value scorecards for ICU telemedicine” underscore the importance of ethically evaluating telemedicine tools. These evaluations should ensure not only efficiency and effectiveness but also the ethical implications of these tools on patient care and data security.

As telemedicine continues to grow and evolve, so do the ethical considerations surrounding its use. From ensuring quality care and data security to navigating the complex dynamics of patient-doctor interactions in digital spaces, healthcare providers, policymakers, and technologists must collaboratively address these concerns. The overarching goal should always remain: to provide ethically sound, “high-quality care to patients, regardless of the medium”.

The integration “of” telemedicine into healthcare practice is expanding rapidly, fueled by technological advancements and shifts in healthcare delivery paradigms. While the benefits are evident, the rise of telemedicine has ushered in an array of ethical considerations. The potential “of telemedicine to enhance the quality of medical care, especially in” regions with limited resources, is significant. However, with the advantages come concerns about ensuring that telemedicine meets or exceeds the standard of traditional face-to-face consultations in terms of quality, accuracy, and comprehensiveness.

Teletriage has been instrumental in managing healthcare demands, yet the reliance on technology-based triage systems poses ethical dilemmas, particularly when patient priorities are decided based solely on digital data without human clinical judgment. This raises

questions about the balance between technological efficiency and the nuanced understanding that human clinicians bring to patient care. Additionally, “the adoption of telemedicine by healthcare providers is” often tempered by concerns related to “privacy and data” protection. “Patient confidentiality and data protection remain paramount in any healthcare” interaction, and telemedicine introduces additional complexities in this domain. Healthcare providers might be hesitant to use systems they perceive as non-secure, thus affecting the adoption rates and effectiveness of telemedicine solutions.

The cost-effectiveness of healthcare is another area indirectly touching upon ethical challenges. Ensuring telemedicine is not just cost-effective but also accessible is crucial. The emphasis on cost-effectiveness should not overshadow the ethical duty to provide equitable access to quality healthcare services. Innovative telemedicine platforms, such as telemedicine drone networks, further complicate the ethical landscape. These approaches raise questions about the readiness of regulations and guidelines to address the ethical issues they might introduce, from operational safety to equitable access.

Patients seeking medical advice on social media platforms highlight another significant ethical concern. The boundaries of professional patient-doctor relationships are blurred in such informal settings, posing risks of misinformation and breaches of confidentiality. The dynamics of these interactions need careful consideration to protect patient privacy and ensure the accuracy of medical advice.

“The development of value scorecards for ICU telemedicine underscores the importance of ethically evaluating telemedicine tools”. These evaluations should ensure not only efficiency and effectiveness but also consider the ethical implications on patient care and data security. As telemedicine continues to grow and evolve, so do the ethical considerations surrounding its use. From ensuring quality care and data security to navigating the complex dynamics of

patient-doctor interactions in digital spaces, healthcare providers, policymakers, and technologists must collaboratively address these concerns. The overarching goal should always remain: to provide ethically sound, “high-quality care to patients, regardless of the” medium. This commitment to ethical standards is essential for the continued trust and successful integration of telemedicine into mainstream healthcare.

2.9 Summary

The literature on telemedicine underscores its growing significance in contemporary healthcare. Ranging from its adoption and acceptance factors, driven by technological, socio-economic, and cultural variables, to its amplified role during the COVID-19 pandemic, telemedicine's potential and challenges have been elaborately discussed. Innovations are continuously shaping digital healthcare, yet the perspectives of patients and practitioners are paramount, influencing its successful integration into healthcare systems.

While the extant literature delves deep into various facets of telemedicine, there is a notable gap when it comes to its implementation in rural and underserved regions, particularly in countries with significant rural populations like India. Most studies have focused on urban settings or have adopted a broader, generalized approach. However, rural settings, especially in developing countries, have unique challenges such as limited infrastructure, lower technological literacy, socio-cultural apprehensions, and financial constraints. Addressing telemedicine from the lens of these regions is critical for holistic and inclusive healthcare.

India, with its vast rural expanse, showcases a stark urban-rural divide in healthcare accessibility. While urban areas benefit from advancements in telemedicine, rural and underserved sections still grapple with basic healthcare access. Given the transformative potential of telemedicine, it's imperative to understand the factors affecting its adoption in these regions. The existing literature, while extensive, lacks a focused study on this

demographic. Exploring this avenue is not just crucial for equity in healthcare delivery but also offers insights that can be replicated in similar global settings. There's a pressing need for research that specifically investigates the challenges, perceptions, and requirements for successfully introducing telemedicine to the rural and underserved population in India.

Chapter 3 – Methodology

3.1 Overview of the Research Problem

In India, the rural and underserved populations are confronted with significant healthcare challenges due to the limited accessibility to medical facilities, a shortage of healthcare professionals, and infrastructural constraints. The introduction of telemedicine offers a promising solution to bridge this gap by enabling remote healthcare services. However, the adoption of telemedicine in these areas remains notably low, highlighting a critical need to explore and understand the factors influencing its adoption. This study aims to dissect and analyze these factors, shedding light on the technological, socio-economic, and cultural dynamics specific to the Indian context, where diversity in language, culture, and economic conditions presents unique challenges.

The significance of this research extends beyond its immediate academic contributions. It holds substantial potential for informing policymakers and stakeholders, aiding in the development of targeted strategies and policies that encourage telemedicine adoption in rural and underserved areas. Additionally, it can guide developers and service providers in creating telemedicine solutions tailored “to the specific needs of these” communities. This “is crucial for” improving healthcare accessibility, potentially reducing the urban-rural health divide, and enhancing the overall quality of life. The socio-economic benefits of such improvements include better health outcomes and increased productivity.

“Furthermore, this research is pivotal in academic circles, contributing to the existing literature on technology adoption and healthcare in developing countries”. The study is not only critical for highlighting the current challenges in telemedicine adoption but also essential for paving the way towards more informed, effective, and culturally sensitive healthcare solutions “in rural and underserved areas of India”.

3.2 Research Purpose and Questions

“This study aims to comprehensively explore the factors influencing the adoption of telemedicine services among rural and underserved populations in India”. “It seeks to understand the interplay between various factors shaping the decision to use” telemedicine in the rural and underserved sections. The focus is on unravelling how these multifaceted factors collectively impact the willingness to adopt telemedicine, with the goal of enhancing healthcare accessibility and efficacy in these communities.

1. How do expectations about the benefits and usability of telemedicine, along with societal influences, shape the adoption decision in rural and underserved areas of India?

2. In what ways do infrastructural support and digital proficiency influence the willingness to adopt telemedicine services in these communities?

3. How do perceptions of health risks, potential threats, and the seriousness of health issues impact the decision to use telemedicine services?

3.3 Operationalization of Theoretical Constructs

“To study factors affecting the adoption of telemedicine to the rural and underserved population in India, a theoretical model has been developed, underpinned by the basic premises of two theories – Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et. al, 2003) and Technology Threat Avoidance Model (TTAT) (Liang & Xue, 2009)”. “Facilitating Conditions, Social Influence, Performance Expectancy, and Effort Expectancy are the variables adopted from UTAUT”. “Perceived Susceptibility, Perceived Severity and Perceived Threat are the variables adopted from TTAT”.

The UTAUT component of the framework, proposed by Venkatesh et al. (2003), posits that “Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating

Conditions (FC) are key determinants of technology acceptance and usage (Venkatesh et al., 2003)".

- "Performance Expectancy is the degree to which an individual believes that using a particular system would enhance job performance (Venkatesh et al., 2003)".
- "EE is the degree of ease associated with the use of the system (Venkatesh et al., 2003)".
- "SI is the degree to which an individual perceives that important others believe he or she should use the new system (Venkatesh et al., 2003)".
- "FC is the degree to which an individual believes that an organizational and technical infrastructure exists to support the system use (Venkatesh et al., 2003)".

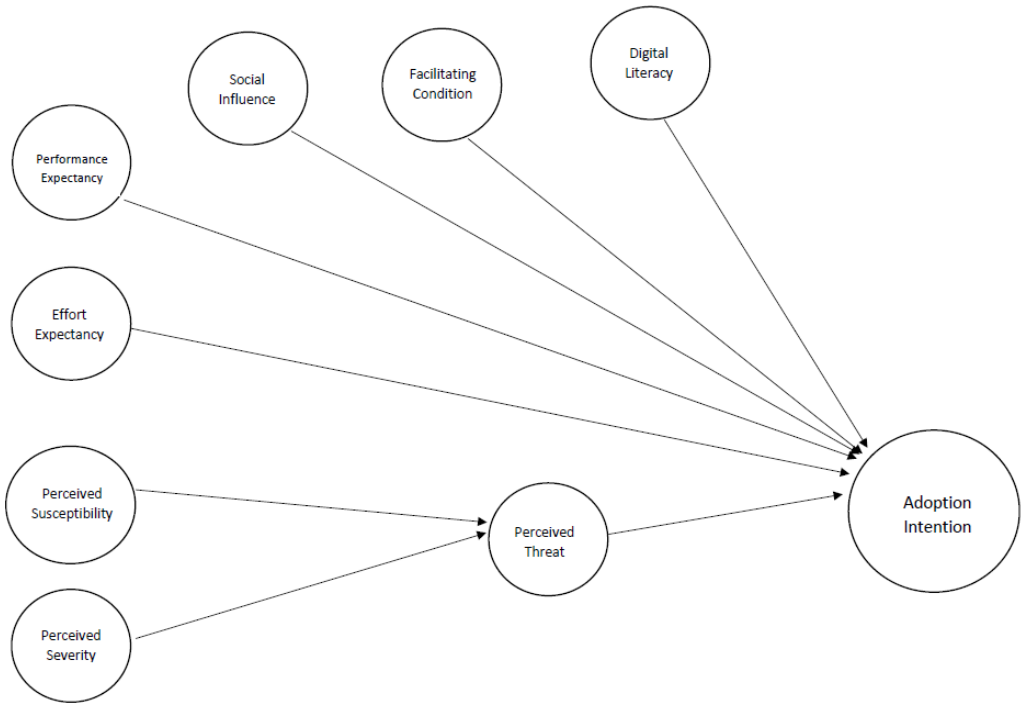
"On the other hand, the TTAT component, introduced by Liang and Xue (2009), covers the avoidance behaviors in technology adoption, where Perceived Threat (PT) and its susceptibility (PSS) and severity (PSE) play critical roles".

- "PSS refers to the subjective assessment of the risk of falling victim to a condition and an individual's feelings of personal vulnerability (Liang & Xue, 2009)".
- "PSE refers to feelings concerning the ethical and legal consequences of using the technology (Liang & Xue, 2009)".
- "PT is the extent to which an individual feels threatened by the possibility of negative outcomes from using a system, such as data breaches or other security concerns (Liang & Xue, 2009)".

Finally, I want add one more construct "Digital Literacy" to the theoretical framework. Adding the construct of Digital Literacy (Neumeyer, Santos, and Morris, 2020), acknowledges the role of technological and digital proficiency in technology adoption, particularly for fostering entrepreneurship among the poor. Digital Literacy (DL) could be defined as the degree to which

individuals in rural and underserved areas possess the skills and knowledge to effectively use digital technologies, including telemedicine platforms. This construct is critical in a setting like rural India, where levels of digital literacy can "significantly influence the adoption and effective use of telemedicine services"

Figure – 3.1: Theoretical Model of the Study



Control Variables: Gender, Age and Income *(Shi et al., 2021)*

3.4 Hypotheses of the Study

H_1 – Performance Expectancy will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

H_2 – Effort Expectancy will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

H_3 – Social Influence will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

H_4 – Facilitating Conditions will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

H_5 – Perceived Susceptibility will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

H_6 – Perceived Severity will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

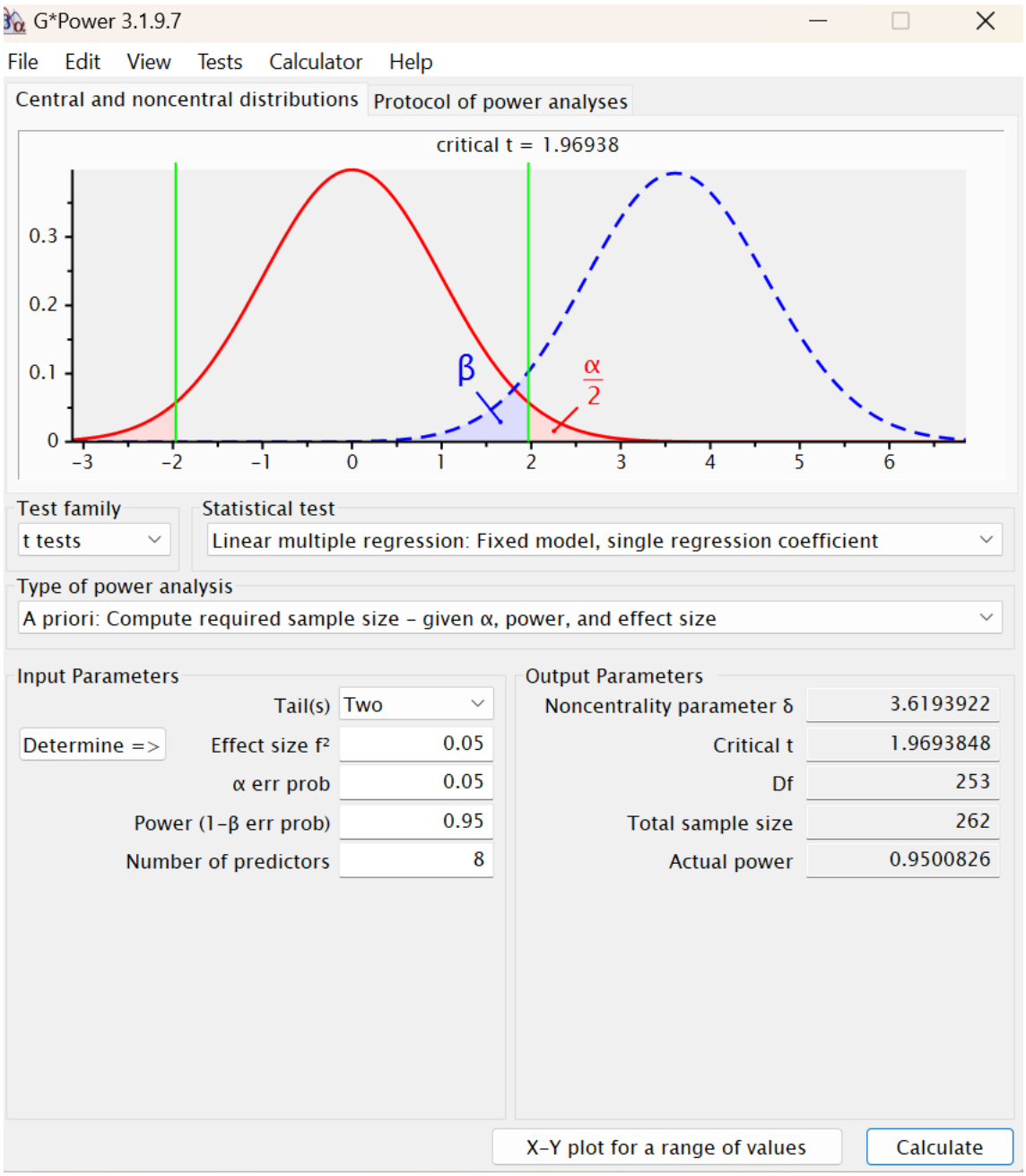
H_7 – Perceived threat will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

H_8 – Digital Literacy will have significant influence on the adoption intention of telemedicine to the rural and underserved population of India

3.5 Sample Size

"To compute the required sample size needed for the proposed research model" G* Power Software been used "and the results of the software are shown in Figure 3.2". "As the required sample size is 262, to ensure statistical accuracy of the model and to reduce Type I and II error, sample size is fixed at 600 (more than 2 times of the needed sample size)". "It is believed that the increased sample size will ensure the robustness of the results".

Figure 3.2: Minimum Sample Size



3.6 Sampling Technique

"Convenience sampling technique will be used for the study due to paucity of resources and also because of the expected resistance from the respondents to participate in the study".

3.7 Measurement Scale

Please rate the Below Statements

(From 1 – strongly disagree to 7 – strongly agree)

Construct	Indicator	1	2	3	4	5	6	7
Performance Expectancy	PE01 – Telemedicine serves can effectively meet my immediate healthcare needs							
	PE02 – The quality of care I receive through telemedicine is comparable to in-person medical care							
	PEO3 - Using telemedicine will help me to receive healthcare services at affordable cost							
	PE04 – Telemedicine services significantly improve my access to specialist medical consultation							
	PE05 - Using telemedicine services will enhance the overall outcomes of my healthcare							
Effort Expectancy	EE01 - Learning how to use telemedicine is easy for me							

	EE02 – “My interaction with telemedicine platform is clear and understandable”
	EE03 - I find telemedicine easy to use
	EE04 – “It is easy for me to become skilful at using telemedicine”
Facilitating Condition	FC01 - I have the necessary resources to use telemedicine
	FC02 - I have the knowledge necessary to understand and use telemedicine
	FC03 – “Telemedicine platforms are compatible with other technologies I use”
	FC04 - I can get help from others when I have difficulties in using telemedicine platform
Digital Literacy	DL01 - I am at ease with understanding digital technology
	DL02 - I have good knowledge about digital technology
	DL03 - I am good in managing data digitally

Social Influence	SI01 – "Peers who influence my behavior think that I should use telemedicine"
	SI02 – "Friends whose opinions I vale think that I should use telemedicine"
	SI03 - People who are important to me think that I should use telemedicine
Perceived Susceptibility	PS01 – The impersonal nature of telemedicine may jeopardize my health
	PSO2 – The absence of non-verbal cues in telemedicine communication may lead to misunderstanding and errors
	PSO3 – Lack of internet connectivity and network disruptions may limit the reach of telemedicine to the underserved population
Perceived Severity	PSE01 – There is a possibility of unable to access telemedicine services when needed

	PSE02 – Telemedicine may increase the unauthorized access to patient data
	PSE03 – Over-reliance on telemedicine may lead to lack of immediate access to in-person care
	PT04 – Discontinuity of healthcare providers is a possibility in telemedicine
	PT05 – Insurance coverage of telemedicine is uncertain
Perceived Threat	PT01 - My fear of exposure to telemedicine risks (misdiagnosis or inadequate treatment) is high
	PT02 – Absence of physical examination may affect the accuracy of diagnoses
	PT03 - Uncertainties associated with the use of telemedicine is higher
Intention to Use	"IU01 - I intent to use telemedicine services in the future"

	IU02 – I plan to actively seek out telemedicine services the next time I need medical consultation
	IU03 - I intend to recommend telemedicine services to others

3.8 Data

"The study is mainly based on primary data. The opinions of the respondents will be collected using a well-structured and pre-tested questionnaire".

3.9 Data Analysis

"Due to the complexity of the model, PLS-SEM analysis will be done using SMART PLS software".

Chapter 4 - Results and Analysis

“To satisfy the objectives of the study, required data were collected from 750 respondents using a well-structured and pre-tested schedule questionnaire”. “It could be noted that, purposive sampling has been used for the study, as answering the questions required certain level of knowledge and understanding about telemedicine”.

4.1 Demographics

“The demographic landscape of the respondents in the study presents (Table 4.1.1) a diverse cross-section of participants across various geographies and attributes”. “Of the 750 individuals who participated, the majority hail from Chennai, comprising 44% of the total”. “This is followed by the Mumbai, which accounts for 28%, while the Delhi, Kolkata and Bangalore represent 11%, 13% and 4% respectively”. “In terms of gender, the cohort skews significantly towards males, who constitute 81% of the respondents, with females representing a smaller fraction at 19%”.

“A closer look at the age distribution reveals a concentration of maturity and potential work experience in the bracket, with nearly half of the respondents, 48%, falling within the 30-40 year age range”. “The younger demographic, aged 18-30, comprises a modest 7.5%, whereas those between 40-50 years make up a substantial 39%”. “The eldest age group, those above 50 years, forms a mere 5.5% of the sample, indicating a tilt towards a younger demographic overall”.

“Considering the income of the respondents, the” data indicates 75% of the respondents are having less than or equal to Rs. 50000 per month and, the remaining quarter of the respondents are having more than Rs. 50000 per month.

“When the lens shifts to technology adoption, the results show an overwhelming propensity towards rapid integration, with 95% of the respondents categorizing their adoption speed as

'Quick'". “Only a minimal 5% consider their approach to be 'Deliberate', implying a significant emphasis on agility and responsiveness to technological advances within the surveyed group”.

“This demographic profile offers a glimpse into the varied characteristics of the respondents, with a predominant representation from Chennai and Mumbai, a younger, predominantly male demographic, and a clear inclination towards swift technology adoption”.

Table 4.1.1 – Demographic Profile of Respondents

Place		Gender		Age		Income		Technology Adoption	
Chennai	330 (44)	**Male**	608 (81)	**18-30 years**	56 (7.5)	**Less than or equal to 50K p.m.**	562 (75)	**Deliberate**	38 (05)
Mumbai	210 (28)	**Female**	142 (19)	**30-40 years**	360 (48)	**More than 50k p.m.**	188 (25)	**Quick**	912 (95)
Delhi	82 (11)			**40-50 years**	292 (39)				
Kolkata	98 (13)			**Above 50 years**	42 (5.5)				
Bangalore	30 (4)								
Total	**750 (100)**	**Total**	**750 (100)**	**Total**	**750 (100)**	**Total**	**750 (100)**	**Total**	**750 (100)**

Source: *Primary Data*

Note: The figures in parentheses are percentage to the total

4.2 PLS-SEM Results

1. Assessment of Measurement Models

"To assess the measurement models, Hair et. al (2019) guideliness on how to report PLS-SEM results has been followed". "In this study, the indivdiual indicator variables are reflective in nature and the assessment of reflective measurement models comprises of measuring the internal reliabiltiy, internal consistency, convergent validity and discriminant validity".

"Internal reliability is ensured by looking into the indicator loadings, which are shown in Table 4.2.1".

Table 4.2.1: Indicator Loadings

Construct	Item	Loading
Performance Expectancy	PE01	0.856
	PE02	0.852
	PE03	0.794
	PE04	0.913
	PE05	0.830
Effort Expectancy	EE01	0.871
	EE02	0.895
	EE03	0.874
	EE04	0.898
Facilitating Condition	FC01	0.878
	FC02	0.902
	FC03	0.841

	FC04	0.909
Social Influence	SI01	0.915
	SI02	0.913
	SI03	0.880
Digital Literacy	DL01	0.776
	DL02	0.862
	DL03	0.836
Perceived Severity	PSE01	0.859
	PSE02	0.802
	PSE03	0.726
	PSE04	0.834
	PSE05	0.879
Perceived Susceptibility	PS01	0.734
	PS02	0.883
	PS03	0.898
Perceived Threat	PT01	0.760
	PT02	0.762
	PT03	0.856
Intention to Use	IU01	0.905
	IU02	0.875
	IU03	0.925

Source: *Primary Data*

Note: PLS-SEM analysis is done using SMART PLS software

“Indicator loadings explain the amount of variance shared between the individual variables and the construct associated with them”. “Indicator loadings ensures the indicator reliability of reflective measurement models”. “It can be seen in Table 4.2.1, that all the indicator loadings of our measurement models are more than the recommended critical value of 0.708 (Hair et. al, 2019)”. “The critical value of 0.708 indicate that the associated construct explains more than 50% of the related indicator’s variance and thus provide adequate item reliability”. “Thus, we can say that our model has satisfactory indicator” reliabilitiy.

“After ensuring indicator reliability, the next step is to assess internal consistency and convergent validity”. “The composite reliabiltiy and ρA is used to assess the internal consistency of reflective constructs, and AVE (Average Variance Extracted) is used to assess the covergent validity of reflective constructs”. Compositie reliabilty, “ρA and AVE of our assessment model is shown in Table 4.2.2”.

“It can be seen from Table 4.2.2, that both the composite reliabilty and ρA lies in between the recommended thresholds of 0.70 and 0.95. and all the AVE values exceed the recommended critical value of 0.5”. “Thus, we can say that our reflective assessment model has satisfactory level of internal consistence as well as covergent validity”.

Table 4.2.2: Reliability and Validity

Constructs	ρA	Composite Reliability	Average Variance Extracted
Digital Literacy	0.808	0.865	0.681
Effort Expectancy	0.914	0.935	0.783
Facilitating Conditions	0.911	0.934	0.779

Intention to Use	**0.888**	**0.929**	**0.814**
Perceived Severity	0.892	0.912	0.676
Perceived Susceptibility	0.815	0.878	0.708
Perceived Threat	0.720	0.836	0.630
Performance Expectancy	0.918	0.928	0.722
Social Influence	0.934	0.930	0.815

Source: *Primary Data*

Note: PLS-SEM analysis is done using SMART PLS software

"The final step in the assessment of reflective measurement model is to ensure discriminant validity, which explains the extenet to which each construct is empirically separate from other construct". "HTMT (Hetrotrait-monotrait) ratio is used to assess the discriminant validity of the model". "The HTMT values are shown in Table 4.2.3".

"HTMT is the mean correlation value of items across constructs in relation to the geometric mean of average correlations for item measuring the same construct". "When HTMT values are high, discriminat validity is said to be low". "It can be seen from Table 4.2.3., that all the HTMT values of our reflective measurement model are significantly lower than the conservative threshold limit of 0.85". "Thus, it can said that discriminant validity of our model is satisfactorily established".

Table 4.2.3: Hetrotrait-monotrait (HTMT) Ratio of Correlations

	Digital Literacy	Effort Expectancy	Facilitating Conditions	Intention to Use	Perceived Severity	Perceived Susceptibility	Perceived Threat	Performance Expectancy
Effort Expectancy	0.320							
Facilitating Conditions	0.389	0.405						
Intention to Use	0.376	0.471	0.344					
Perceived Severity	0.184	0.104	0.063	0.268				
Perceived Susceptibility	0.150	0.068	0.036	0.249	0.075			
Perceived Threat	0.344	0.254	0.224	0.854	0.430	0.409		
Performance Expectancy	0.276	0.362	0.346	0.310	0.068	0.100	0.208	
Social Influence	0.431	0.369	0.427	0.490	0.143	0.139	0.367	0.302

Source: *Primary Data*

Note: PLS-SEM analysis is done using SMART PLS software

2. Assessment of the Structural Model

“To assess the structural model, the guideliness of Hair et. al (2019) has been followed”. “According to Hair et. al (2019), assessment of the structural model involves three important things viz., checking the collineartity issues, checking the relevance and significance of path coefficientts and checking the models’ explanatorty and predictive power”. “The results of our structural model were shown in Table 4.2.4, 4.2.5, and 4.2.6, and the significance of the path coefficients with relevant hypothesis has been separately shown in Figure 4.2.1”.

“VIF (Variance Inflation Factor) is used to check collinearity issues in the model”. “It can be seen from Table 4.2.4, that the VIF values are less than 2”. “The largest inner VIF value of our model construct is 1.387 (Hair et. al, 2019)”. “Thus, we can say that collinearity is not at critical level in the inner model and will not affect the regression results”.

Table 4.2.4: Variance Inflation Factor

	Intention to Use	**Perceived Threat**
Digital Literacy	1.286	
Effort Expectancy	1.298	
Facilitating Conditions	1.348	
Perceived Severity		1.002
Perceived Susceptibility		1.002
Perceived Threat	1.150	
Performance Expectancy	1.208	

Social Influence	1.387

“A look into the R^2 values in Table 4.2.5 shows that perceived susceptibiltiy and perceived severity are the important predictor constructs in explaining perceived threat ($R^2 = 0.210$); perceived threat, effort expectancy, and social influence are the important predictor constructs in explaining the intention to use (0.579)”. “As the R^2 value of the endogenous construct is between 0.5 and 0.75, the model has achieved a moderate to high level of success (Hair et al., 2019) in explaining the intention to adopt telemedicine”.

Table 4.2.5: R^2 Value

Construct	R-square
Intention to Use	0.579
Perceived Threat	0.210

“Table 4.2.6 and Figure 4.2.1 illustrates” “the size and significance of path coefficients between the endogenous and exogenous constructs”. “In examining the factors influencing the adoption of Telemedicine, the study integrates the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Threat Avoidance Model (TTAT) to construct a comprehensive theoretical framework”. “The empirical results derived from this model provide significant insights into the interplay between various determinants and the intention to use Telemedicine”.

“The analysis revealed that effort expectancy and social influence, constructs derived from the UTAUT theory, significantly influenced the intention to use telemedicine”. “Specifically, effort expectancy showed a robust positive effect, indicating that easier-to-use telemedicine systems are more likely to be adopted by the target population”. “Social influence also

positively affected intention, suggesting that social norms and the influence of peers play a crucial role in the adoption of telemedicine services".

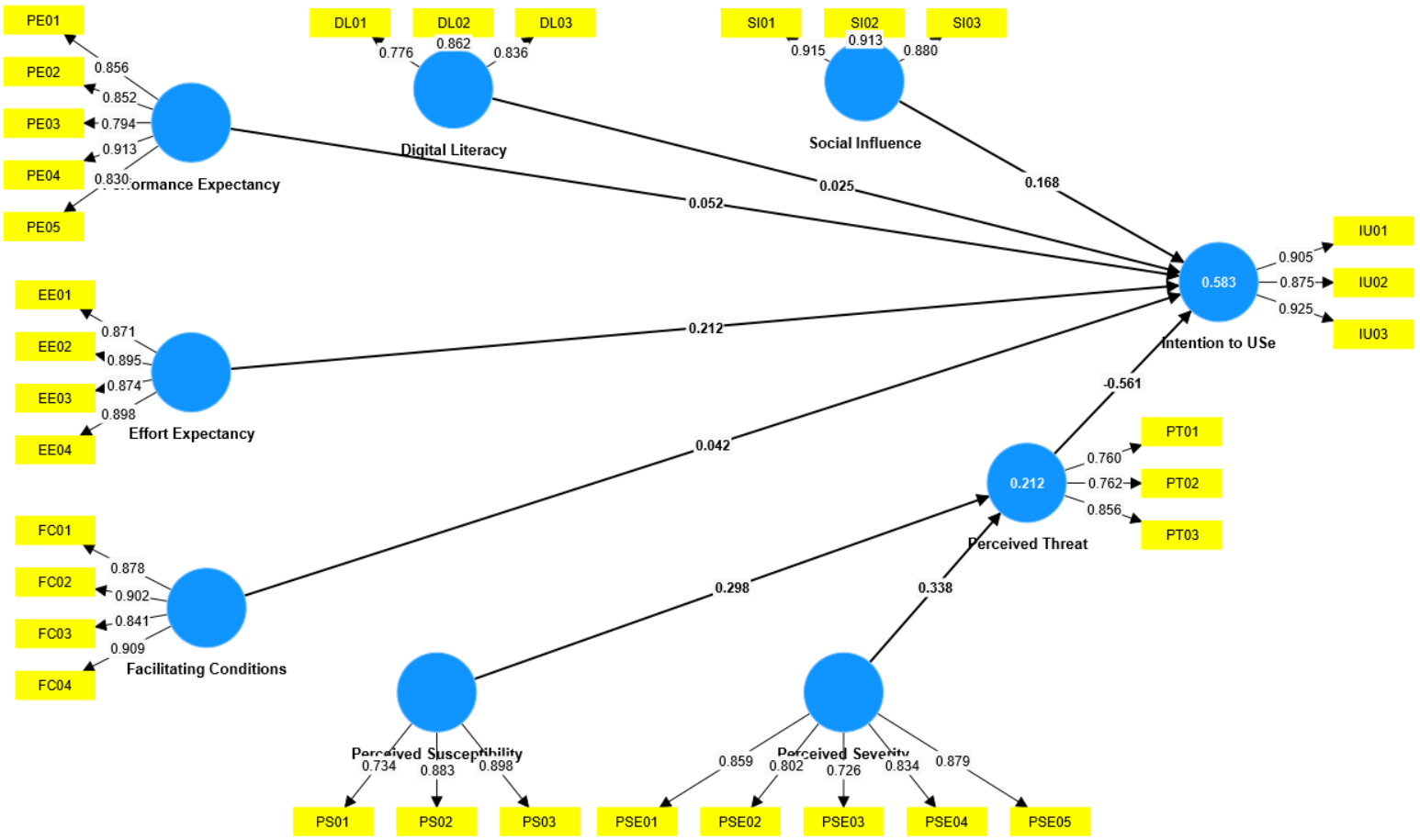
"On the other hand, facilitating conditions" and performance expectancy did not show significant effects on "the intention to use telemedicine, indicating that the mere presence of resources and the perceived performance of telemedicine" might not be sufficient drivers for its "adoption in the rural and underserved areas of India".

From "the" TAT perspective, perceived severity and perceived susceptibility significantly contributed to the perception of threat. However, the "perceived threat had a negative impact on the intention to use" telemedicine, which is a critical finding. It suggests that even though individuals recognize the risks associated with not using telemedicine, this recognition alone may paradoxically reduce their willingness to adopt such services.

Control variables also played a notable role. Age significantly influenced several factors, including digital literacy and perceived severity, indicating variations in how different age groups perceive and are willing to engage with telemedicine. Income levels showed a broad influence across many factors, enhancing both the capabilities and perceptions related to telemedicine use, such as digital literacy and effort expectancy. Gender had mixed effects, notably influencing facilitating conditions and perceived threat, suggesting varying perceptions and opportunities between genders regarding telemedicine use.

These findings highlight the complex interplay of technology acceptance theories and threat appraisal in determining the adoption of telemedicine in underserved areas, "emphasizing the need for tailored approaches that consider both the ease of use and" the socio-economic and demographic characteristics of the target population.

Figure 4.2.1: Structural Model Results



Source: *Primary Data*
Note: PLS-SEM analysis is done using SMART PLS software

Table 4.2.6: Path Coefficients

Path	Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Significance
Digital Literacy -> Intention to Use	0.042	0.033	1.280	0.201	No
Effort Expectancy -> Intention to Use	0.209	0.031	6.654	0.000	Yes
Facilitating Conditions -> Intention to Use	0.032	0.033	0.968	0.333	No
Perceived Severity -> Perceived Threat	0.386	0.040	9.781	0.000	Yes
Perceived Susceptibility -> Perceived Threat	0.297	0.040	7.450	0.000	Yes
Perceived Threat -> Intention to Use	-0.558	0.027	20.945	0.000	Yes
Performance Expectancy -> Intention to Use	0.034	0.030	1.136	0.256	No
Social Influence -> Intention to Use	0.171	0.032	5.418	0.000	Yes
Age -> Digital Literacy	0.574	0.086	6.655	0.000	Yes
Age -> Effort Expectancy	0.179	0.109	1.647	0.100	No
Age -> Facilitating Conditions	0.086	0.091	0.943	0.346	No

Age -> Intention to Use	**0.004**	**0.082**	**0.049**	**0.961**	**No**
Age -> Perceived Severity	-0.407	0.114	3.564	0.000	Yes
Age -> Perceived Susceptibility	-0.212	0.127	1.676	0.094	No
Age -> Perceived Threat	0.325	0.097	3.353	0.001	Yes
Age -> Performance Expectancy	0.435	0.100	4.335	0.000	Yes
Age -> Social Influence	-0.032	0.100	0.323	0.747	No
Gender -> Digital Literacy	-0.179	0.103	1.741	0.082	No
Gender -> Effort Expectancy	0.008	0.117	0.066	0.947	No
Gender -> Facilitating Conditions	-0.205	0.097	2.112	0.035	Yes
Gender -> Intention to Use	-0.005	0.079	0.057	0.955	No
Gender -> Perceived Severity	-0.173	0.121	1.426	0.154	No
Gender -> Perceived Susceptibility	0.239	0.123	1.936	0.053	No
Gender -> Perceived Threat	0.262	0.097	2.689	0.007	Yes
Gender -> Performance Expectancy	-0.275	0.096	2.845	0.004	Yes
Gender -> Social Influence	-0.429	0.107	3.991	0.000	Yes

Income →Digital Literacy	0.377	0.101	3.722	0.000	Yes
Income →Effort Expectancy	0.636	0.103	6.180	0.000	Yes
Income → Facilitating Conditions	0.763	0.109	7.007	0.000	Yes
Income → Intention to use	0.090	0.085	1.059	0.289	No
Income → Perceived Severity	0.254	0.124	2.054	0.040	Yes
Income → Perceived Susceptibility	-0.284	0.120	2.361	0.018	Yes
Income → Perceived Threat	-0.307	0.097	3.157	0.002	Yes
Income → Performance Expectancy	1.277	0.086	14.911	0.000	Yes
Income → Social Influence	0.321	0.115	2.787	0.005	Yes

Source : Primary Data
Note: PLS – SEM analysis is done using SMART PLS software

3. Mediation Anlaysis

"The significance and strength of the mediating constructs have been assessed using bootstrapping procedure at a 95% confidence interval, and the results are shown in Table 4.2.5".

Table 4.2.7: Structural Mediation

	Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Sig.
Perceived Severity -> Perceived Threat -> Intention to Use	-0.215	8.694	0.000	-0.215	Yes
Perceived Susceptibility -> Perceived Threat -> Intention to Use	-0.166	6.823	0.000	-0.166	Yes

Source: *Primary Data*

Note: *PLS-SEM analysis is done using SMART PLS software.*

In the study examining factors influencing telemedicine adoption in rural and underserved populations in India, two specific mediated relationships "involving perceived severity and perceived susceptibility, as part of the Threat Appraisal Theory, showed significant results in affecting the intention to use telemedicine".

- **Perceived Severity -> Perceived Threat -> Intention to Use**: The pathway indicates that as perceived severity (the understanding of the seriousness of not using

telemedicine) increases, “it negatively influences the intention to use telemedicine”, contrary to initial assumptions. This suggests a complex relationship where recognizing the severe consequences of not using telemedicine might lead to decreased adoption. This could be due to increased anxiety or fear that the technology might not adequately address these severe consequences, thus deterring usage.

- **Perceived Susceptibility -> Perceived Threat -> Intention to Use**: Similarly, this pathway demonstrates that higher perceived susceptibility (the perceived likelihood of suffering from not using telemedicine) also negatively influences the intention to use. This indicates that while individuals recognize their vulnerability, this recognition may paradoxically lower their inclination to adopt telemedicine, possibly due to concerns over the effectiveness of telemedicine in mitigating their perceived risks.

Both findings highlight a negative mediation effect where increased threat perception, whether through severity or susceptibility, does not encourage telemedicine adoption but instead might hinder it. These insights are crucial for understanding the psychological barriers in telemedicine adoption, suggesting that interventions to increase telemedicine uptake should carefully address these fears and concerns, providing reassurance about the effectiveness and reliability of telemedicine solutions.

4. Predict Relevance of the Model

"Table 4.2.8 indicates that the model has achieved moderate to high level of success (Hair et al., 2019) in explaining the adoption intention of Telemedicine Models, as the R^2 value of the endogenous construct (0.579) is greater than 0.5". "However, the R^2 statistics explains only the in-sample explanatory power of the model (Saari et. al, 2021)". "In order to assess the out-of-sample predict relevance of our model for Telemedicine adoption, Q^2 values has been obtained for major constructs using blindfolding technique and the results are shown in Table 4.2.6".

Table 4.2.8: Predict Relevance of the Model

Construct	Q^2 Predict
Perceived Threat	0.125
Intention to Use	0.498

Source: *Primary Data*

Note: *PLS-SEM analysis is done using SMART PLS software*

"It can be seen from Table 4.2.8, that the $Q^2_{predict}$ values are above zero". "It could be noted that $Q^2_{predict}$ is used to verify that the predictions have outpaced the most naïve benchamark, which has been defined as "the indicator means from the analysis sample" (Hair et. al, 2019). This proves the out-of-sample predict relevance of the model".

5. Importance-Performance Map Analysis (IMPA)

“In order to identify the impact and perforamnce of the constructs with respect to the endogeneous construct, importance-performance map analysis (IMPA) has been conducted with intention to use as the target construct and the results are shown in Table 4.2.9” “and” “Figure 4.2.2. The results of IMPA demonstrate for which exogenous construct the total effects are important by explaining the variance of the endogenous construct (Saari et. al, 2021)”.

In “the” study analyzing the adoption of telemedicine among rural and underserved populations in India, “an Importance-Performance Map Analysis (IPMA) was conducted to evaluate the relative importance and performance of” various factors influencing this adoption. The analysis highlights some critical insights into how different constructs impact the intention to use telemedicine and how effectively they perform in the model.

Effort expectancy emerged as a significant predictor with a substantial total “effect of 0.237 and a performance rating of 48.029”. This indicates that “the ease of use of telemedicine solutions plays a crucial role in” their adoption. “The” higher performance suggests that improving the usability of telemedicine platforms could effectively increase their adoption rates.

On the other hand, digital literacy and facilitating conditions showed very minimal positive effects (0.01 and 0.02 respectively) with corresponding lower performance metrics (42.338 and 45.908). This suggests that while essential, these factors alone are not strong determinants of telemedicine usage in the studied population. Enhancements in these areas alone may not significantly drive higher adoption rates.

The negative impacts observed from perceived severity and perceived susceptibility (-0.302 and -0.236, respectively) with low performance scores (41.938 and 40.546) point to a significant challenge. These findings imply that greater awareness of the risks and vulnerabilities associated with not using telemedicine paradoxically decreases the likelihood of its adoption, potentially due to increased anxiety or mistrust regarding the effectiveness of telemedicine services.

Moreover, perceived threat displayed the most substantial negative effect on intention to use (-0.998) with the highest performance score among the negative factors (51.005). This indicates that the perception of threat significantly deters telemedicine adoption, despite being an important construct in the model. Addressing this perception could be key to enhancing acceptance.

Performance expectancy and social influence, although with relatively smaller positive effects (0.072 and 0.114, respectively), still show reasonable performance scores (44.620 and 46.138). These suggest that the expected benefits of telemedicine and the influence of social networks do encourage its use, albeit to a lesser extent compared to effort expectancy.

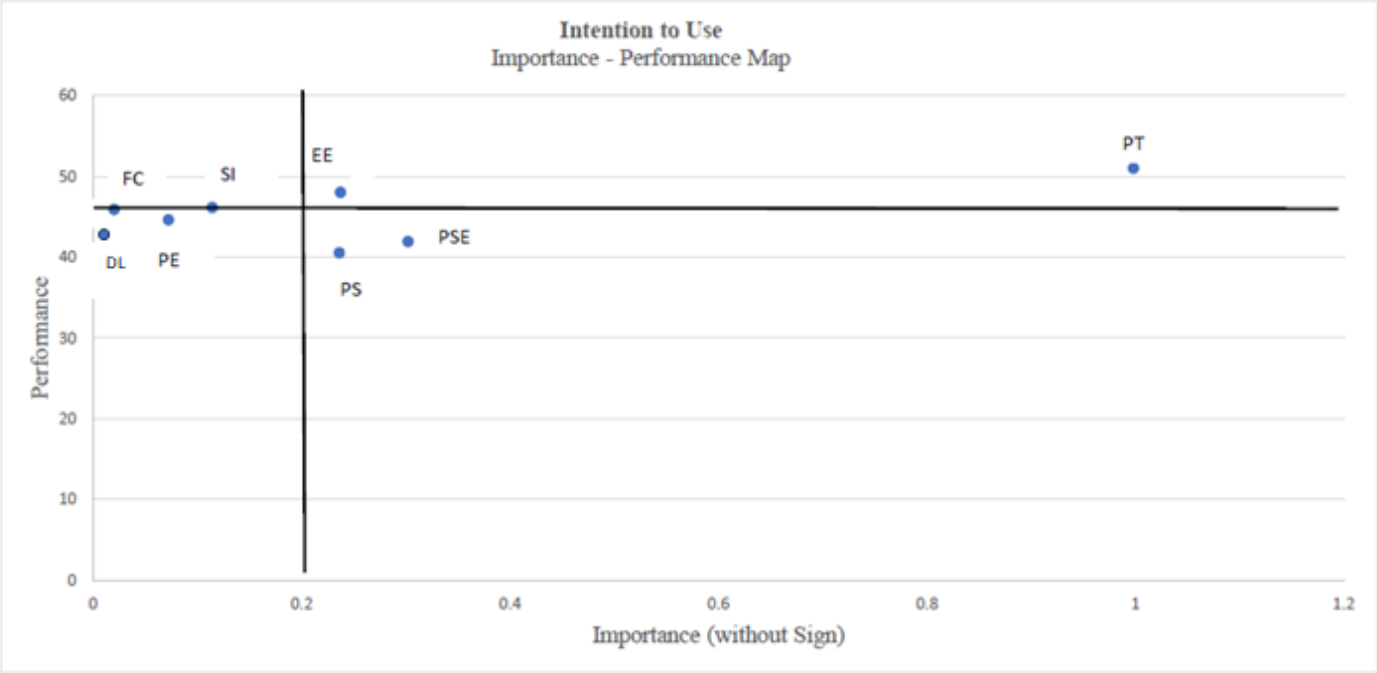
The IPMA's average performance index across all constructs was 45.5, with an average effect magnitude of 0.3, highlighting that while there are strong deterrents to telemedicine adoption, there are also potent levers that can be optimized to enhance uptake. This nuanced understanding from the IPMA provides a strategic foundation for targeted interventions to increase telemedicine adoption, focusing on alleviating fears and improving usability and social endorsements.

Table 4.2.9: Importance-Performance Map Analysis

	Unstandardized Total Effect (With Sign)	Unstandardized Total Effect (Without Sign)	Performance	LV Performance
Effort Expectancy	0.237	0.237	48.029	-
Digital Literacy	0.01	0.01	42.338	
Facilitating Condition	0.02	0.02	45.908	-
Perceived Severity	-0.302	0.302	41.938	-
Perceived Susceptibility	-0.236	0.236	40.546	-
Perceived Threat	-0.998	0.998	51.005	-
Performance Expectancy	0.072	0.072	44.62	-
Social Influence	0.114	0.114	46.138	-
Intention to Use	-	-	-	49.859
Average	-	0.3	45.5	

Source: *Primary Data*

Figure: 4.2.2: Importance-Performance Map Analysis



Note: *DL = Digital Literacy, PE = Performance Expectancy, EE = Effort Expectancy, FC = Facilitating Conditions, SI = Social Influence, PS = Perceived Susceptibility, PSE = Perceived Severity, PT = Perceived Threat.*

Chapter 5 – Discussion

5.1 Key Findings

"The study" on telemedicine adoption in rural and underserved areas of India, conducted with 750 respondents, reveals several key findings:

1. **Demographics**: The majority of respondents are from Chennai (44%), followed by Mumbai (28%). The sample is predominantly male (81%) with a significant age distribution in the 30-40 years range (48%). Most respondents earn less than Rs. 50,000 per month (75%).
2. **Technology Adoption**: A high percentage (95%) of respondents exhibit rapid technology adoption, indicating a strong inclination towards integrating new technologies.
3. **Measurement Models**: "Using PLS-SEM, the study confirms the reliability and validity of the reflective measurement models". "All indicator loadings exceed the critical value of 0.708, ensuring adequate item reliability". "Composite reliability and AVE values meet the required thresholds, indicating satisfactory internal consistency and convergent validity". "The HTMT ratio confirms discriminant validity".
4. **Structural Model**:
    - **Effort Expectancy and Social Influence**: "These significantly influence the intention to use telemedicine, suggesting that ease of use and social norms are crucial for adoption".
    - **Facilitating Conditions and Performance Expectancy**: These do not "significantly affect the intention to use" telemedicine.
    - **Perceived Severity and Perceived Susceptibility**: "These significantly contribute to perceived threat but negatively impact the intention to use

telemedicine. This highlights the paradox where recognizing risks deters adoption".

- **Control Variables**: Age influences digital literacy and perceived severity. Income affects several factors, including digital literacy and effort expectancy. Gender impacts facilitating conditions and perceived threat.

5. **Mediation Analysis**: "Perceived severity and susceptibility negatively influence the intention to use telemedicine through perceived threat, suggesting psychological barriers to adoption".
6. **Predictive Relevance**: The model shows moderate to high success ($R^2 = 0.579$ for intention to use), with Q^2 values indicating predictive relevance.
7. **Importance-Performance Map Analysis (IMPA)**:
    - **Effort Expectancy**: This has a substantial positive effect and high performance, indicating that usability improvements can drive adoption.
    - **Perceived Severity and Susceptibility**: These show significant negative effects, highlighting the need to address fears and mistrust.
    - **Perceived Threat**: "This has the most substantial negative effect on intention to use, indicating a critical barrier to adoption".

Overall, the findings underscore the importance of usability, social influence, and addressing psychological barriers to enhance telemedicine adoption in rural and underserved populations.

5.2 Effort Expectancy and Telemedicine Adoption

"The study's findings on the impact of effort expectancy on telemedicine adoption in rural and underserved populations in India provide significant insights into the dynamics of technology acceptance in these areas". "Effort expectancy, defined as the perceived ease of

using the telemedicine system, emerged as a critical factor influencing the intention to adopt telemedicine services". "This aligns with the Unified Theory of Acceptance and Use of Technology (UTAUT), which posits that ease of use is a fundamental determinant of technology adoption (Bhattacharyya et al. 2021)". "In the context of rural and" underserved populations, where technological literacy might be lower, and access to sophisticated medical facilities is limited, the simplicity and user-friendliness of telemedicine platforms become even more crucial.

The empirical data from the study highlighted "that effort expectancy had a robust positive effect on the intention to use telemedicine" (Hair et al. 2019). This suggests that individuals in these populations "are more likely to adopt telemedicine services if they perceive" the systems "to be" straightforward and "easy to" navigate. This is corroborated by similar findings in other studies, such as those by "Alviani et al. (2023), who noted that perceived ease of use significantly influenced the adoption of virtual healthcare services in Indonesia". The importance of effort expectancy in the Indian context underscores the need for telemedicine solutions that are tailored to the technological capabilities and comfort levels of rural users. Simplified interfaces, local language support, and minimal technical requirements are essential to enhance the usability of these systems.

"Furthermore, the positive relationship between effort expectancy and telemedicine adoption also highlights the broader implications of digital inclusivity". As Bhattacharyya and Mandke (2022) point out, "during the COVID-19 pandemic, there was a marked increase in" telemedicine usage, driven largely by the necessity to maintain social distancing and the consequent need for remote healthcare services. However, for sustained adoption beyond the pandemic, especially in rural and underserved areas, continuous efforts to make telemedicine systems more accessible and easier to use are paramount. This includes user training

programs and community-based initiatives to build digital literacy, which can empower these populations to leverage telemedicine effectively.

Additionally, the study's findings resonate with the experiences of other countries facing similar challenges. For instance, Bentahar et al. (2021) discuss “the barriers and drivers to telemedicine adoption in” rural areas, noting that ease of use “is a critical factor that can either facilitate or hinder adoption”. “The rural healthcare landscape in India” shares many similarities with these contexts, where infrastructural limitations and low digital literacy levels can impede the adoption of telemedicine. Therefore, addressing effort expectancy by ensuring that telemedicine platforms are intuitive and user-friendly is a strategic imperative for healthcare providers aiming to expand their reach in these regions.

In conclusion, the study reinforces “the pivotal role of effort expectancy in telemedicine adoption” among rural and underserved populations in India. This aligns with broader global findings and underscores the necessity of designing telemedicine systems that prioritize ease of use. By doing so, healthcare providers can enhance the accessibility and effectiveness of telemedicine, ultimately improving healthcare outcomes for these communities (Alt & Zimmermann 2021; Bhattacharyya et al. 2021; Alviani et al. 2023).

5.3 Social Influence and Telemedicine Adoption

“The study's results on the impact of social influence on telemedicine adoption among rural and underserved populations in India reveal critical insights into how societal factors affect the uptake of this technology”. “Social influence, defined as the degree to which individuals perceive that important others believe they should use a particular technology, significantly influences the intention to use telemedicine services”. “This finding is consistent with the

Unified Theory of Acceptance and Use of Technology (UTAUT), which identifies social influence as a crucial determinant of technology adoption (Bhattacharyya et al. 2021)".

"In rural and underserved areas, where community ties and social networks are strong, the role of social influence becomes even more pronounced". "The study showed that social norms and peer influences play a pivotal role in shaping individuals' attitudes towards telemedicine". "When respected community members or influential peers advocate for telemedicine, it can substantially increase its acceptance and use". "This is supported by the findings of Alviani et al. (2023), who observed similar dynamics in the adoption of virtual healthcare services in Indonesia, where social influence was a significant driver".

"The positive impact of social influence on telemedicine adoption in these areas underscores the importance of leveraging community leaders and influencers in promoting telemedicine". These individuals can serve as change agents, fostering trust and acceptance among community members. This approach is particularly effective in overcoming resistance to new technologies, as seen in the "study by Cannavacciuolo et al. (2023), which highlighted the role of social endorsement in facilitating the adoption" of telemedicine projects in various healthcare settings.

Moreover, "the study's findings align with the broader literature on telemedicine adoption, which emphasizes the importance of social factors". For instance, "Cobelli et al. (2021) found that the perceived social approval of telemedicine significantly" influenced its "adoption during the COVID-19 pandemic". "In rural India, where access to healthcare is often limited, the" endorsement by community leaders and the visible use of telemedicine by peers can create a positive feedback loop, encouraging more individuals to adopt the technology.

Additionally, “the impact of social influence on telemedicine adoption highlights the need for targeted communication strategies that address the specific social dynamics of rural communities”. Public health campaigns and educational initiatives that involve local influencers can enhance the perceived legitimacy and benefits of telemedicine, thereby boosting its adoption rates. This is crucial for overcoming the barriers posed by limited healthcare infrastructure and digital literacy, which are prevalent in underserved areas.

The study's results also suggest that social influence can mitigate some of the psychological barriers to telemedicine adoption, such as fear and mistrust. By seeing their peers successfully using telemedicine, individuals may feel more confident in the technology's effectiveness and reliability. This phenomenon is akin to “the findings of Borscheva et al. (2021), who reported that social influence positively affected the” perceived quality of telemedicine services in Russia.

In conclusion, “the study underscores the significant role of social influence in” “the adoption of telemedicine in rural and underserved populations in India”. By leveraging the power of community networks and social norms, healthcare providers can enhance the acceptance and utilization of telemedicine services, thereby improving healthcare access and outcomes in these regions (Alt & Zimmermann 2021; Bhattacharyya et al. 2021; Alviani et al. 2023).

5.4 Perceived Threat and Telemedicine Adoption

The study's examination of perceived threat and its impact on telemedicine adoption in rural and underserved populations in India reveals complex dynamics that significantly influence user behavior. Perceived threat, encompassing both perceived severity (the seriousness of the consequences of not using telemedicine) and perceived susceptibility (the likelihood of experiencing these consequences), “plays a pivotal role in shaping the intention to use

telemedicine services. However, contrary to what might be expected, the study found that higher levels of perceived threat negatively impacted the intention to adopt telemedicine (Hair et al. 2019)".

This paradoxical finding suggests that while individuals in rural and underserved areas recognize the potential health risks of not utilizing telemedicine, these perceived threats may induce anxiety and mistrust rather than motivate adoption. This outcome aligns with the insights from other studies, such as those by Bentahar et al. (2021), who identified that high perceived risks and fears about telemedicine's reliability and effectiveness can act as significant barriers to its adoption. In these communities, where access to healthcare is already limited, the fear that telemedicine might not adequately address severe health issues can exacerbate reluctance to adopt this technology.

"Further, the study's findings resonate with the broader literature on technology adoption in healthcare settings". For instance, Alviani et al. (2023) noted that in Indonesia, perceived "risks associated with telemedicine, such as data privacy concerns and doubts about the" accuracy "of" remote diagnoses, can hinder its acceptance. This is particularly relevant in rural Indian contexts, where digital literacy is often lower, and skepticism about new technologies can be more pronounced (Bhattacharyya et al. 2021). Therefore, perceived threat, while highlighting the importance of telemedicine, simultaneously underscores the necessity for robust assurance mechanisms to mitigate fears and build trust.

Moreover, the study emphasizes that perceived severity and susceptibility significantly contribute to the perception of threat. However, the negative impact of perceived threat on telemedicine adoption indicates a critical need for targeted interventions. These interventions should focus on addressing the underlying fears and providing clear, reassuring information about the efficacy and safety of telemedicine services. "This approach is supported by the

findings of Cheng et al. (2021), who highlighted that reducing perceived risks through effective communication and demonstrating successful telemedicine outcomes can enhance user acceptance".

"Additionally, the study highlights that demographic factors such as age and income influence perceived threat". Older individuals and those with lower incomes are more likely to perceive higher threats, potentially due to their limited exposure to digital technologies and greater reliance on traditional healthcare systems. This insight aligns "with the findings of Cobelli et al. (2021), who reported similar trends in the adoption of" telemedicine in various global contexts. Therefore, tailored communication strategies that consider these demographic sensitivities are crucial for increasing telemedicine adoption in rural and underserved populations.

"In conclusion, the study underscores the dual-edged nature of" perceived threat in telemedicine adoption. While it raises awareness about the importance of telemedicine, it also highlights significant psychological barriers that need to be addressed. By focusing on building trust, providing clear information, and ensuring robust support mechanisms, healthcare providers can mitigate the negative impacts of perceived threat and enhance the adoption "of telemedicine services in rural and underserved areas" of India (Alt & Zimmermann 2021; Bhattacharyya et al. 2021; Alviani et al. 2023).

5.5. Perceived Susceptibility and Telemedicine Adoption

The study's results on the impact of perceived susceptibility on telemedicine adoption among rural and underserved populations in India provide profound insights into how the recognition of personal health risks influences the acceptance of telemedicine. "Perceived susceptibility, which refers to an individual's belief about the likelihood of experiencing a health issue" if

telemedicine is not used, emerged “as a significant factor that negatively impacts the intention to adopt telemedicine” services. “This finding aligns with the Threat Appraisal Theory, which suggests that high perceived susceptibility can induce fear and anxiety, thereby deterring the adoption of health technologies”.

“In the context of rural India, where healthcare” infrastructure is often inadequate, and access to medical services is limited, the perception of susceptibility to health issues is understandably high. However, rather than motivating individuals to adopt telemedicine, this heightened sense of vulnerability appears to exacerbate their fears about the efficacy and reliability of telemedicine services. This paradoxical effect, where increased awareness of health risks reduces the willingness to use telemedicine, underscores the complex psychological barriers that need to be addressed (Bhattacharyya et al. 2021).

“The study's findings are consistent with those of Alviani et al. (2023)”, who found that in Indonesia, perceived health risks negatively influenced the adoption of virtual healthcare services. Similarly, research by Bavafa et al. (2021) highlighted that individuals' concerns about the potential inadequacies of telemedicine in addressing serious health issues could lead to reduced trust and lower adoption rates. This indicates a common challenge across different developing regions where healthcare infrastructure and digital literacy are still evolving.

Furthermore, the study suggests that efforts to promote telemedicine in rural and underserved populations must address these psychological barriers by enhancing the perceived reliability and effectiveness of telemedicine services. Public health campaigns that provide clear, evidence-based information about the benefits and success rates of telemedicine could help mitigate fears and build trust. This is supported by “Cheng et al. (2021), who emphasized the

role of" positive telemedicine experiences "in" reducing anxiety and fostering greater acceptance among users.

The negative impact of perceived susceptibility also highlights the need for targeted interventions that focus on education and reassurance. As observed by Khodadad-Saryazdi (2021), overcoming resistance to telemedicine requires not only technological solutions but also strategic communication efforts that address users' fears and misconceptions. In rural India, leveraging local healthcare workers and community leaders to advocate for telemedicine could "play a crucial role in changing perceptions and" encouraging adoption.

Additionally, "the" study's findings resonate with broader insights from telemedicine adoption literature, which underscores the importance of addressing both technological and psychological factors. For instance, Cobelli et al. (2021) found that perceived risks and susceptibilities significantly impacted "telemedicine adoption during the COVID-19 pandemic, indicating the need for comprehensive strategies that go beyond merely providing access to technology".

In conclusion, the study reveals that perceived susceptibility is a critical barrier to telemedicine adoption among rural and underserved populations in India. Addressing this "barrier requires a multifaceted approach that includes education, reassurance, and the" involvement "of" trusted community figures to build confidence in telemedicine services. By doing so, healthcare providers can enhance the acceptance and utilization of telemedicine, ultimately improving healthcare outcomes for these vulnerable populations.

5.6 Perceived Severity and Telemedicine Adoption

"The study's findings on the impact of perceived severity" on telemedicine adoption among rural and underserved populations in India reveal significant and nuanced insights. Perceived

severity, which refers to the belief about the seriousness of the consequences of not using telemedicine, “plays a complex role in shaping individuals' intention to adopt” this technology. “The” results indicated that higher perceived severity correlates with a lower intention to use telemedicine, suggesting a counterintuitive effect where recognizing severe health risks does not necessarily lead to increased telemedicine adoption (Hair et al. 2019).

In rural and underserved areas, this phenomenon can be attributed to several factors. Firstly, individuals in these regions may experience heightened anxiety and fear when they perceive the health consequences of not using telemedicine as severe. This fear can become a barrier to adoption if individuals doubt the efficacy of telemedicine in mitigating these severe consequences. The study by Bhattacharyya and Mandke (2022) supports this notion, highlighting that fear and mistrust significantly hinder “telemedicine adoption during the COVID-19 pandemic in” India. These psychological barriers are particularly pronounced in rural areas where trust in digital health solutions is still developing.

Moreover, “the study's findings align with the broader literature on health technology adoption, which often shows that” perceived severity can have a dual-edged impact. On one hand, it can motivate individuals to seek out preventive measures, but on the other, it can also lead to avoidance behaviors if the perceived severity induces too much fear. This dual effect is well-documented in studies on health behavior change, where high perceived severity needs to be coupled with high perceived efficacy of the intervention to drive adoption “(Cobelli et al. 2021). In the context of rural India, if telemedicine” services are not perceived as effective or reliable, high perceived severity alone may deter individuals from using these services.

Additionally, the influence of perceived severity on telemedicine adoption can be understood “through the lens of the Technology Threat Avoidance Theory” (TTAT). This theory posits

that when individuals perceive a high threat, they will adopt avoidance behaviors unless they believe the technology can effectively counteract the threat (Bavafa et al. 2021). The study's findings suggest that rural populations may not yet fully trust telemedicine's ability to address severe health issues, leading to a negative impact on adoption rates. This highlights the need for healthcare providers to build and communicate the efficacy and reliability of telemedicine solutions effectively.

Furthermore, the role of perceived severity in telemedicine adoption is also influenced by socio-economic factors prevalent in rural areas. For instance, limited access to digital infrastructure and lower levels of digital literacy can exacerbate fears and doubts about telemedicine. Bhattacharyya et al. (2021) noted that these infrastructural and educational gaps are significant barriers to “the adoption of digital health solutions in India”. Efforts to enhance telemedicine adoption in these areas must therefore address these underlying issues by improving digital infrastructure and providing targeted education and training to build confidence in telemedicine services.

In conclusion, “the study underscores the complex role of perceived severity” in telemedicine adoption among rural and underserved populations in India. While recognizing the severe consequences of not using telemedicine might intuitively seem to encourage adoption, it can paradoxically lead to avoidance if individuals lack confidence in the technology's effectiveness. Addressing this requires comprehensive strategies that enhance the perceived efficacy of telemedicine, build trust through reliable service delivery, and improve digital infrastructure and literacy in rural areas.

5.7 Practical Applications of IPMA

“The Importance-Performance Map Analysis (IPMA) provides valuable insights that can guide practical and managerial decisions to enhance telemedicine adoption, particularly in rural and underserved areas”. By evaluating the importance and performance of various factors influencing telemedicine use, IPMA helps identify areas where improvements can yield significant benefits and areas where resources might be better allocated to optimize outcomes.

Practically, IPMA can inform the development and refinement of telemedicine services by highlighting which aspects of the service need enhancement. For instance, “the study found that effort expectancy, which measures the perceived ease of use of telemedicine systems, has” a high importance and performance rating. This suggests that further simplifying the user interface and providing robust user support can significantly enhance adoption rates. Efforts should focus on creating intuitive, “user-friendly platforms that are accessible even to those with” limited digital literacy. This practical application aligns with findings from Bhattacharyya and Mandke (2022), who emphasized the need for user-centric design in telemedicine technologies to facilitate broader acceptance.

Managerially, the IPMA results can guide strategic planning and resource allocation. Managers can prioritize investments in areas identified as high importance but low performance. For example, if perceived threat has a high importance but low performance score, this indicates a significant barrier to adoption that needs to be addressed. Managers could implement strategies to mitigate perceived threats by providing clear, evidence-based information about the safety and efficacy of telemedicine. Educational campaigns, endorsements from trusted community figures, and success stories can help reduce fear and build trust among potential users (Cobelli et al. 2021).

The IPMA results also suggest the need for targeted training programs to improve digital literacy, particularly “in rural and underserved areas where this may be a” significant barrier. By improving users' comfort and confidence with digital technologies, managers “can enhance the overall experience and acceptance of telemedicine services”. Training programs can be “tailored to the specific needs of these populations”, using local languages and culturally relevant examples to make the learning process more effective and engaging (Alviani et al. 2023).

Moreover, the managerial implications extend to policy-making and collaboration with stakeholders. The findings can help managers advocate for supportive policies and infrastructure investments. For example, improving internet connectivity and access to digital devices in rural areas can significantly enhance the feasibility and attractiveness of telemedicine services. Collaboration with government agencies, non-profits, and private sector partners can be instrumental in addressing these broader infrastructural challenges (Bentahar et al. 2021).

In terms of service delivery, the IPMA results can help managers design more effective telemedicine programs by aligning them with user expectations and needs. For instance, social influence was identified as an important factor, suggesting that leveraging community networks and peer recommendations can boost adoption. Managers can develop community engagement strategies that involve local leaders and influencers to promote telemedicine. Programs that encourage existing users to share their positive experiences can create a ripple effect, fostering greater acceptance and trust within the community (Cannavacciuolo et al. 2023).

Finally, IPMA provides a framework for continuous improvement. By regularly assessing the importance and performance of various factors, managers can dynamically adjust their

strategies to respond to changing user needs and technological advancements. This iterative approach ensures that telemedicine services remain relevant, effective, and user-friendly, thereby maximizing their impact on healthcare delivery in rural and underserved populations.

In conclusion, the practical and managerial applications of IPMA are extensive and multifaceted. By identifying critical areas for improvement and guiding resource allocation, IPMA helps managers enhance the effectiveness and adoption of telemedicine services. “This strategic tool supports the creation of user-centric, accessible, and trusted telemedicine programs, ultimately improving healthcare access and outcomes in rural and underserved areas (Alt & Zimmermann 2021; Bhattacharyya et al. 2021; Cobelli et al. 2021; Alviani et al. 2023)”.

Chapter 6 – Conclusion

6.1 Study Implications

The study's findings on telemedicine adoption among rural and underserved populations in India have several significant implications that span practical, managerial, and policy domains. These implications are critical for improving healthcare access and ensuring “the successful implementation of telemedicine services in these areas”.

Firstly, the study “highlights the importance of user-friendly technology. Effort expectancy, or the perceived ease of use”, significantly impacts telemedicine adoption. This finding implies that telemedicine platforms must be designed with simplicity and ease of use in mind. Developers and healthcare providers should prioritize creating intuitive interfaces and ensuring that these platforms are accessible to individuals with varying levels of digital literacy. Training programs and user support systems are essential to help users navigate telemedicine services effectively, thereby enhancing their overall experience and increasing adoption rates (Bhattacharyya and Mandke, 2022).

Secondly, “the role of social influence in telemedicine adoption underscores the” need for community engagement strategies. In rural and underserved areas, where community ties are strong, leveraging the influence of local leaders and peer networks can significantly boost telemedicine acceptance. This implies that healthcare providers should actively involve community influencers in promoting telemedicine, utilizing their trust and authority to encourage broader adoption. Campaigns that highlight positive user experiences and endorsements from respected community members can create a positive perception of telemedicine, fostering trust and acceptance among potential users (Alviani et al., 2023).

Thirdly, the study's findings on perceived severity reveal a paradoxical effect where recognizing severe health risks can deter telemedicine adoption due to fear and mistrust. This

implies a need for targeted communication strategies that not only emphasize the benefits of telemedicine but also address users' concerns and fears. Providing clear, evidence-based information about the safety, efficacy, and reliability of telemedicine can help alleviate these concerns. Healthcare providers should focus on building trust through transparent communication and demonstrating the effectiveness of telemedicine in addressing severe health issues (Cobelli et al., 2021).

Moreover, the importance of digital literacy as a determinant of telemedicine adoption suggests that enhancing digital skills among rural populations is crucial. This has policy implications, indicating that government and non-profit organizations should invest in digital literacy programs tailored to rural communities. Such programs can bridge the digital divide, making telemedicine more accessible and ensuring that users can effectively utilize these services. Policies that support the expansion of digital infrastructure, “such as improving internet connectivity and access to digital devices, are also vital to support telemedicine adoption (Bentahar et al., 2021)”.

The study also has managerial implications. Healthcare providers need to allocate resources strategically to address the identified barriers to telemedicine adoption. For instance, improving the usability of telemedicine platforms and providing robust user support can enhance user satisfaction and increase adoption rates. Managers should prioritize initiatives that build trust and confidence in telemedicine, such as patient education programs, community outreach, and partnerships with local influencers. Additionally, regular assessment and refinement of telemedicine services based on user feedback and evolving needs are essential to maintain their relevance and effectiveness (Cannavacciuolo et al., 2023).

Furthermore, the study's findings suggest that telemedicine programs should be integrated into broader healthcare strategies to enhance their impact. This includes collaboration with existing healthcare infrastructure to provide a seamless and complementary service that extends the reach of “healthcare providers. For example, telemedicine can be used” to provide follow-up consultations, remote monitoring, and preventive care, reducing “the burden on physical healthcare facilities and improving overall healthcare” accessibility (Bhattacharyya et al., 2021).

In conclusion, the implications of the study are far-reaching, highlighting the need for user-centric design, community engagement, trust-building communication, digital literacy enhancement, strategic resource allocation, and integration with existing healthcare services. By addressing these areas, stakeholders can significantly improve telemedicine adoption and, consequently, “healthcare access and outcomes in rural and underserved populations in India”. “These implications provide a roadmap for policymakers, healthcare providers, and technology developers to create effective, accessible, and trusted telemedicine solutions that meet the unique needs of these communities”.

6.2 Study Recommendations

“Based on the results of the study, the following recommendations and suggestions can be made to enhance the adoption of telemedicine among rural and underserved populations in India”:

1. **Enhance User-Friendliness of Telemedicine Platforms**:
    - **Simplify Interfaces**: Telemedicine platforms should be designed to be intuitive and easy to use. Simplified interfaces that cater to users with limited digital literacy can significantly increase adoption rates.

- **Provide Multilingual Support**: Given the linguistic diversity in rural India, platforms should support multiple local languages to ensure accessibility and ease of use.
- **User Training Programs**: Implement training programs to help users understand how to navigate telemedicine platforms effectively. These programs can be conducted in community centers, schools, and through mobile units.

2. **Leverage Community Influencers and Social Networks**:
   - **Engage Local Leaders**: Involve respected community leaders and influencers in promoting telemedicine. Their endorsement can build trust and encourage adoption among community members.
   - **Peer Education Programs**: Develop peer education initiatives where early adopters share their positive experiences with telemedicine, thereby encouraging others to try the service.
   - **Community Outreach Campaigns**: Use local media, community events, and social gatherings to disseminate information about the benefits and effectiveness of telemedicine.
3. **Address Psychological Barriers and Build Trust**:
   - **Clear Communication**: Provide clear, evidence-based information about the safety, efficacy, and reliability of telemedicine. Address common fears and misconceptions directly.

- **Transparency in Operations**: Ensure transparency in how telemedicine services operate, including data privacy measures, qualifications of healthcare providers, and success stories.
- **Regular Feedback Mechanism**: “Implement a system for users to provide feedback and report issues, which can” be promptly addressed to improve the service and build trust.

4. **Improve Digital Literacy and Infrastructure**:
   - **Digital Literacy Programs**: “Invest in digital literacy programs that teach basic digital skills, such as using smartphones and accessing online services”. These programs should be tailored to the needs of rural populations.
   - **Infrastructure Development**: Collaborate with government and private sector partners to improve digital infrastructure, “such as internet connectivity and access to affordable digital devices in rural areas”.
   - **Subsidized Devices**: Provide subsidies or financing options for digital devices to make them more affordable for rural populations.
5. **Integrate Telemedicine with Existing Healthcare Services**:
   - **Seamless Integration**: Ensure that telemedicine services are integrated with existing healthcare systems to provide a continuum of care. This includes linking telemedicine consultations with physical healthcare facilities for follow-up treatments and tests.
   - **Collaborative Models**: Develop collaborative models where telemedicine complements in-person care, particularly for follow-up visits, chronic disease management, and preventive care.

- **Support for Healthcare Providers**: “Train local healthcare providers in telemedicine practices to enhance their capacity to deliver remote care effectively”.

6. **Targeted Communication and Awareness Campaigns**:
    - **Awareness Campaigns**: “Conduct awareness campaigns to educate rural populations about the availability and benefits of telemedicine”. Use local radio, television, and social media platforms to reach a wider audience.
    - **Educational Content**: Create educational content, such as videos and brochures, that explain how to use telemedicine services, the types of services available, and the benefits of remote healthcare.
    - **Success Stories**: Share success stories and testimonials from users who have had positive experiences with telemedicine to build credibility and encourage others to adopt the service.
7. **Policy Support and Incentives**:
    - **Government Policies**: Advocate for supportive government policies that promote telemedicine adoption, such as subsidies for digital devices, funding for infrastructure development, and incentives for “healthcare providers to offer telemedicine services”.
    - **Regulatory Framework**: Develop a regulatory framework that ensures “the quality and safety of telemedicine services, protects patient data”, and standardizes telemedicine practices across the country.

By implementing these recommendations, stakeholders can address the barriers to telemedicine adoption and enhance healthcare access and outcomes for rural and underserved

populations in India. These strategies focus on making telemedicine more accessible, trustworthy, and integrated with the broader healthcare system, ultimately improving the quality of healthcare delivery in these regions.

6.3 Conclusion

The study on telemedicine adoption among rural and underserved populations in India provides comprehensive “insights into the factors influencing the acceptance and utilization of telemedicine services”. The findings underscore “the significance of effort expectancy, social influence, and” perceived severity in shaping user intentions. “Effort expectancy, or the ease of use, emerged as a” critical factor, highlighting the necessity for user-friendly telemedicine platforms and comprehensive training programs. Social influence also plays a pivotal role, indicating that community leaders and peer networks are essential in promoting telemedicine. Conversely, the study revealed a paradoxical effect of perceived severity, where recognizing severe health risks could deter adoption due to fear and mistrust.

To address these challenges, several practical and managerial recommendations have been proposed. Enhancing the usability of telemedicine platforms, leveraging community influencers, addressing psychological barriers, and improving digital literacy and infrastructure are crucial steps. Additionally, integrating telemedicine with existing healthcare services and conducting targeted communication campaigns can further boost adoption rates. Policy support and regulatory frameworks are also essential “to ensure the quality and safety of telemedicine services”.

“Despite these insights, the study has limitations that open avenues for future research”. “Future studies could explore the long-term impact of telemedicine adoption on healthcare outcomes in rural areas”. Investigating the effectiveness of different training programs and community engagement strategies could provide deeper insights into optimizing telemedicine

implementation. Additionally, research could focus on “the role of government policies and incentives in promoting” telemedicine adoption “and the” potential for public-private partnerships to enhance digital infrastructure in underserved areas.

Furthermore, examining the socio-cultural “factors that influence telemedicine adoption could” “provide a more nuanced understanding of user behavior”. “Future research could also investigate the potential of emerging technologies, such as artificial intelligence and machine learning, to enhance telemedicine services and address specific healthcare needs in rural populations”. “By addressing these areas, future research can contribute to developing more effective, equitable, and sustainable telemedicine solutions, ultimately improving healthcare access and outcomes for rural and underserved populations in India”.

BIBLIOGRAPHY

Agarwal, N., Jain, P., Pathak, R., & Gupta, R. (2020). Telemedicine in India: A tool for transforming health care in the era of COVID-19 pandemic. *Journal of education and health promotion, 9*.

Alt, R. & Zimmermann, H.-D., 2021. The digital transformation of healthcare - An interview with Werner Dorfmeister. *Electronic Markets*, 31(4), pp. 895-899.

Alviani, R., Purwandari, B., Eitiveni, I. & Purwaningsih, M., 2023. Factors Affecting Adoption of Telemedicine for Virtual Healthcare Services in Indonesia. *Journal of Information Systems Engineering and Business Intelligence*, 9(1), pp. 47-69.

Baudier, P., Kondrateva, G., Ammi, C., Chang, V. & Schiavone, F., 2021. Patients' perceptions of teleconsultation during COVID-19: A cross-national study. *Technological Forecasting and Social Change,* 163.

Bavafa, H., Savin, S. & Terwiesch, C., 2021. Customizing Primary Care Delivery Using E-Visits. *Production and Operations Management,* 30(11), pp.4306-4327.

Bentahar, O., Beaulieu, M., Delacour, H. & Di Cesare, E., 2021. Barriers and drivers to a medical innovation adoption: The case of the telemedicine cabin. *Gestion 2000*, 38(3), pp.119-141.

Bhattacharyya, S.S. & Mandke, P.V., 2022. Study of awareness, adoption and experience of telemedicine technology services; perspectives during coronavirus (COVID-19) pandemic crisis and associated economic lockdown in India. *Journal of Science and Technology Policy Management*, 13(4), pp. 788-811.

Bhattacharyya, S.S., Rupainwar, M. & Kumar, A., 2021. Indian Telemedicine Industry: Evolving Nature of Business Models and Customer Interactions. *South Asian Journal of Business and Management Cases,* 10(3), pp.327-343.

Borscheva, N.L., Fedorova, Y.V., Mityaeva, N.V., Gerchikova, E.Z. & Fedorov, E.A., 2021. The use of telemedicine services to improve the quality of medical care in Russia. *Quality - Access to Success,* 22(181), pp.124-128.

Brindha, G. (2013). Emerging trends of telemedicine in India. *Indian Journal of Science and Technology, 6(sup 5)*.

Çakıcı, O.E. & Mills, A.F., 2021. On the role of teletriage in healthcare demand management. *Manufacturing and Service Operations Management*, 23(6), pp. 1483-1504.

Cannavacciuolo, L., Capaldo, G. & Ponsiglione, C., 2023. Digital innovation and organizational changes in the healthcare sector: Multiple case studies of telemedicine project implementation. *Technovation*, 120.

Chandwani, R. K., & Dwivedi, Y. K. (2015). Telemedicine in India: current state, challenges and opportunities. *Transforming Government: People, Process and Policy, 9(4)*, 393-400.

Chellaiyan, V. G., Nirupama, A. Y., & Taneja, N. (2019). Telemedicine in India: Where do we stand?. *Journal of family medicine and primary care, 8(6)*, 1872.

Cheng, Y., Wei, W., Zhong, Y. & Zhang, L., 2021. The empowering role of hospitable telemedicine experience in reducing isolation and anxiety: evidence from the COVID-19 pandemic. *International Journal of Contemporary Hospitality Management,* 33(3), pp.851-872.

Chivilgina, O., Elger, B.S. & Jotterand, F., 2021. Digital Technologies for Schizophrenia Management: A Descriptive Review. *Science and Engineering Ethics*, 27(2).

Cobelli, N., Cassia, F. & Burro, R., 2021. Factors affecting the choices of adoption/non-adoption of future technologies during coronavirus pandemic. *Technological Forecasting and Social Change,* 169.

Cobelli, N., Cassia, F. & Donvito, R., 2023. Pharmacists' attitudes and intention to adopt telemedicine: Integrating the market-orientation paradigm and the UTAUT. *Technological Forecasting and Social Change*, 196.

Dash, S., Aarthy, R., & Mohan, V. (2021). Telemedicine during COVID-19 in India—a new policy and its challenges. *Journal of Public Health Policy, 42(3)*, 501-509.

dos Santos Silva, E.K., Cruz, J.A.W., da Cunha, M.A.V.C., de Moraes, T.P., Marques, S. & da Silva, E.D., 2021. Cost-effectiveness in health: consolidated research and contemporary challenges. *Humanities and Social Sciences Communications,* 8(1).

Fong, B., Fong, A.C.M. & Tsang, K.-F., 2021. Capacity and Link Budget Management for Low-Altitude Telemedicine Drone Network Design and Implementation. *IEEE Communications Standards Magazine*, 5(4), pp. 74-78.

Fong, B., Fong, A.C.M. & Tsang, K.-F., 2021. Capacity and Link Budget Management for Low-Altitude Telemedicine Drone Network Design and Implementation. *IEEE Communications Standards Magazine,* 5(4), pp.74-78.

Ganapathy, K., & Ravindra, A. (2009). Telemedicine in India: the Apollo story. *Telemedicine and e-Health, 15(6)*, 576-585.

Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M., 2019. When to use and how to report the results of PLS-SEM. *European business review*.

Hiller, M., Bracht, H. & Schroeder, S., 2022. One year with the COVID-19 pandemic − Lessons learnt? Intersectoral collaboration measures established during the crisis could benefit capacity and patient flow management in daily clinical practice. *Journal of Health Organization and Management*, 36(2), pp. 141-148.

Hsu, W.-C.J., Liou, J.J.H. & Lo, H.-W., 2021. A group decision-making approach for exploring trends in the development of the healthcare industry in Taiwan. *Decision Support Systems,* 141.

Jha, A.V., Mishra, S.K., Appasani, B. & Ghazali, A.N., 2021. Communication Networks for Metropolitan E-Health Applications. *IEEE Potentials*, 40(2), pp.34-42.

Jordan, R., Agi, K., Arora, S., Christodoulou, C.G., Schamiloglu, E., Koechner, D., Schuler, A., Howe, K., Bidram, A., Martinez-Ramon, M. & Lehr, J., 2021. "Peace engineering in practice: A case study at the University of New Mexico". *Technological Forecasting and Social Change,* 173.

Kaissar, S., Zara, S., Fabrice, F., Marion, V., Jade, B., Vincent, M. & Antoine, P., 2023. Physicians' satisfaction with the use of teleconsultation in France. *Journal of Hospital Management and Health Policy*, 7.

Kautish, P., Siddiqui, M., Siddiqui, A., Sharma, V. & Alshibani, S.M., 2023. Technology-enabled cure and care: An application of innovation resistance theory to telemedicine apps in an emerging market context. *Technological Forecasting and Social Change*, 192.

Khodadad-Saryazdi, A., 2021. Exploring the telemedicine implementation challenges through the process innovation approach: A case study research in the French healthcare sector. *Technovation*, 107.

Khodadad-Saryazdi, A., 2021. Exploring the telemedicine implementation challenges through the process innovation approach: A case study research in the French healthcare sector. Technovation, 107.

Lu, W., Hou, H., Ma, R., Chen, H., Zhang, R., Cui, F., Zhang, Q., Gao, Y., Wang, X., Bu, C., Zhao, J. & Zhai, Y., 2021. Influencing factors of patient satisfaction in teleconsultation: A cross-sectional study. *Technological Forecasting and Social Change*, 168.

Mishra, S. K., Kapoor, L., & Singh, I. P. (2009). Telemedicine in India: current scenario and the future. *Telemedicine and e-Health, 15(6)*, 568-575.

Mishra, S., 2021. Looking for Medical Advice in Everyday Digital Spaces: A Qualitative Study of Indians Connecting with Physicians on Facebook. *Vikalpa,* 46(2), pp.86-98.

Nadig, N. et al., 2021. Preliminary Development of Value Scorecards as ICU Telemedicine Evaluation Tools. *Journal of Healthcare Management,* 66(2), pp.124-138.

Oborn, E., Pilosof, N.P., Hinings, B. & Zimlichman, E., 2021. Institutional logics and innovation in times of crisis: Telemedicine as digital 'PPE'. *Information and Organization,* 31(1).

Oderanti, F.O., Li, F., Cubric, M. & Shi, X., 2021. Business models for sustainable commercialisation of digital healthcare (eHealth) innovations for an increasingly ageing population: (A new business model for eHealth). *Technological Forecasting and Social Change,* 171.

Pal, A., Mbarika, V. W. A., Cobb-Payton, F., Datta, P., & McCoy, S. (2005). Telemedicine diffusion in a developing country: the case of India (March 2004). *IEEE Transactions on Information Technology in Biomedicine, 9(1)*, 59-65.

Pierre-Louis, R.E., 2021. PRACTITIONER APPLICATION: Preliminary Development of Value Scorecards as ICU Telemedicine Evaluation Tools. *Journal of Healthcare Management*, 66(2), pp. 139-140.

Raj, A., 2021. Leveraging physician leadership in healthtech startups in India. *BMJ Leader,* 5(4), pp.229-231.

Saari, U.A., Damberg, S., Frömbling, L. and Ringle, C.M., 2021. Sustainable consumption behavior of Europeans: The influence of environmental knowledge and risk perception on environmental concern and behavioral intention. *Ecological Economics*, *189*, p.107155.

Sadrul, S.S.M. & Noushin, N., 2021. Alternative Mode of Health Service Delivery. *Sustainable Futures,* 3.

Sensmeier, J., 2021. Managing health with remote patient monitoring. *Nursing Management*, 52(11), pp.13-17.

Serrano, K.M., Mendes, G.H.S., Lizarelli, F.L. & Ganga, G.M.D., 2021. Assessing the telemedicine acceptance for adults in Brazil. *International Journal of Health Care Quality Assurance,* 34(1), pp.35-51.

Steinhauser, S., 2021. Enabling the utilization of potentially disruptive digital innovations by incumbents: The impact of contextual, organisational, and individual factors in regulated contexts. *International Journal of Innovation Management,* 25(2).

Teece, D.J., 2021. Technological Leadership and 5G Patent Portfolios: Guiding Strategic Policy and Licensing Decisions. *California Management Review,* 63(3), pp.5-34.

Wan, M., Shukla, N., Li, J. & Pradhan, B., 2023. Data-driven approaches to sustainable referral system design integrating the offline channel and the online channel. *Journal of Cleaner Production*, 414.

Zimmerling, A. & Chen, X., 2021. Innovation and possible long-term impact driven by COVID-19: Manufacturing, personal protective equipment and digital technologies. *Technology in Society,* 65.

Zobair, K.M., Sanzogni, L., Houghton, L., Sandhu, K. & Islam, M.J., 2021. Health Seekers' Acceptance and Adoption Determinants of Telemedicine in Emerging Economies. *Australasian Journal of Information Systems*, 25.

Annexure 1 - Questionnaire

A STUDY ON THE FACTORS AFFECTING THE ADOPTION OF TELEMEDICINE TO THE RURAL AND UNDERSERVED POPOULATION IN INDIA

Demographics

1. Place
    a) Chennai
    b) Hyderabad
    c) Delhi
    d) Mumbai
2. Gender
    a) Male
    b) Female
3. Age
    a) Less than 40 years
    b) Greater than 40 years
4. Education
    a) UG
    b) PG
5. Income
    a) Less than Rs. 50000 per month
    b) Greater than Rs. 50000 per month

Please rate the Below Statements

(From 1 – strongly disagree to 7 – strongly agree)

Construct	Indicator	1	2	3	4	5	6	7
Performance Expectancy	PE01 – Telemedicine serves can effectively meet my immediate healthcare needs							
	PE02 – The quality of care I receive through telemedicine is comparable to in-person medical care							
	PEO3 - Using telemedicine will help me to receive healthcare services at affordable cost							
	PE04 – Telemedicine services significantly improve my access to specialist medical consultation							
	PE05 - Using telemedicine services will enhance the overall outcomes of my healthcare							
Effort Expectancy	EE01 - Learning how to use telemedicine is easy for me							

	EE02 - My interaction with telemedicine platform is clear and understandable
	EE03 - I find telemedicine easy to use
	EE04 - It is easy for me to become skilful at using telemedicine
Facilitating Condition	FC01 - I have the necessary resources to use telemedicine
	FC02 - I have the knowledge necessary to understand and use telemedicine
	FC03 – Telemedicine platforms are compatible with other technologies I use
	FC04 - I can get help from others when I have difficulties in using telemedicine platform
Digital Literacy	DL01 - I am at ease with understanding digital technology
	DL02 - I have good knowledge about digital technology
	DL03 - I am good in managing data digitally

Social Influence	SI01 - Peers who influence my behavior think that I should use telemedicine
	SI02 - Friends whose opinions I vale think that I should use telemedicine
	SI03 - People who are important to me think that I should use telemedicine
Perceived Susceptibility	PS01 – The impersonal nature of telemedicine may jeopardize my health
	PSO2 – The absence of non-verbal cues in telemedicine communication may lead to misunderstanding and errors
	PSO3 – Lack of internet connectivity and network disruptions may limit the reach of telemedicine to the underserved population
Perceived Severity	PSE01 – There is a possibility of unable to access telemedicine services when needed

	PSE02 – Telemedicine may increase the unauthorized access to patient data
	PSE03 – Over-reliance on telemedicine may lead to lack of immediate access to in-person care
	PT04 – Discontinuity of healthcare providers is a possibility in telemedicine
	PT05 – Insurance coverage of telemedicine is uncertain
Perceived Threat	PT01 - My fear of exposure to telemedicine risks (misdiagnosis or inadequate treatment) is high
	PT02 – Absence of physical examination may affect the accuracy of diagnoses
	PT03 - Uncertainties associated with the use of telemedicine is higher
Intention to Use	IU01 - I intent to use telemedicine services in the future

	IU02 – I plan to actively seek out telemedicine services the next time I need medical consultation
	IU03 - I intend to recommend telemedicine services to others