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

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

Abstract

With the advancement of digital technology, governments have created more channels for citizens to access accessing 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 2023 Nationwide Telecommunications Usage Behavior and Device Access Survey ($n = 42,335$). Chi-squared test, z-test and, 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.

1. Introduction

In today's digital era, the development of digital technology is rapidly transforming the landscape of information processing and communication (Corradini & Corradini, 2020). The diverse functions of digital technologies have sparked government interest globally in leveraging this promising potential (Katsonis & Botros, 2015). In Thailand, the integration of digital technology has become a national-level priority in recent years. Various initiatives have been implemented to enhance citizens' access to government services through digital platforms (Sagarik et al., 2018).

Over the past decade, the Thai government has made collaborative effort to expand citizens' access to government services through digital platforms by introducing multiple applications (Digital Government Development Agency, 2022). For instance, "Pao Tang", a health wallet application, provides access to health prevention and universal healthcare services (National Health Security Office, 2021). "Thai ID" offers digital identity verification for accessing services

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that require identification, such as banking and online transaction (The Bureau of Registration Administration, 2023). The most recent initiative is the “Tang Rat” application, a government “Super App” that serves as a centralized platform for over 150 government services. This application enables citizens to identify their social security benefits, retirement pensions, medical treatment eligibility, and government welfare benefits. Moreover, it will function as a wallet for citizens to receive and spend digital-based money that will be released in the fourth quarter of 2024 (Bangprapa, 2024). These e-government services facilitate seamless online access to government services, eliminating the need for physical presence. By leveraging digital technologies, the Thai government can enhance the efficiency and accessibility of public services, fostering greater convenience for citizens and promoting transparency in governance (Electronic Transactions Development Agency, 2021).

The introduction of e-government services, while offering promising benefits, raises concerns about the disparity between those with access to digital technologies and those without (Bélanger & Carter, 2009). This divide, known as “Digital Divide” (Van Dijk, 2006), arises as individuals who already possess access to technology can leverage and benefit from the technologies, while those lacking the means to access such technologies are left behind (Kvasny & Keil, 2006). 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.

The digital divide has a long history of research, with the term first introduced in an official publication by the US Department of Commerce’s National Telecommunications and Information Administration (National Telecommunications and Information Administration, 1999; Van Dijk, 2006). It has been explored in numerous ways, including definition of the concept, identification of the determinants, to examination of the digital divide effects (Barzilai-Nahon, 2006; Scheerder et al., 2017, Van Dijk, 2006, Van Dijk, 2017). Digital divide research in Thailand, although there have been studies investigating the determinant factors for mobile internet adoption (Srinuan et al., 2012) and research identifying critical factors for the success of e-government programs (Apriliyanti et al., 2021), very little academic research has explored the factors influencing the utilization of internet in Thailand, specifically the use of internet for e-government services. Understanding the specific determinants that drive the use of e-government services can lead to segment-specific interventions and strategies to promote growth of e-government usage and yield benefits for Thai citizens.

Drawing from a large dataset, this research aims to identify the determinants of e-government service utilization to provide a clearer understanding of the Thai population who benefit from internet access and those who remain underserved. Beyond demonstrating the impacts of sociodemographic factors on government e-services, it also assesses the impact of technological

factors in terms of price and quality of service to ensure a more holistic understanding of the issue. Moreover, this study provides empirical evidence of the key factors contributing to the inequality in government e-service usage. This could inform suggestions for the government and the regulatory agency to develop more inclusive frameworks and policies to address those needs and foster equal access and utilization of e- government services.

2. Literature Review

2.1. Digital Divide

Definitions

The concept of digital divide emerged around mid-1990s as policymakers and social scientist concern 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 who does not (Castells, 2002; Van Dijk, 2005). This type of research is defined as the first-level digital divide.

As internet connectivity has become more prevalent, research on the digital divide has shifted its focus from issues of access (first-level divide) to inequalities in usage and digital skills (second-level divide) (Hargittai, 2001; Van Deursen & Van Dijk, 2019; Hilbert, 2016). With the continuous advancement of technology, scholars have further explored the tangible outcomes and benefits derived from the ability to leverage digital resources to achieve specific outcomes, known as third-level digital divide (Van Deursen & Helsper, 2015). In the context of this research, we focus on individual internet usage as we aim to identify the determinant factors of e-government service utilization. Consequently, we conceptualize digital divide as the unequal usage of online government service 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; Kim & Lee, 2018). A systematic review of the research on digital divide organized the influencing factors into nine categories: sociodemographic, socioeconomic, personal elements, social support, type of technology, digital training, rights, infrastructure, and large-scale events (Lythreathis et al., 2022). 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 (Martin & Robinson, 2007). However, considering only sociodemographic factors is insufficient in explaining non- or limited use of technologies (Eynon & Helsper, 2011). Technological factors, such as internet speed and quality of service, also play a crucial role in determining the digital gap (Várallyai et al., 2015).

According to the Secretary-General's Office of the National Committee on Information Technology in Thailand, digital inequality in accessing information and knowledge is influenced

by four primary factors (National Information Technology Committee Secretariat, 2001). The first factor is infrastructure, including access to electricity, telephones, computers, the internet, and telecommunications services, which are correlated with the ability to obtain information and knowledge. The second factor comprises demographic characteristics, such as higher income, higher education levels, belonging to the younger and middle-age groups, and residing in urban areas increase the likelihood of accessing online resources. The third factor involves government policies, particularly those related to the pricing of information technology products and services, and initiatives aimed at increasing public access to information. The final factor includes organizational factors, where large, data-driven organizations offer individuals more opportunities to utilize information and communication technologies.

2.2 E-government

Definitions

The concept of e-government has been prevalent since the late 1990s (Beynon-Davies, 2007). As e-government initiatives have evolved and become more widespread, researchers and experts have proposed various definitions for the term (Schelin, 2007; Hu et al., 2009). For instance, 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). Similarly, e-government has been referred to as the utilization of communication technologies by government entities to facilitate interactions between citizens, businesses, and public administration through various electronic channels (Almarabeh & AbuAli, 2010). The definitions of e-government vary across countries, reflecting priorities in government strategies (OECD, 2003). In this research, we employ the Thai definition of e-government, which is defined as government services provided through online platform to address the needs of citizens and related sectors in a timely manner (Electronic Transactions Development Agency, n.d.).

E-government Utilization

Studies analyzing the purpose of e-government use have identified e-government use as the use of information and services offered by government (Nam, 2014). This study 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; Viana Thompson et al., 2005; 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 the public service quality by utilizing digital technology, focusing on the 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 (Electronic Transactions Development Agency, 2021). Examples include e-tax filing (Bhuasiri et al., 2016), Thai ID (The Bureau of Registration Administration, 2023), and e-payment (PromptPay) (Bank of Thailand, n.d.). A Thailand Digital

Outlook Annual Report 2023 revealed that top five most popular online governmental services in 2023 were (1) online complaint, (2) registering and checking for rights to government economic stimulus projects, (3) searching for government online services via Citizen Portal (Tang Raat Application), (4) Searching for reports, documents, or statistical information from government websites, and (5) payment of utility bills and public services fees via online channels (Office of the National Digital Economy and Society Commission, 2023). Statistical data showed that over 56.14% of Thai population had filed tax forms online in 2022, an increase from the previous year's 44.98 % (The Revenue Department, n.d.). Additionally, the number of online transactions has increased from 88 million to 19,894 million transactions in the span of 6 years (Bank of Thailand, 2024). Despite the popularity and an increasing trend in government service activities, the inequality gap may widen as those with access continue to benefit, while those without access remain underserved. This study directly measured the usage of e-government service through a survey question, simply asking whether the respondents use e-government service. Their responses were recorded as binary (yes or no).

Base 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 (Niehaves, 2013; Scheerder, 2017; Srinuan, 2012). Furthermore, technological factors such as mobile expenses, type of mobile broadband technology, and internet access limitation are also posited to play a role (Várallyai et al., 2015; Van Deursen & Van Dijk, 2019). Consequently, 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 statistically differences exist among these groups.

The second research question aims to identify the primary factors influencing e-government use or non-use. To comprehensively address this question, it was further divided into two sub-questions, addressing the primary factors influencing e-government utilization from sociodemographic and technological perspectives, respectively. Therefore, the following research questions were raised.

Research Questions

RQ1. Are there any disparities in government e-service utilization among individual 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

The secondary data utilized in this research was collected through a nationwide survey jointly conducted by the National Statistical Office and the Office of the National Broadcasting and Telecommunications Commission (NBTC). The survey aimed to understand the telecommunication usage behavior and device access of the Thai population in 2023, and to develop policies for the enhancement of telecommunication services (National Statistical Office, 2023). The questionnaire was distributed and administered offline by officers from the National Statistical Office, who interviewed individuals aged 18-76 years in households nationwide. The officers provided detailed explanations of the questions to the participants and manually recorded the survey responses using tablets. The data collection employed a stratified two-stage sampling technique. The survey was conducted between 4 to 31 August, 2023. A total of 47,100 representative samples were collected. While the researchers were not involved in the survey design or data collection process, we had access to the data as officers of the NBTC.

Measures

The original questionnaire was in Thai language. It comprised of five sections, covering respondents' demographic, television viewing habits, radio and music listening habits, mobile phone and mobile internet usage, landline phone and fixed internet usage, and purposes of internet usage. 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 (1 = "Male", 2 = "Female"), (2) Age (1 = "18-24 years old", 2 = "25-42 years old", 3 = "43-57 years old", and 4 = "58-76 years old"), (3) Education (1 = "Never attended school", 2 = "Less than primary education", 3 = "Primary education", 4 = "Secondary education", 5 = "Upper secondary education", 6 = "Vocational school or Diploma", 7 = "Bachelor's degree", 8 = "Master's degree", 9 = "Doctoral degree"), (4) Income ("Average monthly income received by the respondent, in Baht per month"), and (5) Geographical area (1 = "Within the municipal area", 2 = "Outside the municipal area").

Due to the different characteristics of payment types – prepaid and postpaid – the technological factors were measured through distinct set of questions tailored to each type.

For prepaid service, *technological factors* were measured through (1) Mobile expenses ("Expenses excluding additional packages, in Baht per month") and (2) Mobile broadband technology (1 = "3G", 2 = "4G", 3 = "5G").

For postpaid service, *technological factors* were measured through (1) Mobile expenses ("Expenses excluding additional packages, in Baht per month"), (2) Mobile broadband technology (1 = "3G", 2 = "4G", 3 = "5G"), (3) Amount of mobile internet ("Amount of mobile internet in GB"), and (4) Internet data cap (1 = "Data limit", 2 = "Speed is reduced", 3 = "Speed is not reduced", 4 = "Not certain").

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 (Mood, 2010). This study addresses two primary questions. The first question investigates the disparities in e-government service utilization among individuals with varying demographic backgrounds and technological usage, The second question analyzes the influence of each factor on the likelihood of e-government service utilization. Consequently, these analyses are well-suited to provide accurate answers to the research questions.

The original dataset contains 47,100 observations. Prior to the analysis, observations that did not meeting 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, as they predominantly arose due to the types of mobile service respondents used. Prepaid users were not required to answer the postpaid section, and vice versa, resulting in missing values. Subsequently, the 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. Although individuals could have multiple number and may use both prepaid and postpaid services, the analysis focused solely on their primary number. Regarding “the amount of internet”, respondents were required to provide their internet allowance based on their package. However, those with unlimited internet packages entered “9999” as their response. Such responses were adjusted to the maximum value of among non-unlimited users, as 9999 GB did not accurately represent the data. Next, descriptive statistics and Pearson correlation analyses were conducted to understand the structure of data and relationships between variables.

For RQ 1, to test whether the utilization of e-government service differs according to sociodemographic and technological factors, a Z-test was performed on the continuous variables: income, mobile expense, and the amount of mobile internet. A chi-squared test was conducted on categorical variables: age, gender, educational level, geographical location, mobile broadband technology, and data cap.

For RQ 2, the data was tested for multicollinearity assumption to ensure the validity of the binary logistic regression model. Then, a binary logistic regression analysis was performed to analyze which factors most influence the utilization of e-government services. We analyzed postpaid user and prepaid user separately because technological factors of prepaid and postpaid contain different variables. While, mobile broadband technology and mobile expense were the common variables in both prepaid and postpaid, for the postpaid service, data cap and amount of mobile internet were added.

4. Results

Descriptive statistics

The sample included 42,335 respondents, consisting of 24,464 prepaid users and 17,653 postpaid users. In the prepaid group, 51.09% of the respondents were female ($n = 12,499$). The age distribution was varied, with the majority, 30.50% being in between 25-42 years old ($n = 7,461$). The majority of participants, 48.91%, had secondary education as their highest level of education ($n = 11,966$). Geographically, 61.95% of the respondents lived outside municipal areas ($n = 15,156$). The average monthly income reported was 9,119.22 Baht (SD = 6,408.4 Baht), with an average monthly mobile expense of 239.89 Baht (SD = 129.29 Baht). 72.98% of the respondents indicated using e-government service ($n = 17,855$). In terms of mobile broadband technology, 76.32% of the respondents used 4G mobile broadband technology ($n = 18,672$).

In the postpaid group, approximately half of the participants, 50.73%, were female ($n = 8,955$). The age distribution showed that 33.44% were between 25-42 years old ($n = 5,904$), followed by 31.88% in the 43-57 age group ($n = 5,628$). The largest proportion of participants, 45.26%, had secondary education as their highest level of education ($n = 7,989$). Around half of the respondents, 50.6%, resided outside municipal areas ($n = 8,933$). The average monthly income reported was 13,727.87 Baht (SD = 9,978.85 Baht), with an average monthly mobile expense of 440.49 Baht (SD = 199.72 Baht). The average mobile internet amount was 58.75 GB (SD = 37.44). A substantial proportion, 83.37%, reported using e-government service ($n = 14,717$). More than half of the participants, 53.17%, used 5G mobile broadband technology ($n = 9,386$). Additionally, 48.33% of respondents were subjected to Fair Use Policies (FUP) regarding their data cap ($n = 8,531$).

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. Given the distinct characteristics of prepaid and postpaid services, the data were analyzed separately for these two groups.

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. 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, $X^2 (2, N = 24,464) = 236.08, p < .001$. However, the proportion did not differ significantly by gender, $X^2 (1, N = 24,464) = 2.169, p = .141$.

Table 2 presented the frequency and proportion of individuals who utilize e-government services and those who do not. The proportion of respondents utilizing e-government services significantly differed across sociodemographic and technological factors. 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, $X^2 (2, N = 17,653) = 25.838, p < .001$. However, the proportion did not differ significantly by gender, $X^2 (1, N = 17,653) = 2.599, p = .107$ and geographical location, $X^2 (1, N = 17,653) = 1.757, p = .185$.

Next, Z-tests were performed to examine differences between e-government service users and non-users. For prepaid internet 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 internet users, there was significant differences in income, $Z = 9.689, p < .001$, mobile expense, $Z = 7.591, p < .001$ between the two groups. However, there was no statistically significant difference in mean of the amount of mobile internet between individuals who utilized e-government service and who did not, $Z = 0.939, p = .348$.

Results Research Question 2

Prior to the binary logistic regression, Pearson's correlation coefficients were calculated to assess the interrelationships among predictor variables. As shown in Table 3, for prepaid service users, income had 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. Due to the different characteristics of the prepaid and postpaid services, two separate models were constructed. Both models included sociodemographic variables (age, gender, Education, geographical location, and income) and technological variables (mobile expense and mobile broadband technology). However, the postpaid model additionally included the amount of mobile internet and data cap as predictors. The prepaid and postpaid models showed moderate correlation between predictor variables in the model.

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"). As shown in Table 4, the binary logistic regression output revealed statistically significant coefficients for all predictors. Factors positively associated with the likelihood of e-government service utilization, compared to the base outcome, included age between 25-42, $\beta = (0.448)$, $SE = 0.045$, $Wald = 97.392, p < .001$, age between 43-57, $\beta = (0.196)$, $SE = 0.047$, $Wald = 17.393, p < .001$, income, $\beta = (<0.000)$, $SE = <0.000^*$, $Wald = 62.817, p < .001$, less than primary education, $\beta = (0.451)$, $SE = 0.176$, $Wald = 6.550, p = .010$, primary education, $\beta = (0.754)$, $SE = 0.155$, $Wald = 23.700, p < .001$, secondary education, $\beta = (1.195)$, $SE = 0.157$, $Wald = 58.259, p < .001$, undergraduate degree, $\beta = (1.415)$, $SE = 0.162$, $Wald = 75.925, p < .001$, graduate degree, $\beta = (1.071)$, $SE = 0.380$, $Wald = 7.961, p = .005$, mobile expense, $\beta = (0.001)$, $SE = <0.000$, $Wald = 46.548, p < .001$, 4G, $\beta = (0.485)$, $SE = 0.065$, $Wald = 55.096, p < .001$, and 5G, $\beta = (0.594)$, $SE = 0.072$, $Wald = 67.226, p < .001$. Conversely, male, $\beta = (-0.150)$, $SE = 0.031$, $Wald = 24.211, p < .001$, age between 58-76 years

old, $\beta = (-0.559)$, $SE = 0.054$, $Wald = 108.884$, $p < .001$, and living outside of municipal areas, $\beta = (-0.101)$, $SE = 0.032$, $Wald = 10.316$, $p = .001$, were negatively associated with the likelihood of e-government service utilization compared to the base outcome.

For postpaid service users, the binary logistic regression model correctly identified 83.37% of the positive cases (“yes”) but failed to predict negative case (“no”). As presented in Table 5, the binary logistic regression output revealed a positive and statistically significant coefficients for age 25-42 years old, $\beta = (0.397)$, $SE = 0.060$, $Wald = 48.822$, $p < .001$, age 43-57 years old, $\beta = (0.301)$, $SE = 0.062$, $Wald = 23.467$, $p < .001$, primary education, $\beta = (0.709)$, $SE = 0.329$, $Wald = 4.655$, $p = 0.031$, secondary education, $\beta = (0.969)$, $SE = 0.329$, $Wald = 8.661$, $p = .003$, undergraduate degree, $\beta = (1.218)$, $SE = 0.331$, $Wald = 13.532$, $p < .001$, graduate degree, $\beta = (1.294)$, $SE = 0.388$, $Wald = 11.109$, $p = .001$, and FUP, $\beta = (0.250)$, $SE = 0.067$, $Wald = 14.132$, $p < .001$. However, male, $\beta = (-0.104)$, $SE = 0.041$, $Wald = 6.323$, $p = .012$ had a negative relationship with the likelihood of e-government service utilization.

Table 1. *Frequency and Proportion of E-Government Service Utilization Among Prepaid Service Users by Demographic and Technological Factors*

Variables	Utilizing E-Government		Not Utilizing E-Government		Total
	Frequency (<i>n</i> = 17,855)	Percentage	Frequency (<i>n</i> = 6,609)	Percentage	
Age					
18-24	4,128	74.38%	1,422	25.62%	5,550
25-42	6,160	82.56%	1,301	17.44%	7,461
43-57	5,400	74.55%	1,843	25.45%	7,243
58-76	2,167	51.47%	2,043	48.53%	4,210
Gender					
Male	8,681	72.55%	3,284	27.45%	11,965
Female	9,174	73.40%	3,325	26.60%	12,499
Living Area					
Inner	6,974	74.92%	2,334	25.08%	9,308
Outer	10,881	71.79%	4,275	28.21%	15,156
Education					
Never	75	39.47%	115	60.53%	190
Less than primary	254	46.35%	294	53.65%	548
Primary	4,867	62.45%	2,926	37.55%	7,793
Secondary	9,313	77.83%	2,653	22.17%	11,966
Undergraduate	3,294	84.38%	610	15.62%	3,904
Graduate	52	82.54%	11	17.46%	63
Mobile Broadband Technology					
3G	618	53.83%	530	46.17%	1,148
4G	13,710	73.43%	4,962	26.57%	18,672

Variables	Utilizing E-Government		Not Utilizing E-Government		Total
	Frequency (<i>n</i> = 17,855)	Percentage	Frequency (<i>n</i> = 6,609)	Percentage	
5G	3,527	75.95%	1,117	24.05%	4,644

Table 2. *Frequency and Proportion of E-Government Service Utilization Among Postpaid Service Users by Demographic and Technological Factors*

Variables	Utilizing E-Government		Not Utilizing E-Government		Total
	Frequency (<i>n</i> = 14,717)	Percentage	Frequency (<i>n</i> = 2,936)	Percentage	
Age					
18-24	2,838	80.4%	692	19.60%	3,530
25-42	5,156	87.07%	766	12.93%	5,922
43-57	4,827	84.23%	904	15.77%	5,731
58-76	2,041	75.93%	647	24.07%	2,688
Gender					
Male	7,273	82.67%	1,525	17.33%	8,798
Female	7,589	83.64%	1,484	16.36%	9,073
Living area					
Inner	7,367	83.62%	1,443	16.38%	8,810
Outer	7,495	82.72%	1,566	17.28%	9,061
Education					
Never	24	57.14%	18	42.86%	42
Less than primary	112	74.67%	38	25.33%	150
Primary	2,426	76.58%	742	23.42%	3,168
Secondary	6,664	82.63%	1,401	17.37%	8,065
Undergraduate	5,379	87.32%	781	12.68%	6,160
Graduate	257	89.86%	29	10.14%	286
Mobile broadband technology					
3G	188	81.74%	42	18.26%	230
4G	6,685	81.96%	1,471	18.04%	8,156
5G	7,989	84.23%	1,496	15.77%	9,485
Data cap					
Limit	1,437	79.48%	371	20.52%	1,808
FUP	7,196	84.35%	1,335	15.65%	8,531
Non-FUP	6,084	83.18%	1,230	16.82%	7,314

Table 3. *Correlations Between Variables – Prepaid and Postpaid Services*

Variables	Income	Mobile Expense	Mobile Internet GB
Prepaid			
Income	1.00	.259***	-
Means	9,119.22	239.89	-
SD	6,408.4	129.29	-
Postpaid			
Income	1.00		
Mobile Expense	.324***	1.00	
Mobile Internet GB	.099***	.272***	1.00
Means	13,727.87	440.49	58.75
SD	9,978.85	199.72	37.44

Note. * $p < .01$, ** $p < .001$, *** $p < .000$

Table 4. *Binary Logistic Regression Analysis of The Likelihood of E-Government Service Utilization of Prepaid Users*

Predictors	β	SE β	Wald's χ^2	p value	e β
Intercept	-0.875	0.173	25.497	.000***	0.417
Age					
18-24					
25-42	0.448	0.045	97.392	.000***	1.565
43-57	0.196	0.047	17.393	.000***	1.216
58-76	-0.559	0.054	108.884	.000***	0.572
Gender					
Male	-0.150	0.031	24.211	.000***	0.860
Female					
Living Area					
Inner					
Outer	-0.101	0.032	10.316	.001**	0.904
Income	<0.000	<0.000	62.817	.000***	1.000
Education					
Never					
Less than primary	0.451	0.176	6.550	.010*	1.571
Primary	0.754	0.155	23.700	.000***	2.125
Secondary	1.195	0.157	58.259	.000***	3.305
Undergraduate	1.415	0.162	75.925	.000***	4.118
Graduate	1.071	0.380	7.961	.005**	2.918
Mobile Expense	0.001	<0.000	46.548	.000***	1.001
Mobile Broadband Technology					
3G					

4G	0.485	0.065	55.096	.000***	1.624
5G	0.594	0.072	67.226	.000***	1.812

*Note. *p <.01, **p <.001, ***p <0.000*

Table 5. *Binary Logistic Regression Analysis of The Likelihood of E-Government Service Utilization of Postpaid Users*

Predictors	β	SE β	Wald's χ^2	p value	e β
Intercept	0.215	0.382	0.318	.573	1.240
Age					
18-24					
25-42	0.397	0.060	43.822	.000***	1.487
43-57	0.301	0.062	23.467	.000***	1.351
58-76	-0.115	0.073	2.448	.118	0.892
Gender					
Female					
Male	-0.104	0.041	6.323	.012*	0.902
Living Area					
Inner					
Outer	0.030	0.042	0.509	.475	1.030
Income	<0.000	<0.000	11.832	.001***	1.000
Education					
Never					
Less than primary	0.724	0.377	3.690	.055	2.062
Primary	0.709	0.329	4.655	.031*	2.032
Secondary	0.969	0.329	8.661	.003**	2.634
Undergraduate	1.218	0.331	13.532	.000***	3.381
Graduate	1.294	0.388	11.109	.001***	3.646
Mobile expense	<0.000	<0.000	3.290	.070	1.000
Mobile internet GB	<0.000	0.002	0.003	.958	1.000
Mobile broadband technology					
3G					
4G	-0.182	0.181	1.007	.316	0.834
5G	-0.112	0.181	0.380	.538	0.894
Data cap					
Limit					
FUP	0.250	0.067	14.132	.000***	1.285
Non-FUP	0.094	0.136	0.478	.489	1.098

*Note. *p <.01, **p <.001, ***p <0.000*

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 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 service, education is the factor that most likely to influence the use of e-government service. However, income and mobile expense do not exhibit a strong impact on the utilization. The marginal effect showed that utilization 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%. The profile of prepaid service users most likely to engage with e-government services are females aged between 25-42 years old, residing in urban areas, holding undergraduate degree, and utilizing 5G broadband technology.

In postpaid service, education is identified as the factor with most influence on e-government service use. However, similar to prepaid service, income and mobile expense do not show a strong impact on utilization. The marginal effect revealed that being subjected to a Fair Use Policy (FUP) rather than limited data cap increased the likelihood of using e-government services by 3.36%. Additionally, belonging in 58-76 years old age group lowered the chance of using e-government services by 1.59%. The profile of postpaid service users most likely to use e-government services are females aged between 25-42 years, with an undergraduate degree, and being subjected to a Fair Use Policy.

6. Implications

Our findings yield policy implications in two key domains: implications for the national government agency and implications for the national telecommunications regulatory authority.

Implications for National Government Agencies

The results underscore the necessity of developing targeted communication strategies for e-government services, especially for vulnerable segments of the population, such as the elderly, underprivileged communities, low-income individual, those with limited education, and people living in rural areas. Those demographic groups may require tailored communication method to effectively promote the utilization of e-government services. For example, using simple and straightforward language, clear and unambiguous terms, and user-friendly application interfaces with pictorial instructions instead of lengthy and small texts, could be particularly beneficial for the elderly and those with limited educational background. This recommendation aligns with a survey conducted by the office of the National Digital Economy and Society Commission Thailand, which revealed that 20.17% of respondents indicated that providing a variety of online services catering to all age groups would encourage non-users to adopt e-government services

(Office of the National Digital Economy and Society Commission, 2023). Furthermore, from a technological standpoint, when developing e-government applications or websites, it is important to consider users who may have slow or limited internet connections. The applications or websites should not require downloading large amounts of data to access the pages. Alternatively, developers could provide an option for a “lite version” of the applications or websites that uses less data. This ensures equal access to e-government services for those with limited internet speed.

Implications for National Telecommunication Regulatory Agencies

Based on the finding, the availability of 5G mobile broadband technology could potentially increase the use of e-government services. Therefore, the rollout of 5G infrastructure in rural areas and the expansion of 5G coverage are necessary for telecommunications infrastructure development. Another significant finding is that mobile expenses have a positive effect on the likelihood of e-government service utilization. As the National Broadcasting and Telecommunications Commission (NBTC), is responsible for protecting Thai citizens’ rights regarding access to and utilization of telecommunications services, and ensuring universal and equal telecommunication service distribution to serve best public interest (The National Broadcasting and Telecommunications Commission, 2016), it should ensure a fair and reasonable service fees for Thai citizens. This can be achieved by closely examining the costs (e.g., spectrum auctions or license fees) imposed on telecommunication operators, which may be passed through to customer in the form of higher price or lower service quality. Implementing these policies could make technology become more affordable, leading to increased utilization and ultimately creating more opportunities for Thai citizens.

7. Limitations

While this study yielded significant findings, certain limitations in this research should be acknowledged. Firstly, a limitation arises from the utilization of secondary data sources. We encountered several aspects that could potentially limit the accuracy of this paper. For instance, an assessment of e-government usage was asked through a dichotomous yes/no question, failing to capture the extent to which individuals leverage these services, the specific services they utilize, and how they use these services. Additionally, the question only focused on whether respondents used the internet for the e-government purposes, without specifying the timeframe of such usage. Knowing when the usage occur could add depth to the research. Therefore, for future research, it is recommended to explore the benefits users received by including more comprehensive questions asking the degree to which they engage with e-government services, the benefit they obtain, and the timeframe of their usage. Furthermore, the questionnaire inquired about the amount of mobile internet in their package but neglected to assess their actual consumption, which could provide more realistic representation of internet usage.

Secondly, the different characteristics of mobile payment types in Thailand posed a challenge in this research. Due to the bundled nature of the postpaid services, which include internet, calls, SMS, and MMS, users purchase a package offering a certain amount of data (e.g., 20 GB per month) at a fixed price. Consequently, users are unable to know the cost per MB of their internet. This causes differences in the questionnaire design as it was not feasible to employ

the same questions to measure mobile expenses across both types of services. As a result, the study relied on mobile expense as a proxy, which may not accurately reflect the cost of internet.

Lastly, there were limitations related to data analysis, including multicollinearity issues between income, mobile expenses and, the amount of mobile internet. To address this limitation in future research, it is recommended to employ calculated variables, such as affordability, to mitigate the effects of multicollinearity.

8. Conclusion

This study investigates the multidimensional issue of digital divide by analyzing the factors influencing the utilization of e-government services. Unequal usage of such services contributes a second-level digital divide, which relates to the skills and usage of users who already have access. While access and infrastructure are foundational for bridging the divide (Khan, 2023; Rao, 2005), the digital divide is deeply ingrained issue that cannot be addressed solely by looking at access (have/have not) to digital technology. It is important to ask further questions, such as what user can accomplish once they have access. Do they have sufficient knowledge and skills to achieve their desired outcomes? Are demographic or technological factors limiting their utilization of digital technologies?

To bridge the divide, it is crucial to identify factors that encourage citizens to leverage digital technologies effectively. Targeted policies should be implemented to facilitate citizen engagement with digital technology in the most beneficial way, ultimately enhancing their quality of life. Furthermore, assessing digital inequality requires a complex and multifaceted approach that considers various aspects, including social resources, economic condition, cultural context, institutional support, education, knowledge, skills, and political factors. This comprehensive understanding is necessary to formulate strategies that support the autonomy of individuals utilizing digital technology.

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