
Determinants Factors of Digital Financial Services Adoption and Usage Level: Empirical Evidence from Ghana

Isaac Anane^{1*}, Fengying Nie¹

¹ Agricultural Information Institute, Chinese Academy of Agricultural Sciences, Beijing 100081, P.R China

Citation: Isaac Anane, and Fengying Nie (2022) Determinants Factors of Digital Financial Services Adoption and Usage Level: Empirical Evidence from Ghana, *International Journal of Management Technology*, Vol.9, No 1, pp. 26-47

ABSTRACT: *Digital Financial Services (DFS) have the potential to benefit people in poverty in developing economies significantly. DFS provides a variety of economical, convenient, and secure financial services. However, the DFS adoption rate is slow in Ghana due to being over-reliant on personal cash delivery. Substantial variation in adoption levels across important socio-demographic characteristics is another factor. Using a representative national dataset from Ghana, this study explored digital financial services adoption determinants. It quantified the role played by each of the six incorporating factors and controlled four socio-demographic characteristics. The work also assessed the adoption level among key socio-demographic groups. The determinants of DFS are estimated using logit specification, and average marginal effects are computed. The logit model indicated that effort expectancy, awareness, facilitating conditions, transaction cost, security and privacy, and self-efficacy positively influence DFS adoption and increase DFS adoption by 0.7%, 2.3%, 28.5%, 3%, 2.1%, and 2.4%, respectively. Additionally, the results indicated a significant disparity in adoption levels across key socio-demographic variables, including education level, gender, urban and rural residence, and administrative regions of Ghana. Given the substantial influence of facilitating conditions and transaction costs on DFS adoption, we argue that it would be advisable to incorporate digital infrastructure development and lower transaction cost measures into the planning of any intervention.*

KEYWORDS: digital financial services, adoption, Ghana, digital economy, development

INTRODUCTION

The digital economy has emerged as one of the most significant world economic development and innovation drivers in the twenty-first century. Digital technology promotes world economic integration, productivity, and efficiency through software, infrastructure, and hardware that enables fast data transfer between individuals, companies, devices, networks, and systems (Roessler 2018; Aker and Mbiti 2010). Access to low-cost financial services is essential for poverty alleviation and economic development (Rana et al. 2018). The World Bank refers to Digital financial services (DFS) as services delivered and used by customers through digital

technology. DFS enables the poor to access basic financial services through digital payment systems, mobile phones, and electronic money models. Countries with more technologically advanced financial systems experience faster economic growth and more significant reductions in inequality and poverty gaps (Pazarbasioglu et al. 2020). DFS reduces transaction costs by increasing transaction speed, security, and transparency and enables more personalized financial services to benefit the poor (Pazarbasioglu et al., 2020). Furthermore, the fast growth of DFSs and substantial technological advances are driving many governments to expand their inclusive finance, which aids in poverty reduction and may serve as a means to mitigate social exclusion (Aaluri et al. 2016; Hasan et al. 2020).

Digital financial services in Ghana, like in most other African nations, have increased in recent years. At present, the nation provides DFS via bank channels, including automated teller machines (ATMs), online banking, mobile devices (mobile banking), and point of sale (POS). Several works of literature emphasize the achievement of developing nations in utilizing DFSs to promote financial inclusion, poverty reduction, and income inequality reduction, as in the case of Nigeria, India, China, and many others (Babajide 2015; Kapoor 2014; Liu et al. 2021; Andrianaivo and Kpodar 2011). Ghana's digital financial industry has expanded significantly since 2010, with total financial sector assets increasing from 53% of GDP in 2010 to 78% in 2017 (Geiger et al. 2019). Between 2012 and 2017, the overall number of mobile voice subscribers rose by 39 per cent. The number of active agents grew by 25 times, from about 6,000 in 2012 to more than 150,000 in 2017 (Geiger et al. 2019; Kennedy 2019). In 2018, Ghana launched the Ghana Interbank Payment Settlement System (GhIPSS), Africa's first interoperable mobile money switch. The government introduced three policy initiatives, including the National Financial Inclusion and Development Strategy, the Digital Financial Services Policy, and the Cash-Lite Roadmap in 2020 (MOF 2020; SIA 2020). According to the World Bank, Ghana has the fastest-growing mobile money market in Africa (Geiger et al. 2019). Mobile phone penetration and the implementation of GhIPSS have provided an opportunity for the growth of DFS and expanded the involvement of non-financial organizations, increasing the convenience and brand value of DFS for many financial customers. Overall, the policies aim to enhance financial inclusion, alleviate poverty, promote social development, advance the private sector, and create an inclusive digital payment environment.

Despite the government's tremendous government effort, there is high dependence on personal cash delivery as 98 per cent of all Ghanaians who participate in any financial transaction do it in cash and deliver the money personally (CGAP, 2015). Adopting digital financial services and usage among important demographic groups is still low (Geiger et al. 2019). Women in Ghana are less financially involved than males, and access to formal financial accounts in rural areas is relatively limited (Akudugu 2013; Atakli and Agbenyo 2020). Inadequate financial literacy is a significant long-term contributor to Ghana's low savings rates. Financial illiteracy reduces consumer demand for digital financial services in Ghana. Many people believe that online banking and mobile money are unsuitable for their savings and borrowing needs (Osei-Assibey 2009).

Furthermore, the high cost of transactions rates and socioeconomic problems impact the large number of consumers that use the service. Our motivation comes from a concern for individuals who have not adopted DFS, are financially disadvantaged, and may lose out on chances to enhance their well-being. Technological advancements may promote inclusion via the provision of DFS, and equal participation in the gains has significant policy consequences. Therefore the study aims to assess the key determinant factors of DFS adoption and the adoption level among key socio-demographic groups. The study's results will be helpful for future research in determining the factors to consider when creating an adoption model for DFS and contributing to the ongoing research dialogue on digital financial adoption in Ghana and other developing countries. Additionally, practitioners engaged in DFS may utilize the results to understand better the factors influencing demand for such services. The remainder of the paper is organized as follows: The second section covers empirical literature and hypothesis development. Section three explains the study methodology and design, while Section four analyzes and discusses the findings. The conclusion and suggestion are presented in Section 5.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Several critical theories have been created, including planned behaviour theory, reasoned action theory, technology acceptance model, and diffusion innovation theory (Ajzen 1991; Fishbein and Ajzen 1977; Rogers 1995). The theories help understand how and why innovation and technology get integrated into human existence and the motivational factors that motivate people to use and adopt new technologies (Venkatesh 2000; Moore and Benbasat 1996). The literature on technology adoption and use has identified the different variables that influence the adoption of digital financial services. Davis (1989) used the technology acceptance model to predict the key factors determining individual intention to accept and use new technology. The study revealed that the two main factors influencing individual intention to accept and use new technology are perceived usefulness and ease of use. The influential factors indicate that people are more likely to accept and use technology if it is simple and helpful in their everyday lives. Venkatesh et al. (2003), Ananda et al. (2020), and Teklemariam (2021) found that social influence, facility conditions, and effort expectancy are drivers of behavioural intention and have an impact on information technology adoption (I.T.). Bridging the DFS acceptance requires service providers to assess the likelihood of success for new technology introductions and understand the factors that influence acceptance to develop proactive interventions targeted at populations of users who may be less likely to adopt and use new systems. A Study by Yavuz (2021) to determine the factors affecting mobile augmented reality (MAR) adoption in Turkey also noted that security and privacy are the two most significant factors influencing MAR application use. Theoretically, internet access improves chances for inclusive development by lowering communication costs, vastly increasing information flows to market players, and expanding market borders (Efobi 2018). Technology adoption may be hampered by a lack of information or awareness, self-efficacy, and high transaction costs (Shaikh and Karjaluoto, 2015). An extensive telecommunications network helps address information asymmetry and transaction cost issues. Several findings on digital financial services inclusion and usage determinants revealed that demographic factors such as education,

income, age, and geographical location significantly affect inclusion and usage (Borg and Smith, 2018; Zins and Weill, 2016; Arora, 2020).

Several studies have been conducted in Ghana on the drivers of digital financial service usage and adoption (Agboh 2015; Awiagah et al. 2016; Glavee-Geo et al. 2019; Amoah et al. 2020). Agboh (2015) and Awiagah et al. (2016) explored the key determinants factors and challenges of adopting Information and Communication Technologies (ICT), e-commerce among Small and Medium Size Enterprises (SMEs) in Ghana. These studies identified that the major factors that influence SMEs customers to adopt and use ICT and e-commerce include perceived cost of a transaction, infrastructure conditions, perceived risk, and lack of information. Glavee-Geo et al. (2019) emphasized that the drivers of consumer engagement in mobile money services in Ghana include performance expectancy, perceived risk, subjective norm, and consumer empowerment and strongly advocated for financial technology firms to improve their services to help society. An effort was made by Amoah et al. (2020) to identify the determinants factors that drive people to use mobile money as an instrument for financial inclusion in Ghana. Amoah et al. (2020) revealed that the motivating factors that propel people to use mobile money in Ghana include service availability, education, and income. The utility-maximizing assumptions cannot explain the emphasized behaviour intention alone.

In digital financial services adoption studies, including digital payment platforms, mobile financial services, and branchless banking, several researchers have used either framework of behavioural intentions, subjective norms, attitude, or demographic characteristics to identify the determinants of DFS adoption. Attitude expresses a consumer's perception of DFS. At the same time, Subjective norms reflect the social influences that may impact a person's desire to use DFS, and behavioural intentions express views about having the required resources and opportunities to adopt DFS. As many investigations have shown, for example, in the work of Ananda et al. (2020), Teklemariam (2021), Yavuz et al. (2021) and Shaikh and Heikki (2015), the vital moderating variables were behavioural intentions/subjective norms/attitude factors. Also, in research by Amoah et al. (2020), Gichuki and Mulu-Mutuku (2018), and Ghosh and Hom Chaudhury (2020), attention was drawn to the demographic characteristics. Again, many studies on DFSs use small sample size data, perhaps due to challenges in data collecting (Ananda et al. 2020; Crabbe 2009; Khan and Siddiqui 2019). Small sample size cannot provide an in-depth picture of the connection between variables. It cannot provide an appropriate depiction of performing economic rationale research more dynamically. The study novelty is in several aspects. First, nationally representative data with a large sample from Ghana allows for an in-depth view of the relationship between variables and appropriate representation of economic rationale research. It also looks at a multi-dimensional factor that influences digital financial services among the Ghana populace from behavioural intentions/subjective norms/attitudes and socio-demographic characteristics for better insight into adoption intentions. Finally, it helps close a gap in the academic literature by broadening empirical research on digital financial services and adoption levels.

Based on the relevant literature, six key variables and four control variables affecting digital financial services adoption were identified, and a conceptual framework was built, helping develop the hypothesis.

Effort Expectancy (E.E.)

With the use of the Unified Theory of Acceptance and Use of Technology (UTAUT), Tsai et al. (2013) studies revealed that one of the most prominent determinant factors of Consumer adoption behaviours of internet banks is effort expectancy (E.E.). Shaikh et al. (2021) confirmed that E.E. strongly influences digital financial service adoption. The researchers highlighted the importance of E.E. as a major driver of adoption intention and its interaction with perceived risk, emphasizing the unique role of both risk and E.E. in the adoption process. An empirical study by Gupta et al. (2008) to explore ICT adoption behaviour in a government organization in a developing country found out that effort expectancy has positively impacted ICT use.

Awareness (Aw)

Based on the innovation diffusion theory, Kalish (1985) reported that two stages define the adoption of a new product: awareness and adoption. The awareness stage is when a user is educated about the product search characteristics. Thus, after innovation is presented, non-adopters are persuaded by adopters via their interactions, eventually leading to adoption. According to Noor (2011), awareness is one of the key factors that affect users' intention to adopt mobile banking technologies. Research that looked at the factors that affect women's adoption of various mobile money technologies by micro-entrepreneurs found that women's participation in table banking groups would readily influence awareness and, as a result, improve the adoption of mobile payments services (Gichuki and Mulu-Mutuku 2018).

Facilitating Conditions (F.C.)

The facilitating conditions here refer to the ready availability of infrastructure and technological resources by DFS providers to the users of DFS. Karakostas et al. (2005) indicated that modern technological facilities are considered a source of competitive advantage since it allows organizations to discover and exploit consumer information while fostering profitable and long-term one-to-one connections. A study argues that, as supporting digital infrastructures become more accessible and available, Electronic business applications such as online banking and mobile will become more viable (Tan and Teo 2000; Gerrard and Cunningham 2003). Consequently, Internet users will be more likely to accept digital financial services.

Transaction Cost (T.C.)

Digital innovation in finance has improved the connectivity of systems, reduced transaction costs, and given rise to new business models and new entrants because the production of financial services can be disaggregated (Feyen et al. 2021). Lower transaction costs can make digital financial services more accessible and increase financial inclusion (Bachas et al., 2018). Electronic payments have made financial transactions easier by bringing services closer to clients, giving rise to customers enhancing the performance banking performance (Aduda and Kingoo 2012)

Security and Privacy (S.P.)

Consumer willingness to adopt digital technology and financial services goes beyond being cheaper or more attractive but instead considers the security and privacy concerns. Consumers' primary reasons to change financial institutions are a lack of confidence and discontent (Jünger and Mietzner 2020; Maier 2016). In a study to examine the limitations of mobile-payment services' rapid adoption, the authors find out that perceived security impacts adoption of mobile payments (Johnson 2018). Security and privacy should be the top priority when developing digital financial systems. DFS decisions are frequently based on sensitive data. The lack of transparency about privacy policy and the proper use of security measures on mobile devices and backend servers lower customer confidence and are less likely to adopt digital finance technology (Traynor 2018).

Self-efficacy (S.E.)

Alalwan et al. (2015) concluded that despite the rapid development of Internet banking, consumers in undeveloped countries continue to be hesitant to use this technology due to their self-efficacy. Wood and Albert defined Self-efficacy as confidence in one's ability to mobilize the motivation, cognitive resources, and courses of action required to fulfil specific situational demands (Wood and Bandura, 1989). Individuals with strong self-efficacy view digital payments as user-friendly and simple to use. They are less reluctant to change; hence, the beliefs directly or indirectly affect consumer behaviour to adopt digital financial service technology (Ma and Chao, 2011). In technology-based self-service research, the authors found that self-efficacy improves novice consumers' financial performance perceptions, service value assessments, and future use intentions (Van Beuningen et al., 2009).

The following hypothesis has been developed based on the findings and empirical studies from the previous research.

Hypothesis 1 (H1). *Effort expectancy has a positive relationship with the adoption of digital financial services.*

Hypothesis 2 (H2). *User awareness positively influences the adoption of digital financial services.*

Hypothesis 3 (H3). *Facilitating conditions have a positive effect on the adoption of digital financial services.*

Hypothesis 4 (H4). *The lower cost of transactions is positively associated with adopting digital financial services.*

Hypothesis 5 (H5). *Security/privacy positively affects the adoption of digital financial services.*

Hypothesis 6 (H6). *Self-efficacy positively relates to digital financial services adoption.*

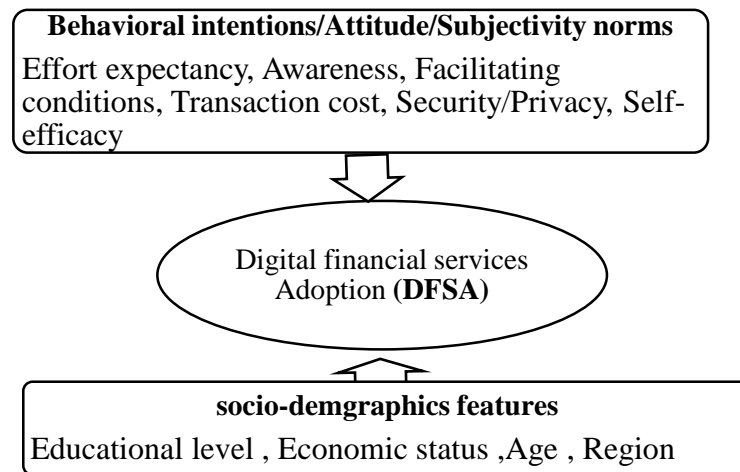


Figure 1 Framework for the adoption of digital financial services

METHODOLOGY

Data and Study Design

We used World Bank's Ghana-Financial Inclusion Insights Survey 2014 (GFIIS-2014) in our analyses. GFIIS-2014 was carried out to provide practical insights into digital financial services (DFS). The data set gives detailed information on the adoption and use of DFS among key target groups (World Bank, 2016). GFIIS-2014 is nationally representative, with a sample size of 3002 Ghanaian adults aged 15 and above. The study was conducted in all the regions of Ghana. The sample frame for the research was the list of Enumeration Areas (E.A.s) created for the 2010 Ghana Population and Housing Census. A two-stage stratified cluster design was used for the household sample survey. The frame was stratified into urban and rural areas of residency. The target sample of 3000 respondents was initially assigned to the country's ten regions in proportion to their projected population of 15 years and older. The resulting sample allocation within each region was proportionately allocated between urban and rural regions. In the first stage, a total of 300 EAs were randomly selected. In the second stage, a household was selected from the 300 EAs using the random walk method (World Bank, 2016; AFI, 2019).

Dependent Variable

The probability of a consumer's adoption of digital financial services is employed as a dependent variable of this study. The dependent variable is a binary variable indicating whether or not a respondent has adopted any digital financial services. The World Bank's Ghana-Financial Inclusion Insights Survey 2014 (GFIIS-2014) has a DFS adoption variable. GFIIS-2014 define a DFS adoption account as an account used in any financial transaction at least once in the last 90 days or three months through digital/electronic technologies. They include e-money (which may be launched online or via a mobile phone), payment cards, and a regular bank account. DFS account refers to a branchless banking account and an e-money account provided in a mobile

money wallet or electronic wallet for this working framework. The indicator is converted to binary to indicate whether an individual adopted DFS or not. The value of 1 indicated adopted DFS and a value of 0 if not. The adopted DFS account is defined as an account used at least once in the last 90 days.

Main Variables of Interest

In line with the previous studies, the key explanatory variables used in our analysis are effort expectancy, Awareness, Facilitating conditions, Transaction cost, Security/Privacy, and Self-efficacy. The effort expectancy was divided into four categories: very easy, easy, difficult, and very difficult. The awareness variable is the response to whether an individual has ever heard any particular DFS. The awareness was put into two categories: aware or not aware. The facilitating conditions were measured based on whether a particular DFS has a reliable network and facilities compatible with other technologies. The facilitating conditions fell into two categories: reliable network and facilities and limited network and resources. The transaction cost was measured based on DFS account charges and was put into three categories: high, medium, and low. The security/privacy measurement was based on whether individuals feel protected, assured, secured, and trust when using DFS. The variable was categorized into two; secure/privacy and not secure/privacy. Self-efficacy was divided into three categories: Do everything myself, somebody helps part, and somebody helps the entire activity.

Control Variables

Some of the cross-sectional differences in adoption can only be explained if appropriate controls are used. By adding this collection of covariates, we can statistically control their possible effects on the likelihood of adopting DFS and estimate the cumulative effects of the suggested explanatory variables more accurately. In our research, we account for socio-demographic characteristics. Our control variables include educational level, economic status, age, and region. Educational level is a categorical variable divided into six categories: No formal, primary, secondary, diploma, undergraduate and postgraduate. Age fell into four groups: 75+, 55-74, 35-54, and 15-34. The economic status was divided based on the poverty line and put into two groups: above and below. The final variable is the region. The region here refers to all administrative regions in Ghana, and as of 2014, Ghana had ten administrative regions. Table 2 has detailed information about the region.

Statistical Analysis

Due to the dichotomous nature of the dependent variable, a multinomial Logit model is constructed. Similar models have been used to examine the adoption of digital financial services in the previous studies (Zhu et al. 2003; Gan et al. 2006). The logit regression model follows the conceptual framework for digital financial services adoption shown in Figure 1.

$$\begin{aligned} \Pr(\text{adoption} = 1) &= \varphi(\gamma'x) + \varepsilon_i \\ &= \varphi(\alpha + \beta_1.EE + \beta_2.Aw + \beta_3.FC + \beta_4.TC + \beta_5.SP + \beta_6.SE + \sum \delta_i.SD + \varepsilon_i) \dots (1) \end{aligned}$$

Where $\varphi(\cdot)$ represents the logistic distribution's probability density function and ε_i denotes error terms. Table 1 has a definition of the variables. This model includes the six hypotheses that were previously established. Equation (1) is used to determine the effect of independent variables on digital financial service adoption. Equation (1) shows the contribution of each component to the degree of digital financial service adoption, according to Greene (2012). The logit model's parameters are not necessarily the marginal effects like the nonlinear regression models. We used the marginal effects equation below to illustrate the effects of changes in explanatory factors on the probability of the dependent variable. Marginal effects are essential since certain limitations and interpretational problems are, particularly with nonlinear models such as logit regression (Jann, 2013; Williams, 2012). The introduction of marginal effects improves the analysis's meaning, intuitiveness, and ease of interpretation (Jann, 2013).

$$\frac{\partial \Pr(\text{adoption} = 1)}{\partial x} = \varphi(\gamma'x)[1 - \varphi(\gamma'x)]\gamma \quad (2)$$

The study used T-test statistics and means estimations to analyze digital financial services adoption differences among key socio-demographic characteristics such as education level, gender, age, residence, and region.

A series of tests were conducted to ensure our model's validity, robustness, and fitness. To account for the potential endogeneity of digital financial service adoption and its determinants, we regress our measures on a set of instruments found in the digital financial services adoption impediments and drivers from previous studies and used the relevant predicted variables in our estimates. After the regression, the link function test was performed to ensure no misspecification or lack of relevant independent variables in our model. The link function test reveals that $\hat{P} = 0.000$ and $\hat{P}^2 = 0.107$, indicating the use of appropriate determinants and all relevant independent variables are included; therefore, the model specification is correct (Stukel, 1988; Pulkstenis and Robinson, 2002). Furthermore, the Hosmer and Lemeshow Goodness-of-Fit test was performed to determine the model's suitability. The test yielded a p-value of 0.334, indicating that the logistic model fit the data well (Hosmer et al. 1997; Polasik and Wisniewski 2009). The study also used the variance inflation factor (VIF) to check for the possibility of multicollinearity; details of VIF are displayed in table 3. All the VIFs were less than 10, with an average VIF of 1.45, suggesting our predictors are free from multicollinearity and that our conclusions drawn regarding the relationships between explanatory and response variables are correct (Midi et al. 2010).

RESULTS AND DISCUSSION

Results

Demographic Profile of Respondent

Table 2 presents the demographic characteristics of the sample data. The data shows that more than half of the respondents were female (57.7%), whereas 42.3% were male. The majority (40.3%) had secondary education, followed by primary education (36.9%), and 11.9% had no formal education. Two-thirds of the sampled population were aged between 15 and 34 years, while just

1.2% were 75 or more. In terms of economic status, over a half (73.7%) of the respondents were above the poverty line (\$2.5 as poverty line). Also, 26.3% were below this line. The sample also included a percentage of the respondent who was not employed (34.8%), and 63.7% were employed. The majority of the people reside in urban (54.8%). Per the regional residence, the Ashanti region had the highest percentage (19.6%), followed by Greater Accra (18.0%), and the least was recorded in the Upper West region (2.7%). The vast majority of respondents (91.4%) claimed to own mobile phones, with only 9% reporting not owning one. Regarding the source of DFS information, most of the respondents (50.4%) reported getting their information from television, followed by radio/newspaper/billboard (28.3) and 19.4% from their Family members/colleagues.

DFS Adoption Level among Key Groups

Table 4 presents the DFS adoptability among key demographic groups in Ghana. A substantial significance difference ($p=0.000$) was found in the adoption of DFS by educational level, gender, and residence. For example, the adoption level of DFS for postgraduate (89.5% vs 15.4%), undergraduate (74.6% vs 15.4%) were over three times greater for the postgraduate compared to the no formal education. Again, the percentage of postgraduates (89.5% vs 21.2%) who had adopted DFS was approximately three times that of people with primary education. Regarding gender, males (39.7% vs 26.1%) had the highest differential adoption level. As per the residence, the adoption level of people who resided in urban areas (38.5% vs 23.7%) was almost twice that of people in rural areas. Furthermore, substantial differentials ($p=0.006$) were found in adopting D.F.s of several regions in Ghana. For example, adoption levels in the Greater Accra region (44.3% vs 19.6%) and the Eastern region (38.1% vs 19.6%) were roughly two times those in the Northern region. For the age group-wise, there was no significant difference ($p=0.708$); however, the young people aged between 15 and 34 (36.0) had the highest adoption level.

Empirical Evidence

Table 5 reports the estimated coefficients of the logit regression for each of the predictors of digital financial services. We observed that effort expectancy, awareness, facilitating conditions, transaction cost, security/privacy, and Self-efficacy influence the adoption of digital financial services in Ghana. Facilitating conditions positively influence the adoption of DFS at a 1% significant level. Effort expectancy, awareness, transaction cost, and security/privacy also positively correlated with adopting digital financial services at a 5% significant level. Again, self-efficacy positively relates to the adoption of DFS. Concerning the control variables, all were found to have a relation with the DFS adoption except region. Education level positively influenced DFS adoption at a 1% significant level. Meanwhile, economic status and age negatively correlated with DFS adoption at significant levels of 10% and 5%, respectively.

Table 6 provides the estimated average marginal effects (AME) of the main variables of interest after logit regression. The marginal effects measure the degree and significance of the relationship between predictors and outcomes. According to the AME measured, a 1% improvement in the facilitating conditions is significantly associated with a high probability of adopting DFS by 0.285

(28.5%). The results also show that effort expectancy, awareness, and self-efficacy are significantly associated with increases in the probability of adopting DFS by 0.007(0.7%), 0.023(2.3%), and 0.024 (2.4%), respectively. At the same time, a 1% lower transaction cost is significantly associated with an increase in the probability of adopting DFS by 0.030(3.0%).

Table 1. Descriptive Statistics of Variables

Explanatory Variables	Acronyms	Mean	Standard deviation	Minimum	Maximum
<i>Key variables</i>					
Effort Expectancy	E.E.	3.451	1.320	1	4
Awareness	Aw	1.738	0.440	1	2
Facilitating conditions	F.C.	1.279	0.449	1	2
Transaction cost	T.C.	1.147	0.373	1	3
Security/Privacy	S.P.	1.566	0.496	1	2
Self-efficacy	S.E.	1.144	0.483	1	3
<i>Control variables(SD)</i>					
Educational level	El	2.560	0.972	1	6
Economic status	E.S.	0.262	0.440	1	2
Age	Age	3.552	0.699	1	4
Region	Rn	4.746	2.941	1	10

Table 2. Demographic Profile of the Sample Data

Demographic variable	Frequency (N=3002)	Percentage
<i>Gender</i>		
Female	1731	57.7
Male	1271	42.3
<i>Educational level</i>		
No formal education	358	11.9
Primary education	1107	36.9
Secondary education	1210	40.3
Diploma	174	5.8
Undergraduate	134	4.5
Postgraduate	19	0.6
<i>Age(years)</i>		
75+	37	1.2
55-74	250	8.3
35-54	734	24.5
15-34	1981	66.0
<i>Economic status ((\$2.50 poverty line)</i>		
Above poverty line	2214	73.7
Below poverty line	788	26.3

<i>Employment status</i>		
Employed within a year	1911	63.7
Not employed within a year	1046	34.8
Others	45	1.5
<i>Residence</i>		
Urban	1645	54.8
Rural	1357	45.2
<i>Region</i>		
Ashanti	590	19.6
Bono-Ahafo	270	9.0
Central	260	8.6
Eastern	320	10.7
Greater Accra	540	18.0
Northern	270	9.0
Upper West	81	2.7
Upper East	120	4.0
Volta	260	8.7
Western	291	9.7
<i>Mobile phone ownership</i>		
Yes	2743	91.4
No	259	8.6
<i>First source of DFS information</i>		
Radio/Newspaper/Billboard	850	28.3
Television	1512	50.4
Family members/Colleagues	582	19.4
Service Providers	58	1.9

Table 3. Variance inflation factor (VIF)

Variables	VIF	Tolerance
Effort expectancy	1.06	0.940
Awareness	1.07	0.935
Facilitating conditions	2.83	0.353
Transaction cost	2.73	0.367
Security/Privacy	1.04	0.960
Self-efficacy	1.14	0.877
Educational level	1.27	0.785
Economic status	1.18	0.849
Age	1.12	0.892
Region	1.04	0.961
Mean VIF	1.45	

Table 4. Digital Financial Services (DFS) Adoption Level among Key Groups

Key groups	DFS level % (95% CI)	P-value
<i>Educational level</i>		
No formal education	15.4(11.6-19.1)	0.000***
Primary education	21.2(18.8-23.6)	
Secondary education	35.4(32.7-38.1)	
Diploma	69.5(62.7-76.4)	
Undergraduate	74.6(67.2-82.0)	
Postgraduate	89.5(75.3-100)	
<i>Gender</i>		
Male	39.7(47.0-52.4)	0.000***
Female	26.1(34.0-38.1)	
<i>Age (years)</i>		
75+	29.8(26.5-33.2)	0.708
55-74	32.1(30.0-34.1)	
35-54	30.4(17.1-47.7)	
14-34	36.0(30.0-42.0)	
<i>Residence</i>		
Urban	38.5(41.2-45.9)	0.000***
Rural	23.7(26.5-31.0)	
<i>Region</i>		
Ashanti	31.0(27.3-34.8)	0.006**
Bono-Ahafo	31.1(25.6-36.6)	
Central	30.0(32.8-43.5)	
Eastern	38.1(29.2-39.6)	
Greater Accra	44.3(40.1-48.5)	
Northern	19.6(14.9-24.4)	
Upper East	30.8(22.5-39.1)	
Upper West	27.2(17.4-36.1)	
Western	23.4(18.5-28.2)	
Volta	26.9 (21.5-32.4)	

Note: (95% CIs) denotes 95% confidence intervals and ***, **, * denotes significant at 1%, 5% and 10% level respectively.

Table 5. Logit Regression Results

Explanatory variable	Coefficients (S.E.)	P-value
<i>Key variables</i>		
Effort expectancy	0.127 (0.060)**	0.034
Awareness	0.420 (0.171)**	0.014
Facilitating conditions	5.167 (0.247)***	0.000
Transaction cost	0.552 (0.233)**	0.018
Security/Privacy	0.381 (0.164)**	0.020
Self-efficacy	0.430 (0.232)*	0.064
<i>Controlled variables</i>		

Educational level	0.601 (0.087)***	0.000
Economic status	-0.390 (0.204)*	0.055
Age	-0.391 (0.114)**	0.001
Region	0.021 (0.016)	0.438
Intercept	-7.45 (0.790)	0.000
<i>Model significance</i>		
Number of observation		3002
Pseudo R-squared		0.660
log of likelihood		-638.277
chi-squared (10)		2480.14
Prob > chi-squared		0.000

Note: SE denotes standard error and ***, **, * denotes significant at 1%, 5% and 10% level respectively.

Table 6 Average Marginal Effects (AME) of Logit Regression

Explanatory variable	Average Marginal effects(SE)	P-value	Decisions on hypothesis
<i>Key variables</i>			
Effort expectancy	0.007(0.003)**	0.035	H1:accept (P-value<0.05)
Awareness	0.023(0.009)**	0.015	H2:accept (P-value<0.05)
Facilitating conditions	0.285(0.014)***	0.000	H3:accept P-value<0.05)
Transaction cost	0.030(0.013)**	0.019	H4:accept (P-value<0.05)
Security/Privacy	0.021(0.009)**	0.021	H5:accept(P-value<0.05)
Self-efficacy	0.024(0.044)*	0.065	H6:accept(P-value<0.05)

Note: ***, **, * denotes significant at 1%, 5% and 10% level respectively.

DISCUSSIONS

Digital financial services help the poor access basic financial services in their daily lives, and the technologically advanced financial systems bring rapid economic development to many countries. Efforts to understand and address digital financial services problems must continue as well. Findings from the current studies reveal major determinants of digital financial services adoption and the adoption level among key demographic groups in Ghana.

Digital Financial Services (DFS) Adoption Level among Key Groups

The current study indicates that the adoption level of DFS differs among people with different educational levels. Most notably, the adoptability rate of people with postgraduate backgrounds is higher than people with no formal education. These findings have been confirmed by Prasad et al. (2018). Financial literacy enables a person to make well-informed and successful judgments based on their knowledge of finances. People with higher educational backgrounds have acquired the requisite knowledge and a better way to make effective DFS decisions, hence the higher adoption rate of DFS among this group of people. There is a great gap in DFS adoptability among men and women. Generally, men have higher access and usage of DFS than women. In separate studies, Arora (2020) and Hilbert (2011) revealed factors affecting DFS usage: low empowerment of

women, fewer women ownership of mobile phones compared to men, less access to the internet by women, and income inequalities. Many women, especially in low-income countries, are less likely to adopt DFS than men because they lack the necessary resources to access the DFS. As found in the previous work by Fong (2009), the adoption of DFS differs significantly among people who reside in urban centres and rural areas and people who live in different regions of the country. According to Salemin et al. (2017), digital connectivity and diffusion of technologies impact DFS adoption and usage. The continuous and increasing disparities in data infrastructure quality between Ghana's urban, rural and administrative regions can be attributed to the discrepancies in DFS adoption between rural and urban areas and the regional lines. Again, Differences in DFS adoption can be linked to hindered technology dissemination and lower average levels of education and skills in rural areas and certain administrative regions.

Determinants of Digital Financial Services in Ghana

In this current study, facilitating conditions influence DFS adoption and are characterized by a higher probability of adopting digital financial services. The findings from this present work are consistent with previous work (Yang and Forney 2013; DA Gayan et al. 2020). The opportunities and resources available can determine whether individuals adopt particular digital financial services or not. The availability of digital financial services infrastructures such as mobile device accessibility, high-speed internet access, and widespread internet connectivity have influenced people's choice of DFS. This case is mainly related to Ghana as many people tend to adopt any digital financial that has resources available to the larger population. The study further revealed that effort expectancy is related to DFS adoption and increases the probability of adopting DFS. These findings are consistent with Tsai et al. (2013) and Gupta et al. (2008) separate reports. There is a high likelihood that people will adopt particular digital financial services when they perceive that it is easy to use and comfortable to operate (Daka and Phiri 2019). The probability of adopting digital financial services technology in Ghana increased when people perceived it as simple and easy to understand. In this case, easy navigations and big screen sizes for easy view and easy financial transaction processing will improve DFS adoption.

Awareness is also a factor that influences and increases the probability of people adopting a particular DFS technology. The extent of information and benefits a customer knows about particular DFS technology can influence the probability of adoption (Noor, 2011). Customer awareness of DFS technology's existence, features, and benefits will affect the probability of adoption. The study's current results also suggest a relationship between transaction cost and DFS adoption, and lower transaction cost increases the probability of adoption. This study outcome occurred in existing literature (Bachas et al., 2018; Garcia-Swartz et al., 2006). The costs associated with digital financial services, such as account opening fees, minimum balance requirements, end-user fees, cash-in, and cash-out fees, restrict the poor from using digital financial services. Indirect transaction fees, such as travel time, are another impediment: The distance to the closest mobile money agent or bank is a significant predictor of using any DFS (Bachas et al. 2018; Jack and Suri 2014). The transactions fees and mobile agent proximity play a key role for people to use DFS in Ghana. Effectively managing digital financial services

technology costs and lowering transaction costs improves financial inclusion and encourages DFS adoption.

Moreover, empirical evidence from this study reveals that security/privacy influences DFS adoption and increases the probability of DFS adoption in Ghana. The recent security breaches have made consumers wary about using the digital financial pay system (Johnson, 2018). When people are concerned about DFS because of the possible breach of their personal information and putting it at risk, they will be reluctant to use it and, therefore, not adopt it (Slade et al., 2013). Secure network and risk-free DFS technologies increase consumer trust and adoption. The result also portrayed that self-efficacy influences person's intention to adopt DFS and increases the probability of adoption. This result is consistent with previous studies (Ma and Chao, 2011). Higher self-efficacy enhances behaviour intentions to use DFS technologies by making them more accessible and lowering resistance (Alalwan et al., 2015). Believing in a high level of competence and handling DFS technology by individuals can lead to DFS adoption. Individual perception and confidence to manage particular DFS technologies can lead to acceptance.

Implication to Research and Practice

The research identifies key concerns that need practical implementation in business enterprises and government sectors in this digital age. The study has shown that customers' awareness of digital financial services, security and privacy, and low transaction costs increases consumers' adoption of digital financial services. In this case, corporate firms need to intensify user education about the product search characteristics. At the same time, security and privacy should be major priorities when establishing digital financial systems to safeguard consumers' security and privacy. Government regulatory reforms or policy initiatives to enhance consumer protection, build customer confidence, promote demand and digital infrastructure development for DFS may also help accelerate DFS adoption.

CONCLUSION

In general, digital financial services allow poorer members of society to fully engage in the financial system and open the market potential of individuals who are presently locked in the informal sector. Many people in Ghana and other developing save their money digitally through their mobile money account, credit cards, and debit cards and use them to make transactions. Since 2010, the Ghana government has taken various steps to improve digital financial services. However, the adoption rate of DFS is still low in Ghana, and there is a significant difference in the adoption rate among key socio-demographic features. Although there is great progress in the government initiatives, it is insufficient to claim success if there are no continuously high use, and new digital financial services that consumer's desire and will adopt. As a result, the present research recognized the need to examine the factors influencing Ghanaians to adopt DFS and the degree. The study also assessed the adoption rate differences among key demographic groups. This study assumed that six main variables would affect DFS adoption: effort expectancy, awareness, facilitating conditions, transaction cost, security/privacy, and self-efficacy and controlled for socio-demographics features. Hypotheses were developed to evaluate the relationship and degree

of effect. The findings revealed that all expected factors affect DFS adoption and enhance the likelihood of DFS adoption. Results also showed a vast difference in adoption level among key socio-demographic characteristics. Given the substantial degree of facilitating conditions and transaction costs that influence DFS adoption, including digital infrastructure and transaction costs in any intervention planning would be prudent. Any measure to invest in the DFS digital infrastructure, education, and awareness creation, especially in rural communities, will enhance DFS adoption and reduce adoption rate differences among key socio-demographic characteristics.

Limitations and Suggestions for Future Studies

Social desirability bias may be a significant factor in sample survey data, mainly when social conventions make it impossible to ensure privacy during interviews (Tourangeau and Yan 2007). Individuals may falsify their real behaviour to conform to the opinions and values of those in the room. For instance, since finances are sensitive, individuals may not always want to provide truthful answers. The current study encourages future research to emphasize individual privacy during an interview to build confidence to minimize social desirability bias and acquire accurate data. Furthermore, the verification and replication of the model generalization to validate the understanding of DFS adoption in the use of two different developing countries' datasets for comparisons will be suggested in future studies.

References

- Aaluri, S., Narayana, M. S., Kumar, P. V. (2016). A study on financial inclusion initiatives and progress with reference to Indian banking industry in digital era. *International Journal of Research in Finance and Marketing*, 6(10), 125-134.
- Aduda, J., Kingoo, N. (2012). The relationship between electronic banking and financial performance among commercial banks in Kenya. *Journal of finance and investment analysis*, 1(3), 99-118.
- Agboh, D. K. (2015). Drivers and challenges of ICT adoption by SMEs in Accra metropolis, Ghana. *Journal of Technology Research*, 6(1).
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational behaviour and human decision processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Aker, J. C., Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, 24(3), 207-32. DOI: 10.1257/jep.24.3.207
- Akudugu, M. A. (2013). The determinants of financial inclusion in Western Africa: Insights from Ghana. *Research Journal of Finance and Accounting*, 4(8), 1-9.
- Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., Lal, B., Williams, M. D. (2015). Consumer adoption of Internet banking in Jordan: Examining the role of hedonic motivation, habit, self-efficacy and trust. *Journal of Financial Services Marketing*, 20(2), 145-157.
- Alliance for Financial Inclusion (AFI) (2019). Digital Financial Service Indicators" Guideline Note No. 33, retrieved from <https://www.afi-global.org/publications/digital-financial-service-indicators/> (accessed on 31 August 2021)
- Amoah, A., Korle, K., Asiama, R. K. (2020). Mobile money as a financial inclusion instrument: what are the determinants? *International Journal of Social Economics*. 47(10) 0306-8293.

- Ananda, S., Devesh, S., Al Lawati, A. M. (2020). What factors drive the adoption of digital banking? An empirical study from the perspective of Omani retail banking. *Journal of Financial Services Marketing*, 25, 14-24. <https://doi.org/10.1057/s41264-020-00072-y>
- Andrianaivo, M., Kpodar, K. R. (2011). ICT, financial inclusion, and growth: Evidence from African countries. *IMF Working Papers*, 2011(073) 45.
- Arora, R. U. (2020). Digital Financial Services to Women: Access and Constraints. In *Gender Bias and Digital Financial Services in South Asia*. Emerald Publishing Limited, 51-75.
- Atakli, B. A., Agbenyo, W. (2020). Nexus between financial inclusion, gender and agriculture productivity in Ghana. *Theoretical Economics Letters*, 10(03), 545.
- Awiagah, R., Kang, J., Lim, J. I. (2016). Factors affecting e-commerce adoption among SMEs in Ghana. *Information Development*, 32(4), 815-836.
- Babajide, A. A., Adegboye, F. B., Omankhanlen, A. E. (2015). Financial inclusion and economic growth in Nigeria. *International Journal of economics and financial issues*, 5(3), 629-637.
- Bachas, P., Gertler, P., Higgins, S., Seira, E. (2018). Digital financial services go a long way: Transaction costs and financial inclusion. In *AEA Papers and Proceedings*, 108(5), 444-48.
- Borg, K., Smith, L. (2018). Digital inclusion and online behaviour: five typologies of Australian internet users. *Behaviour & Information Technology*, 37(4), 367-380.
- Crabbe, M., Standing, C., Standing, S., Karjaluoto, H. (2009). An adoption model for mobile banking in Ghana. *International Journal of Mobile Communications*, 7(5), 515-543.
- DA Gayan, N., Dissanayake, D. M. R., Weerasiri, R. A. S. (2020). Effect of Facilitating Conditions on Intentions and Actions towards Digital Banking Adoption: A Multivariate Analysis. Available at SSRN: <https://ssrn.com/abstract=3862477>
- Daka, C. G., Phiri, J. (2019). Factors Driving the Adoption of E-Banking Services Based on the UTAUT Model. *International Journal of Business and Management*, 14(6), 43-52.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340. <https://doi.org/10.2307/249008>
- Efobi, U. R., Tanankem, B. V., Asongu, S. A. (2018). Female economic participation with information and communication technology advancement: Evidence from Sub-Saharan Africa. *South African Journal of Economics*, 86(2), 231-246.
- Feyen, E., Frost, J., Gambacorta, L., Natarajan, H., Saal, M. (2021). Fintech and the digital transformation of financial services: implications for market structure and public policy. *BIS Papers* No. 117
- Fishbein, M., Ajzen, I. (1977). Belief, attitude, intention, and behaviour: An introduction to theory and research. *Philosophy and Rhetoric*, 10(2), 179-221.
- Fong, M. W. (2009). Digital divide between urban and rural regions in China. *The Electronic Journal of Information Systems in Developing Countries*, 36(1), 1-12.
- Gan, C., Clemes, M., Limsombunchai, V., Weng, A. (2006). A logit analysis of electronic banking in New Zealand. *International Journal of Bank Marketing*, 24(6) 0265-2323.
- Garcia-Swartz, D. D., Hahn, R. W., Layne-Farrar, A. (2006). The move toward a cashless society: a closer look at payment instrument economics. *Review of network economics*, 5(2). <https://doi.org/10.2202/1446-9022.1094>

- Geiger, M. T., Kwakye, K. G., Vicente, C. L., Wiafe, B. M., & Boakye Adjei, N. Y. (2019). Fourth Ghana Economic Update: Enhancing Financial Inclusion-Africa Region. *The World Bank*, No. 137689, 1-61.
- Gerrard, P., Cunningham, J. B. (2003). The diffusion of internet banking among Singapore consumers, *International Journal of Bank Marketing* 21(1) 16-28.
- Ghosh, C., Hom Chaudhury, R. (2020). Determinants of digital finance in India. *Innovation and Development*, 1-20. <https://doi.org/10.1080/2157930X.2020.1850012>
- Gichuki, C. N., Mulu-Mutuku, M. (2018). Determinants of awareness and adoption of mobile money technologies: Evidence from women micro-entrepreneurs in Kenya. In *Women's Studies International Forum*, 67 (03) 18-22. <https://doi.org/10.1016/j.wsif.2017.11.013>
- Glavee-Geo, R., Shaikh, A. A., Karjaluoto, H., Hinson, R. E. (2019). Drivers and outcomes of consumer engagement: Insights from mobile money usage in Ghana. *International Journal of Bank Marketing*, 38 (1) 1-20. <https://doi.org/10.1108/IJBM-01-2019-0007>
- Gupta, B., Dasgupta, S., Gupta, A. (2008). Adoption of ICT in a government organization in a developing country: An empirical study. *The Journal of Strategic Information Systems*, 17(2), 140-154. <https://doi.org/10.1016/j.jsis.2007.12.004>
- Hasan, M. M., Yajuan, L., Khan, S. (2020). Promoting China's inclusive finance through digital financial services. *Global Business Review*, 3(2), 1-23.
- Hilbert, M. (2011). Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics, In *Women's Studies International Forum*, 34(6) 479-489. <https://doi.org/10.1016/j.wsif.2011.07.001>
- Hosmer, D. W., Hosmer, T., Le Cessie, S., Lemeshow, S. (1997). A comparison of goodness-of-fit tests for the logistic regression model. *Statistics in medicine*, 16(9), 965-980.
- InterMedia – CGAP (2015). Financial Inclusion Insights: Applied research for digital financial inclusion. Ghana Summary Report” InterMedia CGAP Ghana survey, retrieved from www.finclusion.org (Accessed on 27 August 2021)
- Jack, W., Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *American Economic Review*, 104(1), 183-223.
- Jann, B. (2013). Predictive margins and marginal effects in Stata 11th German Stata Users group meeting. *University of Potsdam: Potsdam, Germany*.
- Johnson, V. L., Kiser, A., Washington, R., Torres, R. (2018). Limitations to the rapid adoption of M-payment services: Understanding the impact of privacy risk on M-Payment services. *Computers in Human Behavior*, 79 (02) 111-122.
- Jünger, M., Mietzner, M. (2020). Banking goes digital: The adoption of FinTech services by German households. *Finance Research Letters*, 34 (05), 101260.
- Kalish, S. (1985). A new product adoption model with price, advertising, and uncertainty. *Management Science*, 31(12), 1569-1585.
- Kapoor, A. (2014). Financial inclusion and the future of the Indian economy. *Futures*, 56, 35-42.
- Karakostas, B., Kardaras, D., Papathanassiou, E. (2005). The state of CRM adoption by the financial services in the U.K.: an empirical investigation. *Information & Management*, 42(6), 853-863. <https://doi.org/10.1016/j.im.2004.08.006>
- Kennedy F. (2019). Ghana's Economic Growth Expected to Be Stronger in 2019, But Diversifying Economy is Crucial” available at

- <https://www.worldbank.org/en/news/press-release/2019/06/14/ghanas-economic-growth-expected-to-be-stronger-in-2019-but-diversifying-economy-is-crucial> (accessed 13 August 2021)
- Khan, M. S., Siddiqui, S. H. (2019). SME's intention towards use and adoption of digital financial services. *Sustainable Business and Society in Emerging Economies*, 1(2), 65-80.
- Liu, T., He, G., Turvey, C. G. (2021). Inclusive finance, farm households entrepreneurship, and inclusive rural transformation in rural poverty-stricken areas in China. *Emerging Markets Finance and Trade*, 57(7), 1929-1958. <https://doi.org/10.1080/1540496X.2019.1694506>
- Ma, F., Chao, G. (2011). Research on communication products diffusion in china using cellular automata. *International Business Research*, 4(2), 147.
- Maier, E. (2016). Supply and demand on crowdlending platforms: connecting small and medium-sized enterprise borrowers and consumer investors. *Journal of Retailing and Consumer Services*, 33 (11), 143-153. <https://doi.org/10.1016/j.jretconser.2016.08.004>
- Midi, H., Sarkar, S. K., Rana, S. (2010). Collinearity diagnostics of binary logistic regression model. *Journal of Interdisciplinary Mathematics*, 13(3), 253-267.
- Ministry of Finance (MOF) (2020). New Policies to speed up Financial Inclusion and Digital Payments to Transform the Economy. Available at <https://www.mofep.gov.gh/index.php/press-release/2020-05-18/government-launches-new-policies-to-speed-up-financial-inclusion-and-digital-payments-to-transform-the-economy> (Accessed 13 August 2021)
- Moore, G. C., Benbasat, I. (1996). Integrating diffusion of innovations and theory of reasoned action models to predict utilization of information technology by end-users. In *Diffusion and adoption of information technology*, IFIP — The International Federation for Information Processing. Springer, Boston, MA.
- Noor, M. M. (2011). Determining critical success factors of mobile banking adoption in Malaysia. *Australian Journal of Basic and Applied Sciences*, 5(9), 252-265.
- Osei-Assibey, E. (2009). Financial exclusion: what drives supply and demand for basic financial services in Ghana? *Savings and development*, 207-238.
- Pazarbasioglu, C., Mora, A. G., Uttamchandani, M., Natarajan, H., Feyen, E., Saal, M. (2020). Digital financial services. *World Bank*.
- Polasik, M., Wisniewski, T. P. (2009). Empirical analysis of internet banking adoption in Poland. *International Journal of bank marketing*, 27(1) 32-52.
- Prasad, H., Meghwal, D., Dayama, V. (2018). Digital financial literacy: a study of households of Udaipur. *Journal of Business and Management*, 5 (1) 23-32.
- Pulkstenis, E., Robinson, T. J. (2002). Two goodness-of-fit tests for logistic regression models with continuous covariates. *Statistics in medicine*, 21(1), 79-93.
- Rana, N. P., Luthra, S., Rao, H. R. (2018). Developing a Framework using Interpretive Structural Modeling for the Challenges of Digital Financial Services in India. In *PACIS* (p. 53). <https://aisel.aisnet.org/pacis2018/53>
- Roessler, P., 2018. The Mobile Phone Revolution and Digital Inequality: Scope, Determinants and Consequences. *Prosperity Commission Background Paper Series*. Oxford, U.K.: Pathways for Prosperity Commission.

- Rogers Everett M. (1995). Diffusion of Innovations Modifications of a model for telecommunications.” In Die diffusion von innovationen in der telekommunikation, pp. 25-38. Springer, Berlin, Heidelberg.
- Salemink, K., Strijker, D., Bosworth, G. (2017). Rural Development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies*, 54, 360-371.
- Shaikh, A. A., Karjaluoto, H. (2015). Mobile banking adoption: A literature review. *Telematics and informatics*, 32(1), 129-142. <https://doi.org/10.1016/j.tele.2014.05.003>
- Shaikh, A. A., Glavee-Geo, R., Karjaluoto, H. (2021). How relevant are risk perceptions, effort, and performance expectancy in mobile banking adoption? In *Research Anthology on Securing Mobile Technologies and Applications* (pp. 692-716).
- Slade, E. L., Williams, M. D., Dwivedi, Y. K. (2013). Mobile payment adoption: Classification and review of the extant literature. *The Marketing Review*, 13(2), 167-190.
- Strategic Impact advisors (SIA) (2020). “Ghana introduces new digital financial inclusion policies a catalyst for growth” (online) available at <https://www.siaedge.com/news/2020/6/23/ghana-introduces-new-digital-financial-inclusion-policies-a-catalyst-for-growth> (Accessed 13 August 2021)
- Stukel, T. A. (1988). Generalized logistic models. *Journal of the American Statistical Association*, 83(402), 426-431.
- Tan, M., Teo, T. S. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for Information Systems*, 1(1), 5.
- Teklemariam, M. H. (2021). Developing a tailored strategy for mobile applications’ adoption across diffusion levels: A panel data analysis. *Technology in Society*, 66, 101608.
- Tourangeau, R., Yan, T. (2007). Sensitive questions in surveys. *Psychological bulletin*, 133(5), 859.
- Traynor, P. (2018). Digital Finance and Data Security: How Private and Secure Is Data Used in Digital Finance: Published by Center for Financial Inclusions. Retrieved from <https://www.centerforfinancialinclusion.org/digital-finance-and-data-security-2> (Accessed 30 August 2021)
- Tsai, C. H., Zhu, D. S., Jang, Y. M. (2013). A study on the consumer adoption behaviours of Internet Bank. In *2013 IEEE/ACIS 12th International Conference on Computer and Information Science (ICIS)* (pp. 263-268).
- Van Beuningen, J., de Ruyter, K., Wetzels, M., Streukens, S. (2009). Customer self-efficacy in technology-based self-service: assessing between-and within-person differences. *Journal of Service Research*, 11(4), 407-428. <https://doi.org/10.1177/1094670509333237>
- Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information systems research*, 11(4), 342-365. <https://doi.org/10.1287/isre.11.4.342.11872>
- Venkatesh, V., Morris, M. G., Davis, G. B., Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.
- William H. G. (2012). Econometric Analysis seventh edition. *International Edition, Prentice-Hall, New York*.

- Williams, R. (2012). Using the margins command to estimate and interpret adjusted predictions and marginal effects. *The Stata Journal*, 12(2), 308-331.
- Wood, R., Bandura, A. (1989). Impact of conceptions of ability on self-regulatory mechanisms and complex decision making. *Journal of personality and social psychology*, 56(3), 407.
- World Bank (2016). Ghana - Financial Inclusion Insights Survey 2014. Retrieved from <https://microdata.worldbank.org/index.php/catalog/2730/related-materials> (accessed on 27 August 2021).
- Yang, K., Forney, J. C. (2013). The moderating role of consumer technology anxiety in mobile shopping adoption: differential effects of facilitating conditions and social influences. *Journal of Electronic Commerce Research*, 14(4), 334.
- Yavuz, M., Çorbacıoğlu, E., Başoğlu, A. N., Daim, T. U., Shaygan, A. (2021). Augmented reality technology adoption: Case of a mobile application in Turkey. *Technology in Society*, 66, 101598. <https://doi.org/10.1016/j.techsoc.2021.101598>
- Zhu, K., Kraemer, K., Xu, S. (2003). Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. *European journal of information systems*, 12(4), 251-268. <https://doi.org/10.1057/palgrave.ejis.3000475>
- Zins, A., Weill, L. (2016). The determinants of financial inclusion in Africa. *Review of development finance*, 6(1), 46-57. <https://doi.org/10.1016/j.rdf.2016.05.001>