Addressing the Digital Divide: A Study on the Predictors of Government E-Service Utilization in Thailand

Natnaree Wongmith
Onvipa Phueng-ngern

Abstract

With the advancement of digital technology, governments have created more channels for citizens to access government services. However, there are disparities in accessibility and utilization of the services, leading to uneven benefits across the population. This study investigated the determinant factors of e-government service utilization and identified the sociodemographic characteristics and technological usage of individuals who used and did not use the services. The study analyzed data from the 2023 Nationwide Telecommunications Usage Behavior and Device Access Survey (n = 47,100). Chi-squared test, z-test and binary logistic regression were employed to analyze the data. The findings indicated that age, education, geographical location, mobile broadband technology, and type of data cap are significant predictors of e-government utilization.

Keywords: Digital divide, E-Government service utilization, Mobile internet access, Prepaid service, Postpaid service, Survey research

บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่มีความสัมพันธ์ต่อการใช้งานบริการภาครัฐผ่านระบบอิเล็กทรอนิกส์ (E-Government Service) ซึ่งสะท้อนสถานการณ์ความเหลื่อมล้ำทางดิจิทัลของประเทศไทย โดยมุ่งศึกษาใน 2 ประเด็นได้แก่ (1) ความแตกต่างของการใช้งานบริการภาครัฐผ่านระบบอิเล็กทรอนิกส์ระหว่างกลุ่มตัวอย่างที่มีลักษณะทางประชากรศาสตร์และทางการใช้งานเทคโนโลยีโทรคมนาคมที่ต่างกัน และ (2) ปัจจัยที่มีความสัมพันธ์ต่อการใช้งานบริการภาครัฐผ่านระบบอิเล็กทรอนิกส์ เพื่อนำไปสู่ข้อเสนอแนะด้านนโยบายในการกำกับดูแลที่จะช่วยให้ประชากรไทย โดยเฉพาะกลุ่มเปราะบาง เช่น ผู้สูงอายุ ผู้มีรายได้น้อย ผู้มีระดับการศึกษาต่ำ และผู้อาศัยอยู่นอกเขตเมือง สามารถเข้าถึงโอกาสในการใช้ประโยชน์จากเทคโนโลยีดิจิทัลอย่างเท่าเทียมและเกิดประโยชน์สูงสุด การศึกษานี้เป็นการศึกษาเชิงปริมาณ ใช้ข้อมูลจากแบบสอบถามการสำรวจพฤติกรรมการใช้และการเข้าถึงโทรคมนาคม พ.ศ. 2566 ซึ่งจัดทำโดยสำนักงานสถิติแห่งชาติและสำนักงาน กสทช. มีประชากรตัวอย่างคือ ประชากรไทยที่มีอายุระหว่าง 18 - 76 ปี ทั่วประเทศ (n = 47,100) การวิเคราะห์ข้อมูลใช้การทดสอบไคสแควร์ การทดสอบค่าซี และการวิเคราะห์การถดถอยโลจิสติกทวิภาค

ผลการวิจัยพบว่า กลุ่มตัวอย่างที่มีอายุ ระดับการศึกษา รายได้ เขตที่อยู่อาศัย ค่าบริการโทรศัพท์เคลื่อนที่ เทคโนโลยีโครงข่ายโทรคมนาคมเคลื่อนที่ และข้อจำกัดของการใช้งานอินเทอร์เน็ตความเร็วสูงที่แตกต่างกัน มีการใช้งานบริการภาครัฐผ่านระบบอิเล็กทรอนิกส์ที่ต่างกัน และ ปัจจัยที่มีผลต่อการใช้งานบริการภาครัฐผ่านระบบอิเล็กทรอนิกส์ในผู้ใช้บริการโทรศัพท์เคลื่อนที่ ได้แก่ เพศ อายุ การศึกษา รายได้ เขตที่อยู่ ค่าใช้จ่ายโทรศัพท์เคลื่อนที่ เทคโนโลยีโครงข่ายโทรคมนาคมเคลื่อนที่ และข้อจำกัดของการใช้งานอินเทอร์เน็ตความเร็วสูง

คำสำคัญ: ความเหลื่อมล้ำทางดิจิทัล การใช้งานบริการภาครัฐผ่านระบบอิเล็กทรอนิกส์ การใช้งานอินเทอร์เน็ตผ่านโทรศัพท์เคลื่อนที่ การใช้บริการโทรศัพท์เคลื่อนที่ระบบเติมเงิน การใช้บริการโทรศัพท์เคลื่อนที่ระบบรายเดือน

1. Introduction

In today's digital era, rapid advancements of technology are transforming information processing and communication (Corradini & Corradini, 2020). Governments worldwide, including Thailand, are keen to leverage this potential. In recent years, Thailand has prioritized integrating digital technology to enhance citizens' access to government services (Sagarik et al., 2018). Over the past decade, the Thai government has launched various digital initiatives, such as the "Pao Tang" health wallet for healthcare services and "Thai ID" for digital identity verification. These e-government services facilitate online access to government services, reducing the need for physical presence.

The introduction of e-government services, while offering promising benefits, raises concerns about the digital divide (Bélanger & Carter, 2009). In Thailand, although nearly 90 percent of the population reported internet connectivity (WorldBank, 2022), mere access does not necessarily translate into actual utilization (Van Dijk, 2017). This unequal utilization could lead to disparities in economic and social opportunities, creating an uneven distribution of benefits (DiMaggio et al., 2004). As higher usage tends to disproportionately benefit the individuals with greater resources and abilities, there is a pressing need for government to address the digital divide to ensure equitable access and utilization of e-government services across all segments of society.

Although studies in Thailand have examined mobile internet adoption (Srinuan et al., 2012) and factors for e-government success (Apriliyanti et al., 2021), little research has explored the specific factors influencing e-government service utilization. Understanding these determinants can lead to targeted interventions to promote e-government usage, ultimately benefiting Thai citizens.

Using a large dataset, this research aims to identify the determinants of e-government service utilization in Thailand. It examines the impacts of sociodemographic and technological factors, including price and service quality, to ensure a holistic understanding of the issue.

2. Literature Review

2.1 Digital Divide

Definitions

The concept of the digital divide emerged around the mid-1990s as policymakers and social scientists were concerned about the unequal distribution of internet access and its increasing usage (DiMaggio & Hargittai, 2001). Initial research on the digital divide referred to it as a binary distinction between those who have physical access to computers, the internet, and information technology, and those without (Castells, 2002), known as the first-level digital

divide. As internet connectivity has become more prevalent, the focus shifted to inequalities in usage and digital skills (second-level divide) (Van Deursen & Van Dijk, 2019). More recently, scholars have further explored the outcomes and benefits of using digital technology, known as the third-level digital divide (Van Deursen & Helsper, 2015). This study focuses on the second level digital divide as we aim to identify the determinant factors of e-government service utilization. Consequently, we conceptualize the digital divide as the unequal usage of online government services among individuals with varying sociodemographic backgrounds and technological usage.

The Determinant Factors of Digital Divide

Numerous studies have investigated the influencing factors of the digital divide (Barzilai-Nahon, 2006; Scheerder et al., 2017; Van Deursen & Helsper, 2015). A systematic review organized the influencing factors into nine categories: sociodemographic, socioeconomic, personal elements, social support, type of technology, digital training, rights, infrastructure, and large-scale events. Sociodemographic factors, such as age (Czaja et al., 2006), geographical location (Lee et al., 2021), education (Clark & Gorski, 2001), income (Chakraborty& Bosman, 2005), and gender (Bimber, 2000), have been identified as significant explanatory variables in most digital divide studies. However, considering only sociodemographic factors is insufficient in explaining the non-or limited use of technologies. Technological factors, such as internet speed and quality of service, also play a crucial role in determining the digital gap (Várallyai et al., 2015).

2.2 E-government

Definitions

The concept of e-government has been prevalent since the late 1990s (Beynon-Davies, 2007), with various definitions proposed over time (Hu et al., 2009). The Organization for Economic Co-operation and Development (OECD) defined e-government as “the use of information and communication technologies, and particularly the Internet, as a tool to achieve better government” (OECD, 2003). The definitions of e-government vary across countries, reflecting priorities in government strategies (OECD, 2003). In this research, we employ the Thai definition, which is defined as government services provided through an online platform to address the needs of citizens and related sectors in a timely manner (Electronic Transactions Development Agency, n.d.).

E-government Utilization

E-government utilization involves using information and services offered by the government (Nam, 2014). Previous studies further proposed five types of e-government use: obtaining general information, seeking information related to government policies, participating in decision-making and discussion processes, co-creating policies, information, and services with government and other citizens (Nam, 2014; Bertot et al., 2010).

According to Thailand's Digital Government Development Plan (2023-2027), the Thai government aims to transform into a digital government and enhance public service quality by utilizing digital technology, focusing on areas such as education, public health, and social welfare inequality (Digital Government Development Agency, 2022). In recent years, multiple e-government services have been launched to facilitate convenient access to government services for citizens without requiring physical presence. Examples include e-tax filing, Thai ID, and e-payment.

Based on the literature review cited above, disparities in e-government utilization are anticipated among individuals with varying sociodemographic characteristics and technology use. The existing literature suggests the inclusion of age, gender, income, education, and residential location as sociodemographic factors influencing e-government usage. Furthermore, technological factors such as mobile expenses, type of mobile broadband technology, and internet access limitation are also posited to play a role.

The first research question focuses on examining the proportion of e-government usage across users with diverse demographic profiles and technological usage, and assessing whether statistical differences exist among these groups. The second question identifies the primary factors influencing e-government use or non-use, divided into sociodemographic and technological perspectives. Thus, the following research questions were raised.

Research Questions

RQ1. Are there any disparities in government e-service utilization among individuals with different sociodemographic backgrounds and technological affordability?

RQ2. What are the primary factors influencing the likelihood of government e-service utilization?

- ***RQ2a.*** What is the impact of sociodemographic characteristics on government e-service utilization?
- ***RQ2b.*** What is the impact of technological affordability on government e-service utilization?

3. Methodology

Data Collection

This research utilized secondary data from a nationwide survey jointly conducted by the National Statistical Office and the Office of the National Broadcasting and Telecommunications Commission (NBTC). Officers from the National Statistical Office conducted face-to-face interviews with individuals aged 18-76 in households across Thailand, using tablets to record responses. The survey employed stratified two-stage sampling, collecting 47,100 representative samples. The survey was conducted between 4 to 31 August, 2023.

Measures

The original questionnaire was in Thai language comprising five sections. However, for this research, we focused solely on the effects of sociodemographic and technological factors on the utilization of e-government services. Consequently, the following factors were included:

Sociodemographic factors were measured by (1) Gender, (2) Age, (3) Education, (4) Income, and (5) Geographical area.

For prepaid service, ***technological factors*** were measured through (1) Mobile expenses and (2) Mobile broadband technology. For postpaid service, *technological factors* were measured through (1) Mobile expenses, (2) Mobile broadband technology, (3) Amount of mobile internet, and (4) Internet data cap.

The utilization of e-government services was assessed by asking respondents: “Do you use the internet for the following purpose? Participating in government services (e.g., registering for and participating in government services, and using e-government applications, etc.?)” (1= “Yes”, 2= “No”).

Data Analysis

Descriptive statistics, a chi-squared test, and a Z-test (RQ1), as well as a binary logistic regression analysis (RQ2) were performed. A chi-squared test is used to examine the distributions of categorical variables. A binary logistic regression is commonly used in social science research to predict the probability of a binary outcome based on two or more independent factors.

The original dataset contains 47,100 observations. Prior to the analysis, observations that did not meet the criteria – individuals who did not use mobile internet (n = 4,765) – were removed. Missing data (n = 218) were inspected on a case-by-case basis and treated as invalid responses. The final dataset (n = 42,335) was divided into prepaid users (n = 24,464) and postpaid users (n = 17,653) due to the distinct characteristics of these service types.

4. Results

Research Question 1

To investigate disparities in e-government service utilization across demographic backgrounds and technological usage, a chi-squared test of independence was conducted to examine the difference between users and non-users of e-government services.

Table 1 showed the frequency and proportion of individuals who utilize e-government services and those who do not. The proportion of respondents utilizing e-government services differed across sociodemographic and technological factors. For prepaid data, the chi-squared test revealed statistically significant differences in the e-government usage based on age, X^2 (3, N = 24,464) = 1,349.8, p < .001, education, X^2 (5, N = 24,464) = 1,145.9, p < .001, geographical location, X^2 (1, N = 24,464) = 28.52, p < .001, and mobile broadband technology, X^2 (2, N = 24,464) = 236.08, p < .001. For postpaid data, the chi-squared test indicated significant differences in e-government usage based on age, X^2 (3, N = 17,653) = 177.1, p < .001, education, X^2 (5, N = 17,653) = 193.35, p < .001, mobile broadband technology, X^2 (2, N = 17,653) = 14.528, p < .001, data cap, X^2 (2, N =17,653) = 25.838, p < .001.

Next, Z-tests were performed to examine differences between e-government service users and non-users. For prepaid users, the results showed significant differences in income, Z = 18.892, p < .001 and mobile expense, Z = 20.157, p < .001 between e-government service users and non-users. Similarly, for postpaid users, there were significant differences in income, Z = 9.689, p < .001 and mobile expense, Z = 7.591, p < .001 between the two groups.

Research Question 2

Prior to the binary logistic regression, Pearson's correlation coefficients were calculated to assess the interrelationships among predictor variables. For prepaid service users, income had a weak positive correlation with mobile expense, r(24,462) = .259, p < .001. For postpaid service users, income exhibited a moderate positive correlation with mobile expense, r(17,651) = .324, p < .001. Additionally, mobile expense and the amount of mobile internet were weakly and positively correlated, r(17,651) = .272, p < .001, as well as income and the amount of mobile internet, r(17,651) = .099, p < .001.

Next, the binary logistic regression analyses were performed to evaluate the impact of demographic and technological usage factors on the likelihood of e-government service utilization and identify the most influential predictors. For prepaid service users, the binary logistic regression model correctly identified 69.46% of the positive cases ("yes") and 4.82% for the negative cases ("no").

For postpaid service users, the binary logistic regression model correctly identified 83.37% of the positive cases ("yes") but failed to predict negative cases ("no"). The binary logistic regression outputs were presented in Table 2.

Table 1.

Frequency and Proportion of E-Government Service Utilization Among Prepaid and Postpaid Service Users by Demographic and Technological Factors

	Prepaid			Postpaid		
Variables	**Utilize**	**Non-utilize**	**Total**	**Utilize**	**Non-utilize**	**Total**
Age						
18-24	4,128	1,422	5,550	2,838	692	3,530
25-42	6,160	1,301	7,461	5,156	766	5,922
43-57	5,400	1,843	7,243	4,827	904	5,731
58-76	2,167	2,043	4,210	2,041	647	2,688
Gender						
Male	8,681	3,284	11,965	7,273	1,525	8,798
Female	9,174	3,325	12,499	7,589	1,484	9,073
Living area						
Inner	6,974	2,334	9,308	7,367	1,443	8,810
Outer	10,881	4,275	15,156	7,495	1,566	9,061
Education						
Never	75	115	190	24	18	42
Less than primary	254	294	548	112	38	150
Primary	4,867	2,926	7,793	2,426	742	3,168
Secondary	9,313	2,653	11,966	6,664	1,401	8,065
Undergraduate	3,294	610	3,904	5,379	781	6,160
Graduate	52	11	63	257	29	286
Mobile broadband technology						
3G	618	530	1,148	188	42	230
4G	13,710	4,962	18,672	6,685	1,471	8,156
5G	3,527	1,117	4,644	7,989	1,496	9,485
Data cap						
Limit				1,437	371	1,808
FUP				7,196	1,335	8,531
Non-FUP				6,084	1,230	7,314

Table 2.

Binary Logistic Regression Analysis of The Likelihood of E-Government Service Utilization of Postpaid Users

	Prepaid			Postpaid		
Predictors	β	SE β	*p* value	β	SE β	*p* value
Intercept	-0.875	0.173	.000***	0.215	0.382	.573
Age						
18-24						
25-42	0.448	0.045	.000***	0.397	0.060	.000***
43-57	0.196	0.047	.000***	0.301	0.062	.000***
58-76	-0.559	0.054	.000***	-0.115	0.073	.118
Gender						
Female						
Male	-0.150	0.031	.000***	-0.104	0.041	.012*
Living Area						
Inner						
Outer	-0.101	0.032	.001**	0.030	0.042	.475
Income	<0.0001	<0.0001	.000***	<0.0001	<0.0001	.001***
Education						
Never						
Less than primary	0.451	0.176	.010*	0.724	0.377	.055
Primary	0.754	0.155	.000***	0.709	0.329	.031*
Secondary	1.195	0.157	.000***	0.969	0.329	.003**
Undergraduate	1.415	0.162	.000***	1.218	0.331	.000***
Graduate	1.071	0.380	.005**	1.294	0.388	.001***
Mobile expense	0.001	<0.0001	.000***	0.0002	0.0001	.070
Mobile internet amount				<0.0001	0.002	.958
Mobile broadband technology						
3G						
4G	0.485	0.065	.000***	-0.182	0.181	.316
5G	0.594	0.072	.000***	-0.112	0.181	.538
Data cap						
Limit						
FUP				0.250	0.067	.000***
Non-FUP				0.094	0.136	.489

*Note. *p <.05 , **p <.01 , ***p <0.001*

5. Discussions

The primary objective of this research is to investigate the disparities in e-government usage and non-usage across different demographic groups and technology use. Our findings revealed that 77.28% of respondents had utilized e-government services. For prepaid service users, factors such as age, gender, income, education, residential location, mobile expenses, and mobile broadband technology contribute to an individual's e-government service usage. Similarly, for postpaid service users, age, gender, income, education, and data cap influence their government e-service utilization.

Regarding prepaid services, education is the factor that is most likely to influence the use of e-government services. However, income and mobile expenses do not exhibit a strong impact on utilization. The marginal effect calculated at the mean showed that utilization of 5G mobile broadband technology instead of 3G increased the likelihood of e-government service utilization by 10.2%. Furthermore, living outside of municipal areas decreased the likelihood of e-government service utilization by 1.91%.

In postpaid services, education is identified as the factor that has the most influence on e-government service use. However, similar to prepaid services, income and mobile expenses do not show a strong impact on utilization. The marginal effect calculated at the mean revealed that being subjected to a Fair Use Policy (FUP) rather than a limited data cap increased the likelihood of using e-government services by 3.36%. Additionally, belonging to the 58-76 years old age group lowered the chance of using e-government services by 1.59%.

6. Implications

Our findings yield policy implications for the national government agency and the national telecommunications regulatory authority.

Implications for National Government Agencies

The results highlight the need for targeted communication strategies for e-government services, especially for vulnerable populations such as the elderly, underprivileged communities, low-income individuals, those with limited education, and rural residents. These groups may benefit from tailored communication methods that effectively promote e-government services, such as using simple language, clear terms, and user-friendly interfaces with pictorial instructions. Additionally, e-government applications or websites should consider users with slow or limited internet connections by offering a "lite version" that consumes less data.

Implications for National Telecommunication Regulatory Agencies

The findings suggest that the availability of 5G mobile broadband technology could increase e-government service usage. Therefore, expanding 5G infrastructure and coverage in rural areas is essential. Additionally, mobile expenses positively impact e-government service utilization, thus the NBTC should ensure fair and reasonable service fees for Thai citizens. This can be achieved by monitoring the costs imposed on telecommunication operators, which may be passed on to customers as higher prices or lower service quality.

7. Limitations

While this study yielded significant findings, certain limitations should be acknowledged. Firstly, the use of secondary data sources may reduce accuracy. For example, e-government usage was measured using a dichotomous yes/no question, failing to capture the exact services used, the ways individuals interacted with these services, or the benefits they obtained. Future research should include more comprehensive questions to explore the degree of engagement and the benefits users receive from e-government services.

8. Conclusion

This study examines the second-level digital divide by analyzing factors influencing e-government service utilization. We found that having higher education, utilizing 5G, and being subject to the Fair Usage Policy (FUP) are important factors in increasing the utilization of e-government services. In contrast, being part of the elderly population and living in rural areas decreases the likelihood of using these services. To bridge the divide, targeted policies should be implemented to facilitate citizen engagement with digital technology and enhance their quality of life. Assessing digital inequality requires a multifaceted approach, considering social resources, economic conditions, cultural context, institutional support, education, skills, and political factors. This research aims to contribute to a more comprehensive understanding of the problem to better support individuals' autonomy in using digital technology.

References

Apriliyanti, I. D., Kusumasari, B., Pramusinto, A., & Setianto, W. A. (2021). Digital divide in ASEAN member states: Analyzing the critical factors for successful e-government programs. *Online Information Review,* 45(2), 440-460.

Barzilai-Nahon, K. (2006). Gaps and bits: Conceptualizing measurements for digital divide/s. *The Information Society, 22*(5), 269-278. https://doi.org/10.1080/01972240600903953

Bélanger, F., & Carter, L. (2009). The impact of the digital divide on e-government use. *Communications of the ACM, 52*(4), 132-135. https://doi.org/10.1145/1498765.1498801

Bertot, J. C., Jaeger, P. T., Munson, S., & Glaisyer, T. (2010). Social media technology and government transparency. *Computer, 43*(11), 53-59. https://doi.org/10.1109/MC.2010.325

Beynon-Davies, P. (2007). Models for e-government. *Transforming Government:* People, Process and Policy, 1(1), 7-28. https://doi.org/10.1108/17506160710733670

Bimber, B. (2000). Measuring the gender gap on the Internet. *Social Science Quarterly, 81*(3), 868-876.

Castells, M. (2002). *The Internet galaxy: Reflections on the Internet, business, and society.* Oxford University Press.

Chakraborty, J., & Bosman, M. M. (2005). Measuring the digital divide in the United States: Race, income, and personal computer ownership. *The Professional Geographer, 57*(3), 395-410. https://doi.org/10.1111/j.0033-0124.2005.00486.x

Clark, C., & Gorski, P. (2001). Multicultural education and the digital divide: Focus on race, language, socioeconomic class, sex, and disability. *Multicultural Perspectives, 3*(3), 39-44. https://doi.org/10.1207/S15327892MCP0303_7

Corradini, I., & Corradini, I. (2020). *The Digital Landscape. Building a Cybersecurity Culture in Organizations: How to Bridge the Gap Between People and Digital Technology,* 1-22.

Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., & Sharit, J. (2006). Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging, 21*(2), 333-352. https://doi.org/10.1037/0882-7974.21.2.333

Digital Government Development Agency. (2022, June 21). *Thailand digital government development plan 2023-2027*. https://www.dga.or.th/policy-standard/policy-regulation/dga-019/dga-027/dg-plan-2566-2570/

DiMaggio, P., & Hargittai, E. (2001). From the 'digital divide' to 'digital inequality': Studying Internet use as penetration increases. Princeton: *Center for Arts and Cultural Policy Studies, Woodrow Wilson School, Princeton University, 4*(1), 4-2.

DiMaggio, P., Hargittai, E., Celeste, C., & Shafer, S. (2004). Digital inequality: From unequal access to differentiated use. *Social inequality,* 355-400.

Electronic Transactions Development Agency. (n.d.). *Government e-service elevating government capability to serve the public.* https://www.etda.or.th/th/Useful-Resource/Digital-Service/The-Power-and-Development-of-Government-e-Services.aspx?feed=cb66f430-5546-4dd8-b279-3827e88d154b

Electronic Transactions Development Agency. (n.d.). *The power and development of government e-services.* https://www.etda.or.th/getattachment/44e7f628-79f2-43a8-8bfc-a3201e4e3c23/The-Power-and-Development-of-Government-e-Services.aspx

Hu, G., Pan, W., Lu, M., & Wang, J. (2009). *The widely shared definition of e-Government: An exploratory study.* The Electronic Library, 27(6), 968-985. https://doi.org/10.1108/02640470911004066

Lee, H. Y., Kanthawala, S., Choi, E. Y., & Kim, Y. S. (2021). Rural and non-rural digital divide persists in older adults: Internet access, usage, and attitudes toward technology. *Gerontechnology, 20*(2). https://doi.org/10.1093/geroni/igaa057.1329

Nam, T. (2014). Determining the type of e-government use. *Government Information Quarterly, 31*(2), 211-220. https://doi.org/10.1016/j.giq.2013.09.006

OECD. (2003). *The e-government imperative.* https://doi.org/10.1787/9789264101197-en

Sagarik, D., Chansukree, P., Cho, W., & Berman, E. (2018). E-government 4.0 in Thailand: The role of central agencies. *Information Polity,* 23(3), 343-353. https://doi.org/ 10.3233/IP-180006

Scheerder, A., Van Deursen, A., & Van Dijk, J. (2017). Determinants of Internet skills, uses and outcomes. A systematic review of the second-and third-level digital divide. *Telematics and Informatics, 34*(8), 1607-1624. https://doi.org/10.1016/j.tele.2017.07.007

Srinuan, C., Srinuan, P., & Bohlin, E. (2012). An analysis of mobile internet access in Thailand: Implications for bridging the digital divide. *Telematics and Informatics, 29*(3), 254-267. https://doi.org/10.1016/j.tele.2011.10.003

Van Deursen, A. J., & Helsper, E. J. (2015). A nuanced understanding of Internet use and non-use among the elderly. *European Journal of Communication,* 30(2), 171-187. https://doi.org/10.1177/0267323115578059

Van Deursen, A. J., & Helsper, E. J. (2015). The third-level digital divide: *Who benefits most from being online? In Communication and Information Technologies Annual* (Vol. 10, pp. 29-52). Emerald Group Publishing Limited.

Van Deursen, A. J., & Van Dijk, J. A. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society, 21*(2), 354-375. https://doi.org/10.1177/1461444818797082

Van Dijk, J. A. (2017). Digital divide: Impact of access. *The International Encyclopedia of Media Effects,* 1-11. https://doi.org/10.1002/9781118783764.wbieme0043

Várallyai, L., Herdon, M., & Botos, S. (2015). Statistical analyses of digital divide factors. *Procedia Economics and Finance,* 19, 364-372. https://doi.org/ 10.1016/S2212-5671(15)00037-4

Worldbank. (2022). *DataBank World Development Indicators.* https://databank.worldbank.org/source/world-development-indicators/Series/IT.NET.USER.ZS