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SMARTWATCHES AND ELDERLY HEALTHCARE IN PAKISTAN: STUDY OF ADOPTION, ACCEPTANCE, AND SOCIAL SUPPORT

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ABSTRACT

Huge proliferation of IoT devices including smartwatch is observed recently. A smartwatch offers several applications for fitness and healthcare. Considering these trends and benefits elder persons can benefit by using smartwatch and IoT technology for their healthcare. There exist studies on smartwatch use by elderly persons investigating the factors influencing old age adults; however, there is limited research on studying the behavior of elderly persons for adopting smartwatches for the healthcare purpose especially for the developing countries like Pakistan. At the same the adoptions, acceptance and social support are the important factors need to study under the social and technical perspective to provide a way of how the elderly get healthcare using technical aspects of smartwatches. Semi-structured interviews were performed for this purpose. The data was subjected to thematic analysis using socio-technical theory, which revealed four main themes that are health monitoring at an older age, usability features of a smartwatch for healthcare, smartwatch adoption and acceptance and social support of using smartwatches by the elderly. Results revealed that smartwatches helped to encourage better healthcare for the elderly because they could be used as health monitoring devices to actively control and track health-related parameters. The results highlight the mutually beneficial acceptance of smartwatch to improve elderly healthcare along with adoption and acceptance levels. These observations offer vital advice for healthcare professionals, academics, and stakeholders looking to improve the healthcare of the elderly as smartwatches continue to reshape healthcare management.

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INTRODUCTION

With rapid development of Internet of Things (IoT) many smart devices including smart watch and other smart devices have attracted significant attention from both academia, industry, to build IoT based smart solutions including smart homes, smart farming, smart grid and smart healthcare. The smart healthcare is assisted using different body sensors to get the patient data to analyze the health level of a person or a patient, however, the use of smartwatches has high adaptation rate for the health-related data collection and assistance (Masoumian Hosseini et al., 2023). The global smartwatch adoption has reached to 21.7% of the adult population and health and fitness tracking features are more demanding with 60% of users are primarily using it for health and fitness (Pangarkar, 2024). The smartwatch is a personal computing device having multiple functions (i.e. making phone calls, texting, timekeeping, health activities, and fitness tracking) that is worn on the wrist (Ogbanufe & Gerhart 2018).

Unlike the downturn trend seen in the demand for other consumer devices such as smartphones, the global demand for smartwatches has recorded impressive growth. The various functions of smartwatch have attracted the users due to their advantages to offer attractive technology along with healthcare and life style. Smartwatch assists the healthcare using multiple functions like heart rate, blood pressure, fitness promotions, patient tracking and communicating this data to edge and cloud (Cristescu et al., 2022).

All countries are experiencing growth in number of elderly people with respect to general population (Talukder et al., 2020). With the growth of elderly people, providing healthcare facility is becoming a challenge. Smartwatch along with inter-networking of other IoT devices enable to address this challenge. Smartwatch aids for the elderly healthcare, including reduction in hospitalization, improved psychological well-being and support for a healthier overall lifestyle (Kekade et al., 2018; Lee and Lee, 2018). The solutions have potential to control diseases in older age including cardiac, dementia and diabetes (Kekade et al., 2018). Additionally, the communication feature of smart device can help doctor to patient interactions by providing real time data of the patient to healthcare staff and doctors, which can significantly decrease medical costs by reducing the number of required visits to hospitals (Gao et al., 2016; Roman et al., 2015).A lot of research works exist addressing initial insights, approaches, concerns, intentions and behaviors of the older people regarding the use of IoT technologies for their health and its tracking (Talukder et al., 2020; Kekade et al., 2018).

There exist studies on smartwatch use by elderly persons investigating the factors influencing old age adults; however, there is limited research on studying the behavior of elderly persons for adopting smartwatches for the healthcare purpose. Especially the social and technical perspective can provide a comprehensive way of how the elderly get healthcare using technical aspects of smartwatches. Hence analyzing using a socio-technical lens will yield prominent insights into smartwatch technology use and its benefits concerning healthcare. Most of the previous research studies consider studying the behavior of general users for using the smartwatch and using the smartwatch for providing healthcare. However, since smartwatch offer many features that can be used by older adults for managing their health, so a study is required for developing countries to understand behavior and psychological factors in the adoption of smartwatches by elderly ones for healthcare, as the older ones at developing countries usually tend to avoid using the technology.

The application of a socio-technical system considers multiple factors, in addition to the technology itself for implementation design and use of technology in complex healthcare systems (Sittig and Singh, 2015; Irizarry and Barton, 2013). These research works implement social technical model to integrate specific technological and measurement dimensions of healthcare along with hardware and software, clinical content, the human-computer interface. The adoption of wearable activity trackers among elderly individuals in China from a socio-technical perspective (Shu, Li, & Hu, 2018). It examines the interplay between social factors (such as social influence and perceived usefulness) and technical factors (such as ease of use and perceived data accuracy) in shaping adoption behavior.

The socio-technical theory can be applied to the context of studying smartwatch adoption for elderly healthcare. Socio-technical theory underlines the interaction between social and technical factors in shaping human behavior and organizational outcomes. For a research study on smartwatch adoption among the elderly for healthcare purposes, socio-technical theory could provide valuable insights into how both social and technical factors influence adoption and usage patterns.

LITERATURE REVIEW

The smartwatch offers many features for the continuous monitoring of a person. A smartwatch provides many functions such as step-counting, heart rate monitoring, body temperature, energy consumption and monitoring of the physical activity. All of these factors help in health monitoring and can be used to provide healthcare (Cristescu et al., 2022). There exist a lot of research work (Said et al., 2021, Lu et al. 2016, Pang et al. 2021) on the technological aspects of smartwatch and consumer acceptance for general and healthcare use. Yet their adoption rate in real life is very low mainly due to their disruptive nature, requirement of additional smartphone to continue its operations and intrinsic conservativeness of the older people towards any new technology. According to Shin et al. (2019) several studies seem to fail to consider whether the smartwatch has the required functions to complete specific healthcare activities with a special concern of elderly persons adopting or being reluctant while using a smartwatch.

Healthcare Features of Smartwatch

The applications for smartwatches are increasing day by day boosting the Internet of Things, setting a new trend for smartwatch technology (Nagtegaal et al., 2015). Smart wearables offer precise tracking of health data at real-time on any location, during any activities, and are rapidly increasing their market demand (Kang & Jung, 2020). Work by Blaine & Alexandria (2016) showed smartwatches can

promote health by permitting self-monitoring of personal activity at daily to facilitate him in daily life, getting feedback on activity metrics, and helping communication with health care providers and family person. A smartwatch can be used for personal preferences like notifications, a health tracker, communication device, for entertainment or some combinations (Cecchinato, et al., 2015).

The use of smart-healthcare is increasing and related applications are available in most smart watches today making them attractive for sports man and persons anxious about their fitness level. Heart rate monitoring, exercise level, physical activity, heart rate, temperature monitoring and position detection applications are freely available and are in use to monitor their lifestyle. The smartwatch worn by patients on the wrist can record patient data and send this to a smartphone via available communication mean, helping the health-care sector. The smartphone generates an alert for healthcare staff. The application of health activities in smartwatches provides favorable views and behavioral intentions toward smartwatch (Kang & Jung, 2020). The study showed that smartwatches provide very specific health-related information by tracking multiple data permitting its users to vigorously check their health.

Elderly Persons Healthcare Using Smartwatch

Recent developments in smartwatches have led to several applications like smart healthcare and remote health monitoring (Lu et al., 2016). The smartwatch combines features of smartphones with continuous monitoring of health-related data like step-counting, body temperature, heart rate monitoring, and physical activity levels (Glowacki et al., 2018). They can provide feedback to persons by monitoring their health, help in real-time medication based on symptoms, and direct communication with caregivers and doctors (Reeder & David, 2016). People who use the smartwatch or around the arm can get some healthcare data but normally are used to interface with a smart mobile or a smart tablet via Bluetooth, WiFi, or a mobile network to facilitate a smartphone to manage and transmit the data from smartwatch.

Ali and Li (2016) showed how using smartwatches in a nursing home could improve communication and help to prevent fall accidents. A prototype was provide using smartwatch and found that the response time to alarms was reduced when the nursing home used their system instead of the regular one. The healthcare staff can wear the watch and immediately update about alarm and the information related to condition about why alarm was generated.

With the development of smartwatches-based healthcare, it became very easy for people to monitor their health level and their fitness at any location and anytime (Lunney, Cunningham, and Eastin, 2016). Normally it is difficult for people specifically for the older ones to check and monitor their health related parameters, and have some extra care for elderly ones. They have to visit some health centers to test for their blood pressure, temperature, blood sugar level and other factors that can be tedious for the elderly ones if they have to frequently visit the center. Smartwatches can help here to manage and monitor the health status of elderly ones. The smartwatch can collect continuous and real-time data to provide complementary information to some smart healthcare applications finally giving a complete tracking of the person's condition. The smartwatch can monitor one or more criteria regularly, store this data, and analyze it later on to assist healthcare providers in providing and managing their healthcare services (Bloss, 2015). The physiological changes of body temperature and sweat constituents are desirable to understand physiological state of some people and can diagnose common pathological situations like temperature, glucose monitoring, hyponatremia, dehydration, hypokalemia and pressure ischemia (lactate in sweat) (Gao et al., 2016). The circadian rhythm for elderly adults is the hypothalamus, which also controls autonomic functions such as temperature (Nogueira et al., 2014). The smartwatch can actively measure the body temperature and report to the healthcare system in case of some uneven reading. Elderly persons can easily use the smartwatch to monitor their body temperature to avoid some health problems.

Adoption and Acceptance Challenges of Smartwatch by Elderly

Smartwatches getting fame to track human activity in recent years. There are several smartwatch brands available that offers smartwatches with different capabilities enabling the watches to be used in different applications. The sustainability of smartwatch technology consists of different factors including ease of use, usefulness & pleasure (Park, 2020). Dehghani, et al. (2018), discussed how smartwatch is sustainable and that the intention to use the smartwatch was positively adapted due to appealing aesthetic and hedonic motivation. The buyer's buying intention is needed to be noted and studied when he is going for a smartwatch, such as

perceived benefits and design aesthetics of the smartwatch are among high priorities (Kuo-Lun & ChiaChen, 2018).

Just as applications for smartphone are increasing, applications of smartwatch are also continuously increasing and are closely connected to emergence of the Internet of Things, setting a new trend for smartwatch technology (Nagtegaal et al., 2015). According to Adapta (2016), the presence of fitness and healthcare applications in smartwatches is a plus point making users feel it is worth when purchasing a smartwatch. However, factors affecting smartwatch can be classified into nuanced, contextual and multifaceted (Jeong, et al., 2017). Authors in (Blaine and Alexandria, 2016) stated that consumer data is also an issue tied to smartwatch, because smartwatches generate continuous and large amounts of data hence storage will be a significant aspect to be considered in the future. Specifically, in healthcare use, a smartwatch will collect different health related parameters data from the person and its environment.

Socio-Technical Theory and Using Smartwatch for Healthcare

The application of a socio-technical system considers multiple factors, in addition to the technology itself for implementation design and use of technology in complex healthcare systems (Sittig and Singh, 2015; Irizarry and Barton, 2013). These research works implement social technical model to integrate specific technological and measurement dimensions of healthcare along with hardware and software, clinical content, the human-computer interface. The adoption of wearable activity trackers among elderly individuals in China from a socio-technical perspective (Shu, Li, & Hu, 2018). It examines the interplay between social factors (such as social influence and perceived usefulness) and technical factors (such as ease of use and perceived data accuracy) in shaping adoption behavior. The acceptance of wrist-worn activity trackers is studied using a mixed method study among older adults living in the community (Puri et al., 2017). This research considers both social (such as social support and perceived usefulness) and technical (such as usability and data accuracy) factors in understanding adoption behavior.

The research exists implementing social technical theory to explore use of latest technologies for healthcare. Additionally, the use of a socio-technical theory lens to examine how smartwatches can be used for the healthcare of elderly persons in developing countries. The socio-technical theory can be applied to the context of studying smartwatch adoption for elderly healthcare.

METHODOLOGY

This research helps to understand social, and cultural context, specifically examining the issues from the point of view of the elderly like adoption and accaptace. The data will be captured through the technique of narrative interviews with elderly ones, as described by Coffey & Atkinson (1996). Narrative interviews are a way of collecting reviews, comments and stories of persons with a patient centered approach to research and practice. The narrative approach follows person centered study process by placing them at the heart of the study, hence, honors the meanings that they assign to their own stories.

Data Collection

For this study, a semi-structured approach was followed, with a relatively short list of predefined questions, grouped by type. The questions were open-ended and designed to gain an understanding of how the smartwatch is helping toward healthcare. There was an emphasis on how the elderly feel while using the smartwatch for the healthcare. In addition, what additional things or options need to be present in the smartwatch that can urge the elderly ones to easily use the smartwatch technology for healthcare and use it on a regular basis. The interview questions are provided in Appendix A. The goal was to reach the old people and get their reviews about the use of technology for healthcare process. The inclusion criteria are set as the age considered is 60 years or above to be considered as elderly. Moreover, the elderly ones were chosen who owned a smartwatch and using it for healthcare.

Analysis of Data

Qualitative data analysis requires to identify, code, and categorize themes. Thematic analysis explores the meaning of a phenomenon, by coding qualitative information and subsequently identifying themes (Braun, and Clarke 2006). This process also identifies why specific categories were chosen. Thematic analysis will be observed in order to perform this research study. For qualitative data analysis and theme identification a six-step process is proposed, in following details are provided on how this research work is following these steps.

Step 1: Data Familiarization

Transcribe the interview recordings and prepare the notes to become familiar with the data. Read and re-read the notes to engage in the data and identify key points.

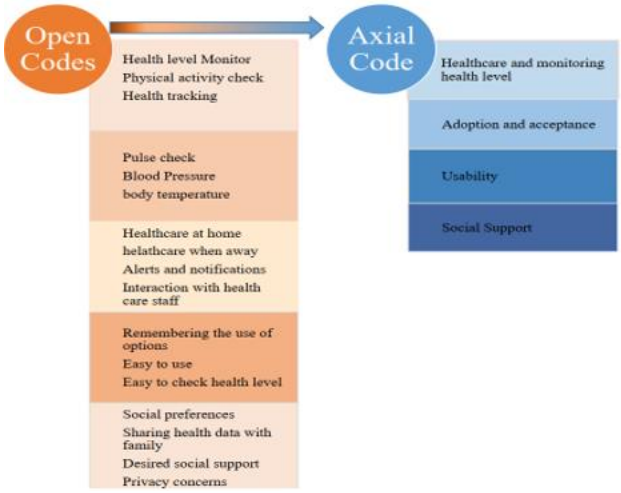

Figure 1 Coding mechanism

Step 2: Coding:

Start by coding and assign descriptive labels or codes to segments of text that were having meaningful concepts or ideas. Above mentioned highlighted features (healthcare benefits, easiness of lifestyle, and understanding of technical features) were coded with labels that accurately reflect the content of each snippet. For this process open coding is followed (Mills, et al., 2006). The explicitly stated themes as well as underlying or implicit themes that emerge from the data were performed. Axial coding helped to identify major categories by sorting and organizing to identify resemblance of different codes identified in open coding phase (Creswell & Creswell, 2018). The open codes and axial codes are provided in Fig. 1.

Steps 3 to 5: Theme Development:

Theme development consists of finding themes, reviewing these and finalizing themes. At the start initial codes were organized into five different categories as shown using different colors in the figure 2 as open codes, after this a detailed review was performed and the identified themes were analyzed according to supporting data to ensure they accurately reflect dynamics of smartwatch adoption and use for elderly healthcare. Refining and revision processes were performed by considering alternative interpretations and perspectives from the data. For this research work major themes emerged related to health monitoring at an older age are as following.

- Health monitoring at older age.
- Usability features of smartwatch for healthcare.
- Smartwatch adoption and acceptance.
- Social support of using smartwatch by elderly.

Step 6: Incorporation:

The final step is incorporating the topics into a logical story that communicates the research findings. The research findings were expressed along with quotes obtained from the interviewees. These quotations helped research findings to perform in-depth analysis and served to emphasize the importance of using smartwatch for elderly healthcare.

EMPIRICAL FINDINGS

This section presents the empirical findings of the research study performed.

Theme 1: Health Monitoring at Older Age

The main concern of study is using smartwatch for elderly healthcare. For this purpose, the participants were asked different questions with main concern on using the smartwatch for healthcare at the older age. Latest technologies are helping here and like the smartwatch that offers many features that can be used for health monitoring. Typically, the older adults in Pakistan are somewhat reluctant to use the latest technology but preferred if used for betterment, so regarding the question "Do you like use of latest technologies in your old age for any task of your life?" asked form the participants they were mixed response to use the latest technologies. Participants highlighted that they will prefer if these are easy.

Response from participant 2 "Yes, I would like using the latest technologies, especially if they help me stay healthy and independent. I find smartwatches quite easy to use."

"I'm all for using the latest technologies, especially if they make managing my health easier." (P3)

"I'm reluctant to use new technologies I faced some hard time to use smartwatch but sounds good for monitoring my health" (P6)

It exhibits comfort can be provided with technology and easiness of smartwatches can be used for healthcare purposes. These people are also willing to opt new technology. A prominent aspect of these technologies emerged as the use of smartwatch for healthcare. A further question put forwarded was regarding the extent of using smartwatch a normal use is observed in the interviews by most of the participants. And when asked the question to what extent they use it for healthcare, the reviews were encouraging as the participants are using the smart watch as it is facilitating them in the healthcare.

"at start it looks tough but the notification feature helped me to align with my health routing and I am using it regular now" (P1)

"I use my smartwatch extensively for healthcare as there exist many health-related applications that help me to live a healthy life" (P2)

"Once I came familiar with smartwatch now, I use it regularly for monitoring my blood pressure, heart rate, and activity levels. It helps me stay on top of my health goals" (P5)

The active engagement with the technology highlights the potential benefits and opportunities associated with smartwatch adoption among elderly individuals. Regular utilization of the smartwatch for monitoring various health metrics reflects a proactive approach towards self-care and health management, indicating a strong alignment between their needs and the capabilities offered by the device. Participants were also asked to tell about the favorite healthcare features of the smartwatch they use and how these are helping in their healthcare. The response was measuring physical activity and heartbeat monitor and temperature recording. One participant said that he uses smartwatch for measuring his blood pressure and checking the oxygen levels and this helped to avoid some emergency as from the notifications he can control the blood pressure and maintain his oxygen level. A prevailing sentiment among the participants was the significant impact of health monitoring features on their daily routines and overall well-being. One participant P-1 expressed, "Thanks to the health monitoring features on my smartwatch, I feel more in control of my health as I can easily track my vital signs." This sentiment was echoed by others, who highlighted the convenience and empowerment that comes with continuous health monitoring.

Theme 2: Usability Features of Smartwatch for Healthcare

The usability features of smartwatches play a pivotal role in shaping their effectiveness as healthcare tools for the elderly population. In a rapidly evolving technological landscape, ensuring that smartwatches are accessible, intuitive, and user-friendly is essential for promoting their adoption and enhancing their utility in healthcare contexts. When asked the participants about are how much you feel comfortable with features of smartwatch and their use for your healthcare:

"the large, easy-to-read display and simple navigation helps the usability. It makes it easy for me to access health-related information and features without feeling overwhelmed" (P1)

"I appreciate the simplicity of the interface" (P3)

This shows elderly feel difficulties at start but the features of smartwatch help to increase usability for healthcare, attributing this to the device's customizable settings and intuitive interface. Some smartwatch features and applications can be made favorite by setting priority or some related options. When the participants asked regarding the favorite features, the participants conveyed about their favorite settings and how they feel comfortable:

"The sleep tracking feature on my smartwatch is one of my favorites. It helps me understand my sleep patterns" (P2)

"The step count application is my favorite it really helped in my fitness and overall health" (P4)

The older adults can easily use, navigate and understand the smartwatch features and memorize them or the notifications and vibrations are helpful regarding the healthcare use. Participant 3 stated "it easy to memorize its features" moreover, he said "I have learned its use within short span of time." One participant said, "if there are only health related features and icons are there, he will be more satisfied." Health monitoring features such as heart rate monitoring, activity tracking, and sleep tracking are highly valued for providing valuable insights into overall health status and promoting proactive health management.

Theme 3: Smartwatch Adoption and Acceptance

Respondents argue that they normally tend to avoid new technologies but smartwatch has great potential and once they know it can be used to monitor healthcare much simpler way they showed positive to accept and adopt it. The most important factor is user acceptance, older people are more vulnerable than people of any other age group, their awareness with respect to digital literacy play and important role. One such response from participant 3 was "after some guidance about smartwatch I started to use the smartwatch for my healthcare, it helped to manage my health easier and more accessible" another similar response was "I've been reluctant to trying new technologies, when I heard about smartwatches for healthcare, I was intrigued. I learnt and now that I've been using one, it helped me stay on top of my medications, track my fitness." (P4). These responses reflect positive experiences and acceptance of smartwatches for healthcare among the elderly.

Theme 4: Social Support of Using Smartwatch by Elderly

Smartwatches equipped with features such as GPS tracking, fall detection, and emergency alerts offer

reassurance to family members by providing real-time updates on the elderly user's location and well-being. this also facilitate effortless communication between elderly users and their family members, enhancing social connectedness and reducing feelings of isolation. When participants asked regarding how they feel along with your family while using smartwatch. Participant 2 expressed that he is comfortable and don't feel shy when using it for his healthcare. "at start I don't use it when I was with my family or going outside with friends and feel very comfortable using my smartwatch around my family. They've been supportive and encouraging so I incorporated it into my healthcare routine." (P5)

This response shows that there is an increased interest and support from their family. Participant 3 stated "the family support was really helpful as regarding critical healthcare notifications are also forwarded to my family and this helped to handle any heath related problem in a good way." The social and family support surrounding the use of smartwatches by the elderly is characterized by encouragement and assistance in integrating the device into their healthcare routine.

"My family and I use the shared activity tracking feature on the smartwatches to stay motivated and accountable for health goals. It's like having a virtual support system that keeps us all on track and encourages healthy habits" (P5). The exploration of health monitoring at older age reveals the profound impact of smartwatch technology in empowering elderly individuals to take charge of their health and well-being. Through regular monitoring of vital signs, physical activity levels, and sleep patterns, smartwatches offer invaluable insights and promote proactive health management among elderly users. Participant responses underscore the effectiveness of health monitoring features in fostering a sense of control and confidence in managing one's health, ultimately contributing to improved health outcomes and quality of life in later years. Participants express appreciation for features such as large displays, intuitive interfaces, and customizable settings, which enhance accessibility and ease of use for elderly users.

DISCUSSION FOR ACCEPTANCE, ADOPTION AND SOCIAL SUPPORT

The subject of smartwatches for healthcare has attracted substantial research. In addition, when talking about the healthcare of the elderly the latest technology is helping much more and new research and development are in progress. Examining smartwatch adoption by the elderly in developing countries like Pakistan through mainly considering the themes like usability features, adoption and acceptance, and social support, offers a broad understanding of the dynamics at play in the adoption process.

Regarding the theme 1, how elderly perceive the role of smartwatches in health monitoring, including their attitudes towards continuous monitoring, the integration of health data into daily routines, and the perceived benefits in terms of proactive healthcare management. A smartwatch can provide desired healthcare outcomes for the old age adults when it is based on their daily life. Outcomes of this study demonstrate the selected elderly feel uncomfortable at start but tend to adopt smart watch for healthcare and add its use to their daily routine for their healthcare. Smartwatches are effective in promoting health, fitness-oriented life among the users when they feel comfortable to wear it for prolonged duration (Adapa et. al, 2018). Reviews of the participants make it clear that tracking heartbeat, blood pressure and body temperature are among common features used by the participants for managing their health by using smart watch. The tastes of respondents showed that the need and behavior was clear that is for healthcare activity, while at the same time it also served as a tool for communications and social aspects as well. This makes it clear that the common perceived value according to the participants is for healthcare and this also accompanied with Iqbal and Jokela (2022). The elderly are using smartwatches to monitor their health & daily activities.

Exploring the usability theme (theme 2) studies have delved into the usability features of smartwatches for healthcare applications, shedding light on their effectiveness in enhancing user experience and promoting adoption among diverse populations, including the elderly. Smith et al. (2020) evaluated the usability of smartwatches among elderly individuals with chronic conditions, focusing on features such as navigation, readability, and ease of use. The findings revealed that participants perceived smartwatches as intuitive and user-friendly tools for managing their health, with clear displays and simple interfaces being particularly praised for their accessibility. These results align with the experiences reported by participants in this paper, the participants emphasized the importance of usability features such as large displays and customizable settings in facilitating their interaction with smartwatches for healthcare purposes.

The adoption and acceptance of smartwatches for healthcare (theme 3) purposes among elderly individuals are influenced by a myriad of factors, including usability, perceived usefulness, and social support. Lee et al. (2020) conducted a study to evaluate the usability of smartwatches for elderly users in healthcare settings. Their findings revealed that features such as medication reminders, activity tracking, and emergency alerts were highly valued by elderly users. Outcomes from this paper support this as the user comments are there claiming that their medication became regular after using the smartwatch for their healthcare and now, they are enjoying the use of smartwatch for their healthcare. One response that he feels that the smartwatch is acting like a personal assistant that notifies him about his medication time to avoid a severe health related problem. This makes clear that usability features such as intuitive interfaces, customizable settings, and health management features are essential for enhancing the usability and acceptance of smartwatches for elderly healthcare users.

Social support (theme 4) and help play a vital role in facilitating the adoption and use of smartwatches among elderly individuals. Family members, caregivers, medical staff, and peers provide encouragement, assistance, and required technical support, which facilitate elderly users' acceptance and engagement with smartwatch technology. Mitzner et al. (2010) explored older adults' attitudes toward technology usage and found that peer support networks can enhance elderly users' confidence and motivation to adopt new technologies. Existing studies have highlighted the importance of social support to facilitate the adoption and acceptance of smartwatch technology among the elderly for healthcare purposes. These emphasize the importance of peer support and community help in promoting the adoption and continued use of smartwatch technology among elderly individuals.

Overall, the results from existing studies underscore smartwatch adoption among elderly individuals in healthcare settings and the importance of considering socio-technical factors in examining this phenomenon. By critically analyzing these studies through a socio-technical theory lens, a deeper understanding was obtained related to interplay between social, technical, smartwatch technology factors that shape the adoption, acceptance, and utilization of smartwatch technology among elderly healthcare users.

CONCLUSION

This study confirms the significant roles of perceived usefulness, adaptability, facilitating applications, features, and self-reported healthcare status in directly predicting the intention to use of elderly toward smartwatch for their healthcare. On the one hand, the findings fill the research gap of older adults' acceptance of smartwatch while on the other hand the study helps community and other stakeholders to carry out feasible plans to facilitate the adoption of the smartwatch technology for the healthcare. In this study, majority of the participants expressed their willingness to accept smartwatch for the healthcare. The results showed that perceived usefulness and adaptability are the antecedents of intention to use smartwatch technology.

Collectively, the material and studies provided contribute to both research and practice by offering evidence-based insights into the factors influencing smartwatch adoption and use among elderly individuals. Healthcare professionals can get benefits from the insights and recommend the older adults to use the smartwatch technology for the healthcare. By understanding the social, technical, and organizational dynamics shaping elderly users' engagement with smartwatch technology, researchers, healthcare practitioners, and technology developers can design interventions and solutions that better meet the needs and preferences of elderly users, ultimately improving their health outcomes and quality of life. Overall, the material and studies provided serve as valuable resources for advancing our knowledge of smartwatch adoption among elderly individuals and informing efforts to promote the effective use of technology in healthcare settings.

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APPENDIX A: INTERVIEW QUESTION TEMPLATE

INTRODUCTION

Dear Respondent , hello!

This study is being undertaken as part of a master's thesis in informatics at the Linnaeus University. The rapid development of smart watch and the widespread application of mobile-related apps may completely change our concept of health prevention, medical services, and thus completely affect the health of each of us. To better understand and take advantage of the important contribution of using smartwatch for your healthcare, you are invited for an interview to understand the smartwatch use details for the helathcare at old age. The best research results will be delivered that can be used for the betterment of the community, thank you for your support.

QUESTIONS

Background

Question: Do you like use of latest technologies in your old age for any task of your life?

Question: How long you are using smartwatch for healthcare?

Health & Fitness Monitoring

Question: To what extent do you currently use smartwatch for any aspect of your life?

Question: To what extent do you currently use a smartwatch for the healthcare?(baseline)

Question: Which healthcare features do you like most in your smartwatch, and how they are helping in healthcare activities? (Tangible & intangible benefits).

Question: Which features of smartwatch are helpful for you to manage your health?

Question: How do you say that using a smartwatch have improved overall health?(Narrrative)

Question: Do you feel any change in your life routine related to healthcare by using this smart technology? If yes, then how? (Narrrative)

Question: Do you feel conscious about your health when the smartwatch is put on charging or the smartwatch is away from you for any reason?

Adoption and Social Behavior

Question: How would you say the use of smartwatch is acceptable by older persons for helathcare purpose? (Narrrative)

Question: Do you feel comfortable along with your family while using smartwatch?

Question: Do you use it as much as in the beginning, more, or less? Reason

Question: Which feature do you like most in your smartwatch and how are they impacting in your daily work life?