

A Preliminary Sentiment Analysis on Digital Barriers among Senior Citizens During Covid-19 Pandemic

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Abstract: Nowadays, digital technology has been an important element in assisting the community in their daily routine. During the COVID-19 era, The Special Committee for Ensuring Access to COVID-19 Vaccine Supply (JKJAV) has been initiated to assist the health and well-being of Malaysian citizens in recovering from the COVID-19 pandemic. *MySejahtera*, a healthcare application technology, has been used by Malaysian citizens for seeking vaccination information as well as updating their health status. While there are benefits to using the application, there is still a challenge in using the technology among senior citizens. This study aims to investigate digital barriers to using a healthcare application, known as *MySejahtera*, among senior citizens in Kelantan. This study also reveals lessons learned regarding the use of technology among senior citizens during the Covid-19 era. Convergent parallel mixed method research design is initiated to produce a sentiment analysis for identifying digital barriers issues and challenges among senior citizens in Kelantan. 5 respondents aged from 60 to 80 years old were interviewed to obtain their sentiments on using digital technology for vaccination information and Covid-19 news. This study highlights issues namely awareness of knowledge, misconception about digital technology, information quality and technology usage among the senior citizens in Kelantan. This study summarizes that there is a need to reduce digital barriers among senior citizens to ensure digital inclusion for their benefit in health and well-being.

Keywords: *Digital Barriers, Senior Citizens, Digital Technology, Sentiment Analysis*

1. Introduction

Nowadays, digitalization has been widely used in various sectors such as education, banking, manufacturing, telecommunication, entertainment, businesses, healthcare, and many more. Digital technology can help the community increase productivity, and improve communication and efficiency for better decision-making. While society is comfortable with using technology, there is still a challenge in adopting technology among senior citizens due to possible factors that may contribute to digital barriers (Kaushik, 2022). To elaborate, the digital barrier can be defined as a digital divide that prevents an individual from accessing information using technology (Calderón Gómez, 2018) whereas another study defines a digital barrier as the difficulty in accessing the resources and inability to use the content online or offline (Uzule & Verina, 2023). In 2020, during the COVID-19 pandemic, digitalization can be considered an important element for obtaining updates on COVID-19 news. In Kelantan, as reported in 16 Mei 2021 (Wahid, 2021), most of the individuals who were not present for the vaccination were senior citizens aged 60 and above thus has affected the wastage of vaccine doses in the community. The State Health Director, Datuk Dr Zaini Hussin has mentioned that the government at national and state levels needs to play its part in mobilizing their efforts towards making the vaccination program a success. Hence, this research will further investigate whether the vaccination information in Kelantan given by the government can be effectively disseminated among the senior citizens in Kelantan by using digital technologies. During the COVID-19 period, the Malaysian government required everyone in the country to install and use the *MySejahtera* mobile application as a digital communication tool to convey health-related information namely vaccinations, infectious disease tracker as well as their current location.

The focus of this paper is to emphasize the implication of digital barriers using the Digital Divide Theory (Coventry et al., 2022). Digital Divide Theory discusses how generational gaps in technology adoption create barriers, as many older adults grew up without digital devices, making them less familiar with modern technology. Their resistance to technology may lead to social isolation, limited access to information and

challenges in accessing essential services (Van Dijk, 2020) like healthcare (Reddy et al., 2022) which are currently increasing in online platforms. By exploring senior citizens' sentiments regarding digital technology, this paper can highlight possible digital barriers to using the *MySejahtera* application among senior citizens in Kelantan. To elaborate, sentiment analysis has grown rapidly in parallel with the development of the Internet.

It has been used not just among researchers but also among businesses, governments, and organizations (Sánchez-Rada and Iglesias 2019). Sentiment Analysis (SA) or Opinion Mining (OM) is the computational study of people's opinions, attitudes and emotions toward individuals, events or topics. These topics are most likely to be covered by reviews (Medhat et al., 2014). Sentiment analysis is widely used in many sectors. For instance, in marketing and customer service, they apply sentiment analysis in analyzing reviews, surveys, and social media to gauge customer satisfaction and identify areas for improvement. In the finance domain, sentiment analysis helps analyze news articles, social media, and financial reports to predict market trends and stock performance. For the healthcare sector, sentiment analysis evaluates patient reviews and feedback on healthcare services to improve patient care and service quality. The findings from this paper will be used to identify possible actions that will be taken to address the issue regarding digital barriers in Kelantan. While there are benefits in using *MySejahtera*, there is still a challenge in using the technology among senior citizens. Therefore, a study has been done to obtain a preliminary finding on the digital barrier situation among senior citizens in the selected area of Kelantan, especially during the COVID-19 pandemic. By producing sentiment analysis, this paper reveals lessons learned regarding the awareness of knowledge, misconceptions about digital technology, information quality and technology usage. Next, Section 2 provides an overview of sentiment analysis and related literature regarding possible factors that contribute to digital barriers to using technology.

2. Related Literature

This section consists of related literature on sentiment analysis and possible digital barriers according to the literature namely awareness of knowledge, misconception about digital technology, information quality and technology usage.

Digital barriers among senior citizens

According to the International Telecommunications Union (ITU), 4.1 billion people were connected to the Internet in 2019 and increasing (del Portillo et al., 2021). According to the Department of Statistics Malaysia (DOSM), the composition of the population aged 65 years and over increased from 7.2% in 2022 to 7.4% in 2023, encompassing 2.5 million people, indicating that Malaysia is experiencing population aging (DOSM, n.d.) while The Malaysian Communications and Multimedia Commission in its Internet Users Survey 2020 report (MCMC, 2020) showed that 11.3% of Malaysians were non-internet users. 51.8% of non-internet users were reported to be aged 60 and above. Based on the report, the common factors of not using the Internet were unconcern on the Internet, too old to learn the Internet and having no device for using the Internet. These factors have been discussed in the Senior Technology Acceptance and Adoption Model (STAM) (Renaud, K., Van Biljon, 2008) where different age factors influence older people's decision to use technology. The elderly population has difficulty in familiarizing themselves with and adopting digital tools and services (Vassilakopoulou & Hustad, 2023). However, a study (Niehaves & Plattfaut, 2010) that used the Unified Theory of Acceptance and Use of Technology (UTAUT) and TAM has reported that the elderly population can be encouraged to use digital technologies. In motivating the elderly population to use digital technologies, they need assistance, and encouragement from their support system to use user interface designs (Guner & Acarturk, 2020).

The digital divide can be described as the incapability to understand technology (Pinar, 2024) and this may lead to digital inequalities, especially in digitalized societies. Digital barriers may exist by gender, geographical location, age group, income and education (Acilar & Sæbø, 2023; Ndoya & Asongu, 2024; Pinar, 2024; Thomä, 2023; Zhao et al., 2023). By looking at the related literature regarding senior citizens and technology, hence, this paper highlights the existence of digital barriers issue which can impact unequal access to various information, and lack of education in a growing digital-based community and thus, this will lead to a feeling of ignorance or feeling left out within the digital age.

Overview of sentiment analysis

Sentiment analysis is a research branch of text mining that can be used to analyze opinions from a text document. Sentiment analysis is carried out in many fields such as media social, e-commerce, e-business and many more. Sentiment analysis or opinion mining is subjective since it represents an individual's thoughts and presumptions about everything that occurs (Kumar et al., 2021). Another study mentioned that sentiment analysis is the process of determining an author's viewpoint on a specific subject and can be evaluated based on words, phrases, or texts (Nandwani & Verma, 2021). Various research implementing sentiment analysis has been carried out many times, including research conducted by (Fauziyyah, 2020) about the COVID-19 pandemic. Sentiment analysis is classifying a block of text as positive, negative, or neutral. It is also referred to as opinion mining, an approach to natural language processing (NLP) that identifies the emotional tone of the text. The main objective of sentiment analysis is to analyze people's opinions in a way that can help to improve the organization or process.

Awareness of knowledge

Awareness of knowledge can be defined as the consciousness of the mind about some issues (Collazos et al., 2002). In engaging individuals with health awareness, it is crucial to know the impact of COVID-19 on each individual and to understand how it can get worse. In this case, knowledge and attitude concerning the disease are useful for preventing, controlling, and mitigating infections during the outbreak (Razu et al., 2021). Therefore, the community members need to play their role in helping to reduce any health risks related to Covid-19. However, attitude can also have an impact on perceiving healthcare knowledge. A previous study done by (Frishammar et al., 2023) stated that negative attitudes and technology anxiety are the key barriers that are affecting technology adoption in healthcare technology and education activities are recommended to increase the trust and awareness in using digital healthcare platforms.

Misconceptions about digital technology

Digital and technological solutions are essential for better workplace safety and health outcomes (Gan & Seah, 2024). However, the community usually misunderstands and believes technology is only relevant for advanced medical procedures or specialized care, not daily health management or preventive measures. This misconception usually derives from a lack of awareness about using technology tools and their potential benefits to the individual's health status. There was an initiative made by The Australian Government that introduced an app-based contact tracing to prevent the spread of COVID-19 in April 2020. However, the download and use of the apps were not favorable due to privacy concerns (Thomas et al., 2020).

Information quality

Information quality can be defined as users' subjective judgment of whether the information characteristics meet their own needs and intended use (Jiang et al., 2021). According to Jiang et al., information quality refers to the user's assessment of whether the information meets their requirements and wants. In Malaysia, during the COVID-19 Movement Control Order, senior citizens utilized the Internet to search for relevant information regarding the different types of vaccines to determine which is the most suitable based on their body condition. This is a crucial aspect for them as providing healthcare to the elderly is always a top concern and they are the most vulnerable group because of their weakened immune systems. Consequently, a poor decision about healthcare could hurt their health (Lee et al., 2021).

Nowadays, the Internet has become a functional tool for communication and information searching and is not only used by young adults but also employed by senior citizens. According to (Ahmad et al., 2020), nine out of ten senior citizens use the Internet to get updates on current news rather than seeking health-related information. Previous research in the banking domain stated that fear of financial scams, lack of digital skills and lack of help are the reasons why senior citizens restrain themselves from using the Internet (Thomas et al., 2023).

Technology usage

In recent decades, significant technological advancements across various domains have profoundly enhanced the overall quality of life. The influence of digital technologies has notably improved efficiency in performing everyday tasks and increased awareness of individual health and wellness. Digital technologies offer various innovative solutions and benefits for senior citizens in maintaining and improving their health (Harris et al.,

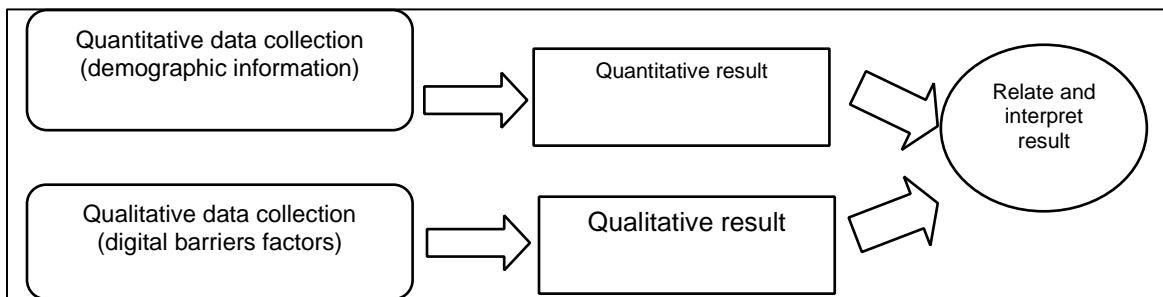
2022). The primary advantage of integrating technology into adult healthcare is remote health monitoring. Through technological innovations, senior citizens can now remotely monitor their health, allowing for the early detection of potential health issues and proactive management of chronic conditions. Utilizing wearable devices like smartwatches and fitness trackers, seniors can effortlessly track vital signs and activity levels, gaining valuable insights into their overall health status. This capability not only empowers older adults to take a proactive stance towards their well-being but also enables healthcare providers to intervene promptly and effectively when necessary (Fowe & Boot, 2022).

The second advantage is in terms of access to information and services. Technology serves as a valuable resource for health education and empowerment among senior citizens. Online health portals, mobile applications, and virtual support groups offer a wealth of information on health topics, disease management strategies, and preventive measures (Lai et al., 2023). By equipping older adults with knowledge and resources, technology empowers them to make informed decisions about their health and actively participate in their care. Furthermore, digital technology provides the best social support and engagement platform. Maintaining social connections is essential for seniors' mental and emotional well-being. Technology facilitates social support and engagement through social media platforms, online communities, and video communication tools. These digital channels enable older adults to stay connected with loved ones, participate in virtual social activities, and access peer support networks, thereby combating feelings of loneliness and isolation (Grey et al., 2024).

3. Research Methodology

This study has used a convergent parallel mixed-method research design to accomplish the research objectives. Figure 1 visualizes convergent parallel mixed method research design.

Figure 1: Convergent parallel mixed method research design



A convergent parallel mixed method research design is initiated to produce a preliminary sentiment analysis for identifying digital barriers issues and challenges among senior citizens in the selected areas of Kelantan such as Kota Bharu and Machang. The convergent parallel design occurs when the researcher uses concurrent timing to implement the qualitative and quantitative strands during the same phase of the research process (Rahman, 2014). This qualitative study that was conducted by using a sentiment analysis process was aimed to investigate digital barriers in using a healthcare application, known as *MySejahtera*, among senior citizens in the selected locations in Kota Bharu and Machang, Kelantan. By investigating digital barriers, this study can reveal a preliminary finding regarding the use of technology among senior citizens during the COVID-19 pandemic.

The research has its limitations in terms of the number of respondents obtained. With the challenging research environment during the Movement Control Order (MCO) in the year 2021, these respondents were selected by using consecutive sampling based on reachable and selected respondents' locations. First and foremost, this research has randomly selected 3 senior citizens located in a suburban area within the Machang area and 2 other senior citizens who are within the Kota Bharu area. Participation in the study was entirely voluntary. Before conducting the study, all respondents were aware of the purpose of the study and the confidentiality of the data. Each person participating in the interview was free to opt out of the session at any time. In this study, demographic data on 5 senior citizens has been quantitatively analyzed to obtain the relationship with the

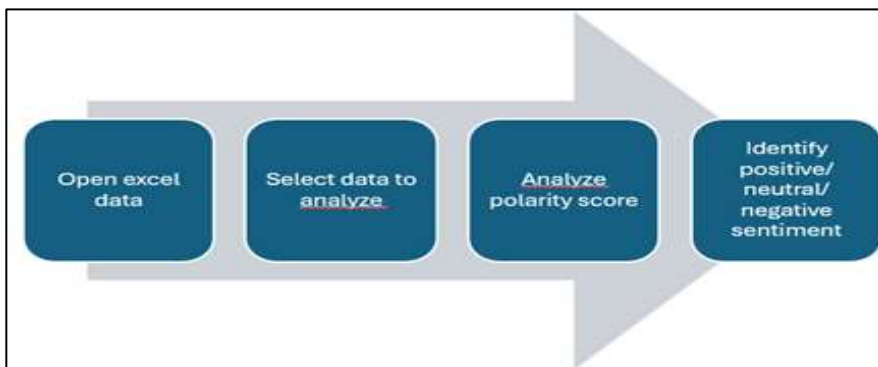
qualitative result. For the qualitative data collection, 5 senior citizens have been interviewed regarding possible digital barriers that they have faced while using the application. The quantitative result and qualitative results are interpreted to produce a preliminary sentiment analysis for digital barriers during the COVID-19 pandemic. Using 5 structured interviews, 5 responses were obtained from five senior citizens aged over 60 years old from Machang and Kota Bharu which represented suburban and urban locations in Kelantan. The interviews were conducted based on a structured set of questions developed by using existing literature which consists of awareness of knowledge, misconceptions about digital technology, information quality and technology usage. The respondents were asked about their opinion towards Covid-19, vaccination information as well as their health status. Convergent parallel mixed method research design results sentiment on digital barriers among respondents during the COVID-19 pandemic. This study has methodological limitations which it has presented qualitative results based on only five healthy respondents and those respondents may or may not have any mobile phones.

4. Results and Discussion

This paper highlights a preliminary finding for identifying digital barriers based on age group, especially among senior citizens aged 60 and above. For sentiment analysis purposes, respondents were chosen from 60 years of age and older with three female and two male respondents. Two of the respondents did not use mobile phones while the remaining three respondents own a mobile phone with *MySejahtera* installed. Regarding the frequency of mobile usage, 2 out of 5 respondents used their mobile phones for less than two hours and the remaining three respondents used the mobile phone within two to eight hours. All of them spent around one to two hours seeking information about COVID-19. According to respondents' feedback, they agree that digital literacy affects awareness of Covid-19 however qualification may or may not influence the awareness of Covid-19 risks. The respondents were asked about their opinions regarding information dissemination on COVID-19. The authors have identified four categories related to digital barriers such as awareness of knowledge, misconception of technology, quality of information and information usage.

In this study, sentiment analysis was produced to quantify the amount of personal opinions, feelings, or personal views contained in the transcribed text from the interview session. The sentiment score and sentiment analysis result were reported as positive, neutral and negative scores. Figure 2 depicts steps to produce the sentiment score by performing the sentiment analysis process.

Figure 2: Sentiment analysis steps for producing sentiment score



According to Lohar et al. (2017), negative sentiment results score below 0.5, while sentiment neutral has a sentiment score equal to 0.5 and positive sentiment results in a sentiment score more than 0.5. By looking at the sentiment score, the study can conclude whether there are digital barriers issues that arose among respondents who have been selected in Kelantan.

Table 1 shows the awareness of knowledge regarding COVID-19 among the community. The questions in Table 1 have led to positive sentiments ranging from 0.69 to 0.97. From the interview session, the respondents felt positive and aware Covid-19 information can be obtained on television and social media platforms such as WhatsApp and YouTube application. Those respondents also agreed that vaccination can help to reduce the

Covid-19 effect. The respondents are also aware of the verified source of information on Covid-19. In summary, the respondents own the knowledge about Covid-19 based on their responses on Covid-19 symptoms and vaccination.

Table 1: Sentiment Polarity for Awareness of Knowledge

Question	Sentiment Score	Sentiment
What is COVID-19? Do you know about COVID-19?	0.84	positive
What are the symptoms of COVID-19?	0.69	positive
How does COVID-19 influence the public?	0.78	positive
What is vaccination?	0.83	positive
What is the effect of vaccination?	0.77	positive
How does the vaccine affect the COVID-19 pandemic?	0.82	positive
Did you know where to get a booster shot?	0.73	positive
What are the things about COVID-19 and vaccines that attract public interest?	0.80	positive
Is television the source of information for rural areas?	0.97	positive
Are you aware that there are verified sources of information for COVID-19 on social media?	0.85	positive

Table 2: Sentiment Polarity for Misconception of Technology

Question	Sentiment Score	Sentiment
Give your opinion how to prevent from getting exposed to COVID-19	0.68	positive
Where does this disease come from?	0.76	positive
Is this vaccine necessary for improving health?	0.62	positive
How do you know whether information about COVID-19 information about vaccines is authentic?	0.66	positive
State your feelings when reading, seeing, and watching COVID-19 on social media/TV or radio.	0.38	negative

Table 2 reveals Sentiment Polarity for Misconception of Technology. This result shows the use of social media is useful in giving information on Covid-19. All the respondents understand and have negative sentiment, with a 0.38 sentiment score, after reading, seeing, or watching about COVID-19 on television or social media platforms. In summary, there is no issue with a misconception of technology since the sentiment on technology to obtain COVID-19 information is understood and the score indicates ranged from 0.62 to 0.76.

Table 3: Sentiment Polarity for Information Quality

Question	Sentiment Score	Sentiment
Did you understand the information given by the government?	0.71	positive
Do you know how the information is obtained?	0.69	positive
Did you trust the information given about COVID-19?	0.72	positive
Do you think the information given is easy to understand?	0.78	positive

Table 3 concludes positive sentiment ranged from 0.69 to 0.78 regarding information quality on COVID-19 and vaccination. They believe that reliable information has been given to the public by using reliable channels on television. In investigating technology usage, the result in Table 4 shows positive sentiments toward the *MySejahtera* application, however, they have some difficulties in using QR code technology which yields a sentiment score of 0.45. This highlights that they accepted *MySejahtera* but they have limited knowledge of QR technology since the technology is new to them and they have no exposure to QR code. Generally, the technology usage is still within positive sentiment.

Table 4: Sentiment Polarity for Technology Usage

Question	Sentiment Score	Sentiment
Do you know what is <i>MySejahtera</i> ?	0.69	positive
How likely that you will be using a QR code in <i>MySejahtera</i> ?	0.45	negative
In your opinion, how social media can help to spread more news about COVID-19 and vaccines?	0.66	positive
Are you aware that <i>MySejahtera</i> can be utilized for seeking health status?	0.66	positive

In summary, based on Table 1 to Table 4, the authors have elaborated on possible digital barriers among senior citizens. Firstly, in terms of awareness of knowledge, the senior citizens have previously heard about COVID-19, however, they did not know about the symptoms of the disease in detail. Secondly, in terms of the misconception of technology, the senior citizens mentioned that they only read or watch COVID-19 news on television as their news channel even though the social media platforms provide more options for seeking COVID-19 information. This is due to the inability to use and operate a smartphone by themselves.

In terms of information quality, the senior citizens were able to understand the content of the information obtained from either the television or from their family members whereas in terms of technology usage, the senior citizens understand the needs of *MySejahtera* application during the Covid-19 pandemic. However, they have insufficient knowledge regarding the QR code technology that is embedded in the application.

5. Conclusion

Nowadays, technology plays a major role in helping the community to gain information instantly. All generations including the senior citizens are inclusive in the technology adoption. However, there is still room for improvement in educating and supporting senior citizens to self-learn new technology. Proper guidance and tools must be prepared for them to allow ease of use for adopting technology in their daily life. The authors believe that currently there is no issue in accepting technology among senior citizens. Generally, they already understood why such technology is imposed in the current situation during the COVID-19 pandemic. Nonetheless, the caretaker or the community needs to be aware that senior citizens must also be continuously informed about the importance of using current technology such as QR codes to avoid digital barriers and feelings of ignorance. There must be a consistent effort by the community to educate senior citizens in using technology as well as giving them appropriate knowledge on technology for using the right assistive technology. In conclusion, this study summarizes that there is a need to reduce digital barriers among senior citizens to ensure digital inclusion for their benefit in health and well-being from time to time. There is also a plan to further investigate assistive technology for senior citizens to improve digital inclusion in society.

The limitation of this study is that it focuses on the general acceptance of technology among senior citizens without going into detail about the difficulties they encounter in real-world situations. Although the study highlights the value of educating and assisting senior citizens in adopting technology, it might not address individual differences in technological proficiency or the variety of demands of seniors with different levels of cognitive and physical abilities. Furthermore, the study's findings may be limited since it relied more on general observations and assumptions about senior citizens' understanding of technology during the COVID-19 pandemic rather than detailed, empirical data from a variety of senior citizen groups. The usefulness and accessibility of various assistive technologies, which are crucial to digital inclusion, are not given enough attention. Future work should aim to explore these obstacles and evaluate the effectiveness of various assistive technologies to enhance digital inclusion for senior citizens. This involves determining which tools and educational approaches are most effective in overcoming the digital barrier and enhancing usability. The study should also explore personalized support systems that consider individual differences in technological proficiency and accessibility requirements.

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