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The Effect of Digital Transformation on the Information Access Gap for the Elderly in Makassar City

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Abstract

This study examines the impact of digital transformation on the gap in access to information among the elderly in Makassar City. The study focuses on three main variables: access to technological devices, frequency of use of digital services, and digital skills. This study involved 100 elderly respondents who were selected using a simple random sampling technique. The results show that these three variables significantly affect the information gap, with digital skills having the greatest impact. Elderly people with high digital skills are better able to access, understand, and use digital information for daily needs, while limited access to technological devices and low frequency of digital service use exacerbate the information gap. The practical implications include the urgent need for the government and stakeholders in Makassar City to design policies that support the digital literacy of the elderly through community-based training, affordable digital devices, and the improvement of inclusive technological infrastructure. Future research should expand geographic and demographic coverage, integrate qualitative methods, and evaluate the effectiveness of digital literacy programs in addressing information gaps.

Keywords: *Digital Divide, Digital Transformation, Elderly, Digital Literacy.*

1. Introduction

In the digital age, technology has advanced rapidly toward digitalization, and quick and easy access to information has become a hallmark of this era. These rapid advances in technology have brought about many significant changes (Ilyas & Hartono, 2023). The rapid development of digital technology has brought about major changes in the way people access and manage information. The transformation towards the digital age opens up opportunities to improve quality of life, expand knowledge, and strengthen social participation. However, amid this acceleration, a serious problem has emerged in the form of the digital information divide, namely the difference in individuals' abilities and opportunities to obtain and utilize technology-based information. One of the groups most affected by this divide is the elderly (Rahmawati, 2023).

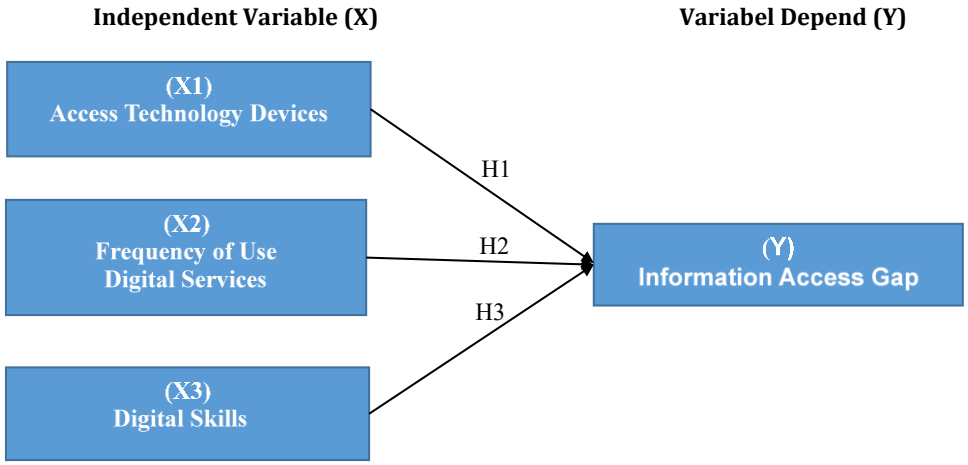
Based on the results of research conducted by the Indonesian Internet Service Providers Association (APJII) on Indonesian Internet User Penetration in 2024, there has been an annual increase in penetration rates in Indonesia. As of 2024, there are 221 million internet users out of a total population of 278 million in Indonesia. The highest percentage of internet user penetration is among millennials aged 28-43 years old, at 93.17%, followed by Gen Z aged 12-27 years old, at 87.02%. However, the use of communication technology is not evenly distributed across all age groups. This is the case for baby boomers aged 60-78 years, with a total percentage of 60.52%, and pre-boomers aged 79 years and above, with a total percentage of 32.00%. According to the WHO's age classification, individuals aged 60 and above are considered elderly. This disparity occurs due to individuals' lack of skills and ability to understand, access, and use information media that have emerged from the development of digital technology.

In urban areas such as Makassar City, which is implementing various smart city programs, this gap is becoming increasingly contrasting. Elderly people who do not have adequate digital devices and skills are at risk of being further marginalized from the modern online-based information ecosystem. Therefore, it is important to examine the factors that influence the information access gap among the elderly so that digital inclusion policies can be targeted appropriately. Some of the factors that influence the digital information gap among the elderly are Access to Technological Devices, Frequency of digital service use, and Digital Skills.

The first factor is access to technological devices. The information gap, especially among the elderly, is largely caused by limited access to technological devices such as computers, smartphones, and tablets (Kurniawan & Setyawan, 2019). Many elderly people have difficulty

obtaining these devices due to financial constraints and a lack of understanding of technology (Rahmatiah & Asiyah, 2019). This creates a significant gap in the ability to receive and process digital information. The second factor is the frequency of digital service use. The low frequency of use is due to a lack of understanding of the benefits and functions of digital services, concerns about technical errors or failures, and a lack of guidance or training. Rapid digital transformation has made access to information and daily activities easier, but older adults often face challenges in using these services, resulting in a lower frequency of use compared to other age groups (AF Shah, 2021). The third factor is digital skills. Digital skills are a person's ability to use information and communication technology effectively to access, understand, and utilize information (Cahyarini, 2021). These concepts cover a wide range of topics, from technical skills, such as the use of digital devices, to cognitive skills, such as information literacy for evaluating the reliability and relevance of content. For older adults, digital skills are often challenging due to age factors, which can affect their ability to learn new technologies (Tulungen et al., 2022).

Based on the research questions in Figure 1, a series of hypotheses were formulated: (H1) there is a positive and significant effect between Access to Technological Devices and the Information Access Gap; (H2) there is a positive and significant effect between the Frequency of digital service use and the Information Access Gap; (H3) There is a positive and significant influence between digital skills and the Information Access Gap. Thus, this study develops a conceptual framework that describes the relationship between access to technology devices, frequency of digital service use, and digital skills on the information access gap.



Picture 1. Theoretical Framework

H1: Access to Technology Devices (X1) has a positive and significant influence on the Information Access Gap (Y).
H2: The frequency of use of digital services (X2) has a positive and significant influence on the Information Access Gap (Y).
H3: Digital Skills (X3) have a positive and significant influence on the Information Access Gap (Y).

2. Method

This study uses a quantitative method with a quantitative descriptive approach, which aims to describe and explain phenomena systematically, factually, and accurately in relation to the relationship between variables. Quantitative descriptive research describes, examines, and explains something that is studied as it is, and draws conclusions from observable phenomena using numbers (Sulistyawati et al., 2022). With this foundation, this study seeks to present structured and statistically tested data to objectively describe the relationship between the variables studied.

The main focus of this study is to analyse the influence of Access to Technology Devices, the frequency of use of digital services, and Digital Skills on the Information Access Gap. Data in this study were obtained through a survey method using a questionnaire as the main data collection instrument. The questionnaire was compiled based on indicators that refer to previous theories and research results, then measured using a five-point Likert scale to assess the respondents' level of agreement with each statement.

The sampling technique used was purposive sampling, which is the selection of respondents based on certain criteria predetermined by the researcher. Purposive sampling is a sampling technique in which subjects are deliberately selected based on certain criteria deemed relevant by the researcher (Subhaktiyasa, 2024). The criteria for respondents in this study were elderly people aged 60 years and above who use digital applications. This study used the Slovin approach, with a sample size (n) obtained from the elderly population in Makassar City of 141,894 people. The sample size was determined using the Slovin formula with a margin of error of 10%, yielding the following results:

$$n = \frac{141.894}{1+141.894 \ x \ (0.1)^2}$$

$$n = \frac{141.894}{1.428}$$

$$n = 99$$

This calculation resulted in a sample size of 99 respondents, which was then rounded up to 100 respondents to simplify the analysis process.

Furthermore, to analyze the collected data, this study used descriptive and inferential analysis with a Structural Equation Modeling-Partial Least Squares (SEM-PLS) approach.

All items were measured using a Likert scale, which allowed researchers to assess respondents' attitudes toward each statement provided. Furthermore, to facilitate the interpretation of results, the assessments were classified into five categories using a continuum based on percentage (Kasmadi & Sunariah, 2013). This operationalization not only serves as a reference in the development of questionnaire instruments but also forms the basis for the quantitative data collection and analysis process. With clear and measurable indicators, this study ensures that each construct examined has scientifically accountable validity and reliability. Based on this foundation, the SEM-PLS approach was chosen as the main analysis method due to its effectiveness in evaluating complex models and its tolerance for non-normally distributed data (Hair, 2022). This method also does not require a large sample size, making it more accessible for studies with a moderate number of respondents. In addition, the use of SmartPLS 4 is motivated by its efficiency and ability to analyze research models. Thus, SEM-PLS is considered the most appropriate approach for assessing the direct effects of independent variables on dependent variables.

To implement this analysis, the research process in SmartPLS 4 is structured into two main components: the measurement model (outer model) and the structural model (inner model). The outer model was evaluated to ensure construct validity and reliability, through convergent validity (factor loadings ≥ 0.70 and AVE ≥ 0.50) and reliability (Cronbach's alpha > 0.60 and composite reliability >0.70) (Hair, 2022). Furthermore, the inner model is used to test the strength and significance of the relationship between latent variables, using indicators such as R^2 and path coefficients. Next, the proposed hypotheses were tested, and the bootstrapping technique was applied with a two-tailed approach at a significance level of 5% ($\alpha = 0.05$). The hypothesis was considered accepted if the t-statistic exceeded 1.96 and the p-value was below 0.05 (Hair, 2022).

3. Results

Table 1. Respondent's Demographic Profile

Characteristic	Makassar City	
	Freq	%
Gender		

Characteristic	Makassar City	
	Freq	%
Man	54	54%
Woman	46	46%
Age		
60-74 Year	13	13%
75 - 90 Year	55	55%
>90 Year	32	32%
Education Level		
SD	0	0%
SMP/MTS	0	0%
SMA/SMK	32	32%
S1	40	40%
S2	28	28%
Long Stay in Makassar City		
< 1 Year	19	19%
1 – 3 Year	12	12%
4 – 6 Year	15	15%
> 7 Year	54	54%

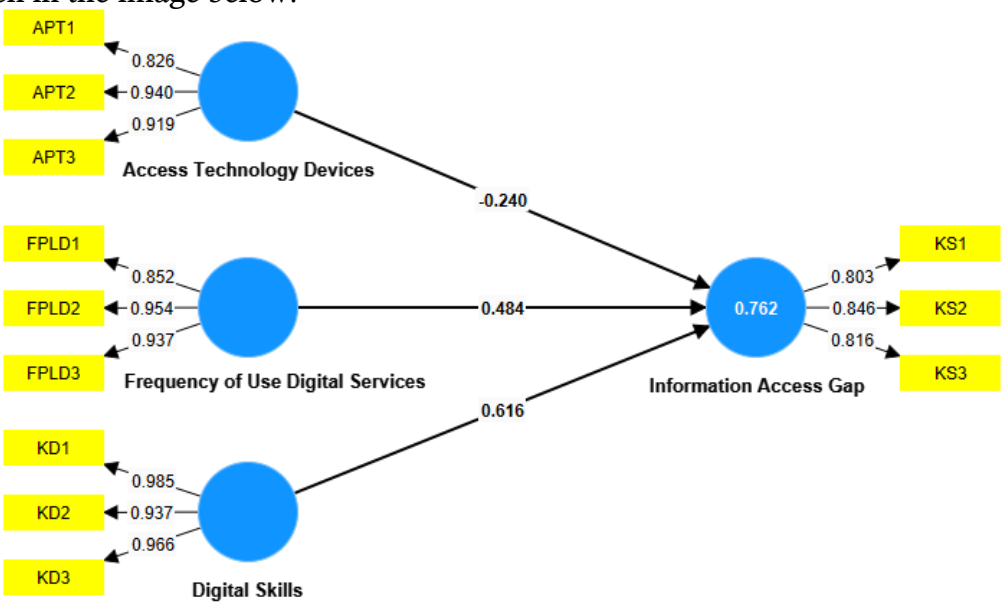
The majority of respondents in this study were older, with 55% aged 75-90 years. This demographic is very much in line with the research focus on the information access gap caused by digital transformation, according to statistics on respondent characteristics in Makassar City. With 54% male and 46% female, the gender distribution was fairly balanced, allowing for analysis to include gender perspectives on access to digital information. With 40% of respondents holding a bachelor's degree and 28% holding a master's degree, the majority of respondents were moderately educated, but only 32% had completed high school. This suggests that there may be a digital divide that is more related to technological proficiency than formal education levels. 54% of respondents said they had been in Makassar City for more than 7 years, indicating that they had lived there for quite a long time but may not have the necessary skills or access to digital technology.

3.1 Outer Model

3.1.1 Validity Test

Validity testing is divided into two types: convergent validity and discriminant validity. Convergent validity values are obtained from factor loadings on latent variables with their indicators, which are expected to have values > 0.70 (Hair, 2022). Meanwhile, discriminant validity uses Average Variance Extracted (AVE). If the Average Variance Extracted

(AVE) value is above 0.5, then it can be stated that each variable has good discriminant validity (Hair, 2022). The convergent validity results can be seen in the image below:



Picture 2. Outer Model

Based on this test, all indicators have an outer loading value > 0.70, so it can be said that all indicators meet convergent validity.

Table 2. Average Variance Extracted (AVE) Result

Variable	**Average Variance Extracted (AVE)**	*Information*
Access Technology Devices	0.804	Valid
Frequency of use of the Digital Service	0,838	Valid
Digital Skills	0,927	Valid
Information Access Gap	0,675	Valid

Based on the results in Table 1, it can be seen that all variables have an AVE value > 0.50, so it can be said that all variables in this study meet convergent validity.

3.1.2 Reliability Test

The most commonly used measure of reliability is internal consistency. To test reliability or internal consistency, researchers can use indicators such as Cronbach's Alpha and Composite Reliability (rho_c). In

this reliability test, researchers use Cronbach's Alpha and Composite Reliability (rho_c). Data is considered reliable if it obtains a Cronbach's Alpha value > 0.70 and Composite Reliability (rho_c) > 0.70 (Hair, 2022).

Table 3. Reliability Test

Variable	*Cronbach's Alpha*	*Composite Reliability*	*Information*
Access Technology Devices	**0,880**	**0,925**	**Reliable**
Frequency of use of the Digital Service	**0,903**	**0,939**	**Reliable**
Digital Skills	**0,960**	**0,974**	**Reliable**
Information Access Gap	**0,760**	**0,862**	**Reliable**

All constructs in this study were found to have strong internal consistency, as indicated by Cronbach's Alpha values exceeding the minimum threshold of 0.60 and composite reliability exceeding 0.70. In addition, the Average Variance Extracted (AVE) value for each construct was also above 0.50, indicating that the proportion of variance explained by the indicators for each construct was quite high. Therefore, it can be concluded that all constructs in the model meet the criteria for validity and reliability, making them suitable for use in the structural model analysis phase.

3.2 Inner Model

Inner Model analysis or structural model in PLS is used to predict causal relationships between the variables being tested. This structural model is evaluated through R-Square (Ghozali, 2022). The R-Square value is used to measure how much variation is explained by the model in the endogenous variable. This value indicates the strength of the model's prediction, with the following criteria: 1. R-Square ≥ 0.67: Strong model 2. 0.33 ≤ R-Square < 0.67: Moderate model 3. R-Square < 0.33: Weak model.

Table 4. Results of the R-squared test

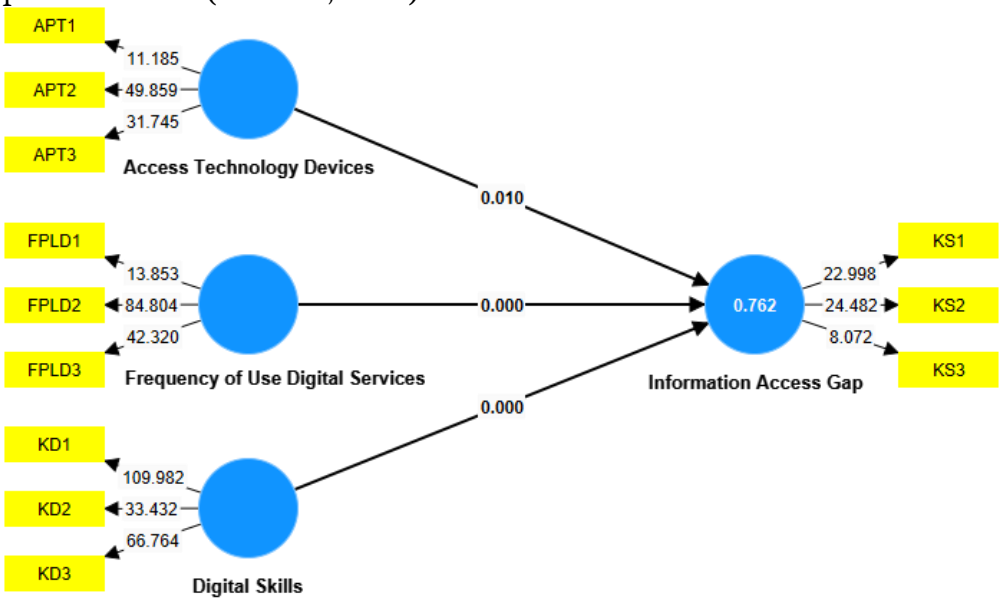
Variable	*R Square*	*R Square Adjusted*	***Information***
Information Access Gap	0.770	0.760	Strong

Based on Table 4, the information access gap construct has an R-squared value of 0.760 or 76%. This figure means that the variables of access technology devices (X1), frequency of digital service use (X2), and

digital skills (X3) affect the information access gap (Y) by 76%. The remaining 24% is influenced by other variables not examined in this study.

3.3 Hypothesis test

Hypothesis testing uses statistical values, so for an alpha of 5%, the t-statistic value used is 1.96. Thus, the criteria for accepting or rejecting the hypothesis are that Ha is accepted and H0 is rejected if the t-statistic > 1.96. To reject or accept the hypothesis using probability, Ha is accepted if the p-value < 0.05 (Ghozali, 2022).



Picture 3. Inner Model / Boostrapping Test

The structural model was evaluated using the bootstrapping technique implemented with SmartPLS software. This process aimed to test the strength and significance of the relationships between variables in the model. The visualization of the analysis results is shown in Figure 3, while a summary of the hypothesis testing results, including coefficient values, is shown in Table 5.

Table 5. Hypothesis Test

Variable	Original Sample (O)	Sample Mean (M)	STDEV	T-Statistics (|O/STDEV|)	P value	Hypothesis
Access Technolo	-0.240	-0.219	0.094	2.567	0.010	Rejected

Variable	Original Sample (O)	Sample Mean (M)	STDEV	T-Statistics (|O/STDEV|)	P value	Hypothesis
gy Devices						
Frequency of Use of Digital Services	0.484	0.496	0.135	3.584	0.000	Accepted
Digital Skills	0.616	0.594	0.165	3.729	0.000	Accepted

4. Discussion

This study aims to examine the influence of digital transformation on the information access gap among the elderly in Makassar City, focusing on three main variables, namely access to technology devices, frequency of use of digital services, and digital skills. Based on the results of the analysis, the three hypotheses tested showed significant results, where the influence of digital transformation on the information access gap was closely related to these three factors. Further discussion of the three hypotheses will be associated with the relevant theoretical framework.

Hypothesis 1 shows that access to technological devices has a significant negative effect on the information access gap, with a p-value of 0.010. This means that the more limited the elderly's access to technological devices, the greater the gap they experience in accessing information (Erwin et al., 2024). Within the framework of the Digital Divide Theory, limited access to technological devices will limit a person's ability to access the digital world, which can exacerbate the information gap, especially for the elderly who have limitations in operating devices (Yani et al., 2024). Without adequate devices, the elderly cannot access various information available digitally, which has an impact on the gap they experience (Press, 2022). Therefore, the results of this study support the argument that limited access to technological devices increases the information access gap for the elderly.

Hypothesis 2 shows that the frequency of digital service use has a significant positive effect on the information access gap, with a p-value of 0.000. This means that the more often the elderly use digital services, the smaller the gap they experience in obtaining information. The high

frequency of use of digital services among the elderly indicates a greater level of convenience and engagement in the digital world, which directly reduces the information access gap (Arumi & Yanto, 2019). In addition, the Digital Literacy Theory also supports these findings by stating that more frequent use of technology will improve a person's digital skills and ability to access information more efficiently (Widowati & Khusaini, 2022). This study shows that the elderly who use digital services more often have more opportunities to reduce the existing information gap.

Hypothesis 3 shows that digital skills have a significant positive effect on the information access gap, with a p-value of 0.000. This indicates that the better the digital skills possessed by the elderly, the smaller the gap they experience in accessing information. Within the framework of Digital Literacy Theory, digital skills are the main element that allows individuals to operate devices and use technology effectively (Widyastuti et al., 2016). Seniors who have better digital skills can access, understand, and utilize various digital information resources available.

5. Conclusion

Based on the analysis results, it can be concluded that access to technological devices, frequency of digital service use, and digital skills have a significant effect on the information access gap among older adults. Access to technological devices shows a significant but negative effect, meaning that the availability of devices alone is not enough to reduce the information access gap if it is not accompanied by the ability to use them. Conversely, the frequency of digital service use and digital skills have a positive influence, indicating that the more often older adults use digital services and the higher their digital skills, the smaller their gap in obtaining information. Overall, digital skills are the most influential factor in narrowing the information access gap among older adults.

However, this study has some weaknesses, such as a limited sample of the elderly in Makassar City and the use of survey methods that may not fully represent the experience of the elderly in general. In addition, the lack of data triangulation to support the results of the study can affect the generalization of the findings. Therefore, further research is suggested to expand the geographical and demographic scope, integrate qualitative methods to explore the experiences and barriers of the elderly in more depth, and explore the influence of sociocultural factors in overcoming the digital divide. Further research can also evaluate the effectiveness of digital literacy intervention programs to produce more evidence-based policies.

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