

**From Access to Impact: Exploring Access–Usage Imbalances in Digital Financial Inclusion
Among Women, Youth, and Rural Communities in Rwanda**
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Abstract

Rwanda has made a remarkable stride in financial inclusion from a financial inclusion rate of 21% in 2008 to 96% in 2024 of adults having a bank account or mobile money wallet. While these platforms have expanded access, persistent disparities remain in usage among women, youth, and rural populations. The specific objectives of this study were to determine the digital payment platforms in use, the access–usage gap, the factors influencing digital payment adoption, and the constraints limiting usage among these groups in Rwanda. The methodology partly borrowed from past financial inclusion studies (Demirgüç-Kunt *et al.*, 2018; Beck *et al.*, 2020, etc.) but added another dimension by jointly considering access and usage indicators, alongside other socio-economic factors. Firstly, the descriptive analysis of digital payment services in use revealed that while mobile money platforms has expanded access, usage remains uneven, particularly among women and rural populations. Analysis confirmed that access and usage do not always move together, underscoring persistent gaps and imbalances. Secondly, Heckman selection model results showed that affordability, trust in digital systems, and literacy significantly influence usage, while the Principal Component Analysis (PCA) identified the four major components of the observed payment usage constraints namely; access and infrastructure constraints, cost and affordability constraints, capability and literacy constraints, and trust and reliability constraints. In addition to that, the study highlights that: increasing affordable and interoperable digital payment infrastructure would enhance the convenience, accessibility and ease of use of digital payments for women, youth and rural populations. Complementary literacy-focused policies would further strengthen capability and confidence in usage. Most importantly, to achieve sustainable financial inclusion through digital payment services, will require a coordinated and collaborative approach between the government, financial institutions, and the private sector as they will help build trust in digital systems while ensuring that populations that are currently underserved can actively use digital payment services to improve their livelihoods.

Key words: Financial Inclusion; Inclusive Finance; Access-Usage Gap; Heckman selection model

I. INTRODUCTION

Financial inclusion is becoming a widely recognized critical enabler of economic development, as it offers access to valuable and affordable financial services such as savings, credit, insurance, pension and payments among others; thereby making it a key contributor to poverty reduction and shared prosperity (World Bank, 2022). Building on this, digital payments have become a critical factor of financial inclusion, allowing transactions to be faster, safer, and more efficient, reducing the use of cash, and lowering the cost of transacting money to individuals and businesses, which in turn improves the economic participation and transparency (CGAP, 2023). Evidence on a global level indicates that enhancing financial access improves household welfare, promotes consumption stability and encourages the development of micro-enterprises (Klapper *et al.*, 2016). The concept of financial inclusion has evolved from merely expanding physical access to ensuring sustained and active use of financial services, especially in the emerging economies where digital transitions are not even (Ozili, 2020).

This distinction is core to the explanation of the “access-use gap” which is currently a debilitating issue in financial inclusion.

Globally, scholars emphasize the idea that the modern financial inclusion is not only about physical access but also active usage, the ability to make transactions digitally, and to use interoperable digital platforms (Arora & Rathore, 2022; Klapper *et al.*, 2022). Although initial policies in developing nations focused on the growth of branches, Automated Teller Machine (ATM), and simple savings accounts, recent indicators demonstrate that digital public infrastructure, including mobile money, biometric authentication, and instant payment systems, has redefined inclusion pathways (Suri & Jack, 2016).

Rwanda has made significant progress in expanding access to digital payment services, particularly through mobile money and other electronic payment platforms. The number of individuals with access to digital payment accounts has increased to a large proportion of the population, indicating high investment in financial infrastructure and payment innovation. As per FinScope 2024 survey, there was an increment in formal financial inclusion to 96% in 2024 as compared to 77% in 2020 of adults. The number of registered mobile money accounts had

increased by 77% in 2024 compared to 60% in 2020 and approximately 86% of adults are utilizing mobile money to carry out finances (NISR, 2024).

Although 73% of women are getting more access to mobile money, there are still obstacles of using digital payments to access their more extensive financial services (MINECOFIN, 2024). Women of the rural communities, more specifically, continue to be disadvantaged compared to their urban counterparts in terms of formal use of digital payment services (Newtimes, 2024). Besides, the financial resources, access to the digital tools as well as the social norms and gender relations deny the women ownership and control over the monetary assets; while the young people are impaired because of the low-income level, unofficial employment and distrust in the financial institutions. Such constraints reduce the chances of digital payments as one of the steps toward greater financial inclusiveness and economic empowerment (Tuyisenge & Habimana, 2024).

FinScope Youth Financial Inclusion Thematic Report (2025) also stated that despite the striking rise in access to digital payment platforms over the years, women, the youth, and the rural population have been low users. The actual usage is still limited in scope and intensity, whereby it is still relatively concentrated on the basic person-to-person transfer, and other payment features like merchant payments, bill payments, online purchases and government related transactions are not adopted as frequently. Consequently, digital payments are not yet fully embedded as a routine and primary payment method, and cash remains a dominating factor in day-to-day transactions, preventing the digital payment systems to progress towards greater efficiency, convenience, and economic inclusion. Given this context, the paper aims to examine the gap between access to and usage of digital payment services among women, youth, and rural populations in Rwanda.

Generally, it is intended to examine the gap between access to digital payment services and their actual usage among women, youth, and rural populations in Rwanda. Whilst specifically, it is intended to: (i) identify the digital payment platforms in use and evaluate the extent of the access–usage gap among women, youth, and rural populations in Rwanda. (ii) determine the factors influencing the use of digital payment services among women, youth, and rural populations in Rwanda. (iii) examine the key constraints limiting digital payment usage among women, youth, and rural populations in Rwanda.

This paper is structured as follows: the next chapter reviews the related literature, chapter three outlines the research methodology, chapter four presents empirical results and discussions, and the last chapter concludes and recommends.

II. LITERATURE REVIEW

II.1. Theoretical literature

Digital financial inclusion is a concept that has been gaining more attention in the academic and policy circles. Financial inclusion is a concept that is widely understood as the access to and utilization of low-cost financial services by individuals and businesses, including payments, savings, credit, and insurance services, which are offered by formal financial institutions. Nonetheless, it has been highlighted in literature that, financial inclusion is not simply about access but also the practical use of financial services among various sections of the population (Akomeah *et al.*, 2025).

Tram *et al.*, (2023) holds that the concept of financial inclusion is usually perceived in three key aspects of availability, accessibility, and utilization of financial services. Availability means having financial infrastructure like bank accounts and digital payment systems, and access means how easily the services are available to people, which is often affected by socio-economic and geographical factors, while utilization is actual usage of the service, after availability and access exist. It has been demonstrated that financial empowerment enhances females both in terms of community decision-making and well-being as well as socio-economic marginalization (World Bank 2015, 2020).

The Technology Acceptance Model (TAM) developed by Davis (1989) states that people tend more to adopt new technologies when they believe that they are helpful and convenient. The perceived benefits, trust, and ease of operation are among the factors that determine the adoption of new technologies and their further use. Thus, despite the presence of new technologies, adoption and use can be low as long as the users think that the technology is too complicated or is not reliable.

The Diffusion of Innovation Theory, which was proposed by Rogers (2014) provides an understanding of the way in which new technologies can diffuse in a society over time. This view suggests that people embrace innovations at varying levels based on awareness, social influence, compatibility with the existing practice and perceived benefits. With digital finance, some groups like rural people or those who are not digitally literate may be slower to adopt. Consequently, unequal usage levels can be attained even in the presence of access to digital payment services

because of the diffusion process. Complementing this, the Capability Approach that has been proposed by Sen (1999) points out that it is not enough to have access to financial services, people must have knowledge, skills, and enabling environment to make use of financial services.

This paper is based on the frameworks above, by examining the gap between access and the use of digital payment services, with a specific focus on women, youth, and rural people in Rwanda.

II.2. Empirical literature

Empirical studies on digital financial inclusion have yielded mixed and even contradictory findings on access, usage, and impact. On the one hand, several studies (e.g., Demirgüç-Kunt *et al.*, 2018; Suri & Jack, 2016; Ozili, 2020; Khera *et al.*, 2021) indicate that greater access to digital financial services, including mobile money and agent banking, result in greater financial resilience, poverty reduction, and empowerment of marginalized groups. As an example, Demirgüç-Kunt *et al.* (2018) based on the Global Findex data revealed that access to mobile money accounts dramatically increase the number of people who could use financial services in Sub-Saharan Africa, alleviating the exclusion factor.

However, empirical evidence (e.g., Triki & Faye, 2013; Gabor & Brooks, 2020; Chen & Mazer, 2016) warns on the other hand that access is not equal to usage or meaningful impact, especially when it comes to marginalized groups such as women, youth, and rural populations who experience barriers to accessibility, i.e. low financial literacy, cultural norms, and infrastructure. Triki & Faye (2013) opined that although there is a growth in account ownership in Africa as a result of financial inclusion efforts, account use is low because of low levels of literacy, culture, and poor infrastructure.

Rastogi & Ragabiruntha (2018) state that although the world has improved in the area of account ownership, women still face imbalances in accessing and using financial products. In their analysis, they indicate that the structural factors which restrict the ability of women to actively use payment services are low levels of income, disproportionate access to labor markets and deficiency in financial knowledge and skills. Consequently, despite the presence of financial services, women still have problems in interacting with them in a manner that can enhance their financial welfare.

The same can be said about Sub-Saharan Africa where mobile money has been adopted extensively but is not evenly used. In their groundbreaking research on Kenya, Suri & Jack (2016) discovered that mobile money adoption assisted households to smooth consumption and alleviate poverty, particularly among female headed households. They however emphasized that the welfare

gains were only realized when households utilized the services actively through saving, transfers and risk management. Similarly, Tiony, O. K., & Yin, Y. (2023) established that although numerous people opened mobile money accounts, not all users of these accounts were account holders. The use was based on the transaction costs, confidence in the system as well as the availability of the agents.

In Rwanda, several digital financial initiatives such as mobile savings products and digital credit services have been introduced to expand financial inclusion. Nonetheless, it is indicated that the adoption of these services by women and rural residents is rather low because of the reasons including trust issues and the fear of excessive debt (Alliance for Financial Inclusion, 2020).

Tuyisenge & Habimana (2024) discovered that rural users are faced with structural barriers such as poor network coverage, high transaction cost, and low agent density, which induce obstacles to the frequent utilization of mobile financial services. These limitations have complicated the ability of rural people to interact regularly with digital financial systems despite the availability of the services. Despite the regulatory reforms, including the interoperability of mobile money platforms and financial literacy campaigns, were added to widen financial access, it is still difficult to make sure that marginalized groups use these services safely and efficiently (NBR, 2021).

Financial inclusion in Rwanda has reached 96% (7.8 million) of adults in 2024 up from 77% (5.4 million) in 2020, getting closer to the universal access of 100% set target, which was promoted by mobile money proliferation. However, adults are the primary users of mobile money in making basic transactions like money transfers and there is a relatively low utilization of more advanced financial activities such as merchant payments, bill payments (utilities and subscriptions), and government payments through platforms like IremboPay (NISR, 2024). The tendency is also supported by the FinScope 2024 Gender and Youth Thematic Report, which indicates that in spite of the fact that women and youth have already increased their account ownership, there is still a low rate of sustained use of formal financial products due to factors like cultural barriers and less financial literacy among women and irregular income patterns among youth which prevent them to always use digital payment services.

III. RESEARCH METHODOLOGY

III.1 Study Description

The research was carried out in Rwanda. The study considered the rural communities, and, in this context, these were considered as communities that are not within major towns and urban centers where formal digital payment services are not easily accessible. Youth are described as individuals between the age of 16 and 30 years. In case of gender and youth, both rural and urban locations were used to sample participants in order to capture a variety of experiences of digital payment services within the country. Usage is described as the actual use of appropriate and needed digital financial products and services over time in terms of intensity and diversification.

III.2 Research Design

This study used a descriptive research design to examine the imbalance of access and usage of digital financial inclusion between women, youth and rural groups in Rwanda. The analysis targets the current existing information aiming at defining the degree to which access to digital payment services is transformed into their real usage. Since the study involves the use of national surveys, policy reports, and institutional statistics, the secondary sources of data are employed to develop an overall picture of the accessibility and utilization of digital payment services. The study used the available statistics and reports to determine trends and differences in uptake and utilization of digital payment services between various population groups. This allowed conducting a systematic evaluation of the way digital financial infrastructure, regulatory reforms, and financial inclusion initiatives have changed in Rwanda over the past few years.

III.3 Data Sources, Collection and Analysis

The research is based on secondary sources of data. The information was found in the national surveys and institutional reports concerning financial inclusion in Rwanda, such as FinScope dataset, 2024; Global Findex dataset, 2025; BNR financial inclusion dashboard data; reports of the National Bank of Rwanda, and the publications of the organizations engaged in financial inclusion. These sources contain details about indicators like account ownership, mobile money usage, and the use of other digital payment platforms among others by various demographic groups. Both descriptive and inferential statistics were used to analyze the data collected. STATA software was used in processing and analysis of data.

III.4 Scope of the Study

The study focused on women, youth, and rural communities in Rwanda as the target population, because they are usually more likely to be affected by the barriers to the full use of digital payment services even as the access to the services has been improved. Through these populations, research aims to gain a better insight into the obstacles to the successful utilization of digital payment services.

III.5 Analytical Framework

The data collected was analyzed to align with the specific objectives.

Objective One: To identify the digital payment platforms in use and evaluate the extent of the access–usage gap among women, youth, and rural populations in Rwanda.

The descriptive statistics were used to address this objective using frequencies, proportions, and cross-tabulations. Frequencies and percentages were used to identify the proportion of women, youth, and rural users accessing each digital payment platform. While Cross-tabulations were to compare access versus actual usage across demographic groups. Descriptive statistics were used to identify most used digital payment systems that are mobile money, mobile wallets and online banking among the various population groups. The analysis compared indicators of access (i.e. ownership of account or access to mobile money services) and indicators of usage (i.e. frequency of transactions or utilization of savings and credit services) to indicate the access-usage gap.

The access–usage gap was calculated using the following formula:

$$\begin{aligned} &\text{Access–Usage Gap (\%)} \\ &= \frac{\text{Number of individuals with access} - \text{Number of individuals actively using the service}}{\text{Number of individuals with access}} \times 100 \end{aligned} \dots\dots\dots (1)$$

The difference between access and active use among the three population groups was used as the access-use gap. This descriptive approach provides a quantitative measure of the gap between having access and actually using digital payment services, highlighting which groups (women, youth, or rural residents) are experiencing the largest disparities.

Objective Two: To determine the factors influencing the use of digital payment services among women, youth, and rural populations in Rwanda.

An individual's decision to use a digital platform usually consists of two steps: gaining access to the platform and then utilizing it (Maina *et al.*, 2023). The dependent (outcome) variable of whether an individual has access to and use of a digital platforms is binary. To achieve this objective, the Heckman selection model was used to determine the factors that influence the access to and use of digital platforms to correct for selectivity bias in the sample (Fikadu *et al.*, 2024; Heckman, 1979). The Heckman selection model is a two-stage procedure that uses the maximum likelihood estimation method to model access and use of digital platforms. The model has a selection phase which modelled access to digital platforms and an outcome phase which modelled the use of digital platforms. Heckman selection assumes the presence of an underlying relationship that is expressed as an unobserved equation denoted by;

$$Y_i = \beta X_i + \varepsilon_{1i} \dots\dots\dots (2)$$

Given that;

$Y_1 > 0$ If and only if an individual accesses the digital platforms, and $Y_1 \leq 0$, Otherwise.

$Y_2 > 0$ If and only if an individual uses digital platforms, and $Y_2 \leq 0$, Otherwise.

The binary outcome for Equation (2) can be observed if $Y_2 > 0$, and its outcome variable (use of digital information) can only be witnessed if and only if $Y_1 > 0$ in the choice model, that can be presented as;

$$\begin{array}{l} Y_1 = \alpha z_i + \varepsilon_{2i} > 0 (= 1) \\ \varepsilon_1 \sim N(0,1) \quad \varepsilon_2 \sim N(0,1) \\ corr(\varepsilon_1, \varepsilon_2) = \rho \end{array} \quad \left. \vphantom{\begin{array}{l} Y_1 = \alpha z_i + \varepsilon_{2i} > 0 (= 1) \\ \varepsilon_1 \sim N(0,1) \quad \varepsilon_2 \sim N(0,1) \\ corr(\varepsilon_1, \varepsilon_2) = \rho \end{array}} \right\} \dots\dots\dots (3)$$

Where X and Z are set of exogenous variables such as socio-economic factors and technological factors among others, α and β are unknown parameters, ε_1 and ε_2 are error terms normally distributed around the mean and a unity variance, and rho; ρ is the correlation of the errors. When the error correlation is not equal to zero ($\rho \neq 0$), applying the standard probit estimation on equation (3) would yield biased outcomes. Hence, the Heckman selection was used to correct the selection bias in the sample by incorporating the maximum likelihood below;

The log likelihood is:

$$\begin{aligned} \ln L = & \sum_{\substack{i \in S \\ Y_i \neq 0}} w_i \ln \left\{ \Phi_2 \left(X_i \beta + \text{offset}_i^\beta, Z_i \gamma + \text{offset}_i^\gamma, \rho \right) \right\} \\ & + \sum_{\substack{i \in S \\ Y_i = 0}} w_i \ln \left\{ \Phi_2 \left(-X_i \beta + \text{offset}_i^\beta, Z_i \gamma + \text{offset}_i^\gamma, -\rho \right) \right\} \\ & + \sum_{i \notin S} w_i \ln \{ 1 - \Phi(Z_i \gamma + \text{offset}_i^\gamma) \} \dots \dots \dots (4) \end{aligned}$$

Where s is the set of observations for which Y_i is observed, $\Phi_2(\cdot)$ is the cumulative bivariate normal distribution function (with mean $[0 \ 0]$), $\Phi(\cdot)$ is the standard cumulative normal, and w_i is an optional weight for observation. In the maximum likelihood estimation, ρ is not directly estimated. Directly estimated is $\text{atanh } \rho$:

$$\text{atanh } \rho = \frac{1}{2} \ln \left(\frac{1+\rho}{1-\rho} \right) \dots \dots \dots (5)$$

From the form of the likelihood, it is clear that if $\rho = 0$, the log likelihood for the probit model with sample selection is equal to the sum of the probit model for the outcome Y and the selection model. A likelihood-ratio test can be performed by comparing the likelihood of the full model with the sum of the log likelihoods for the Probit and selection models.

Objective Three: To examine the key constraints limiting digital payment usage among women, youth, and rural populations in Rwanda.

To examine the key constraints limiting digital payment usage among women, youth, and rural populations in Rwanda, Principal Component Analysis (PCA) was employed. PCA is a multivariate statistical technique widely used in social science research to reduce a large number of correlated variables into a smaller number of principal components while retaining most of the information contained in the original data (Muthui *et al.*, 2019). The method helps to identify the most significant underlying factors that explain variations among observed variables.

Although Factor Analysis (FA) is also commonly used for identifying latent structures among variables, PCA was preferred in this study because it is primarily designed for data reduction and identification of dominant patterns within a dataset. PCA transforms the original correlated variables into a set of uncorrelated principal components, with the first component explaining the largest proportion of variance in the data (Costello & Osborne, 2005).

In this study, PCA was applied to variables representing potential constraints to digital payment usage, including transaction costs, digital literacy, network coverage, trust in digital systems, availability of mobile money agents, and income stability. The objective was to group

these constraints into a smaller number of principal components that capture the main barriers affecting the usage of digital financial services.

Mathematically, the principal components are expressed as linear combinations of the observed variables:

$$Y_1 = a_{11}X_1 + a_{12}X_2 + \dots + a_{1n}X_n \dots\dots\dots (6)$$

$$Y_2 = a_{21}X_1 + a_{22}X_2 + \dots + a_{2n}X_n \dots\dots\dots (7)$$

Where:

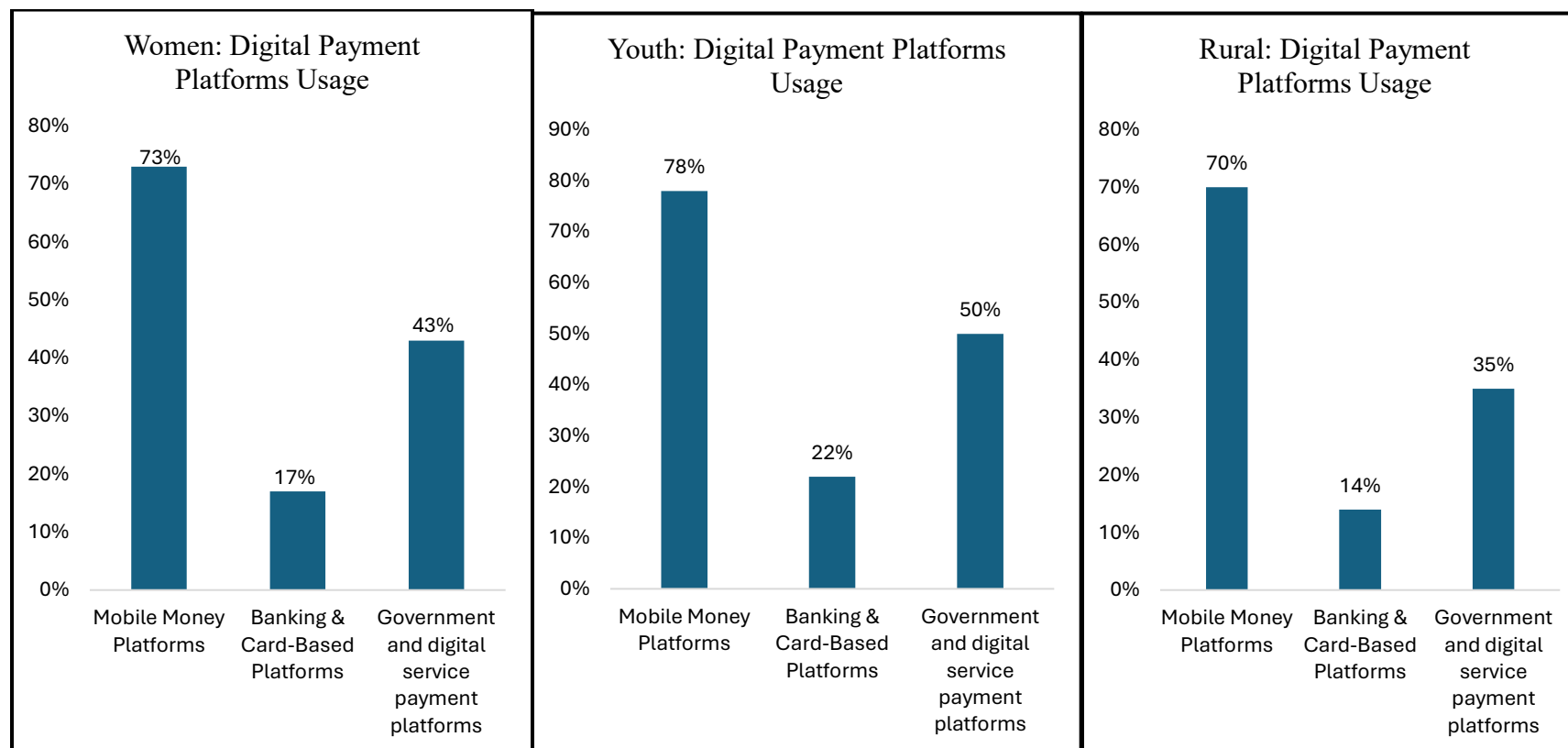
- $Y_1, Y_2, \dots, Y_j$ represents the principal components,
- a_{ij} represents the component loadings (weights), and
- $X_1, X_2, \dots, X_n$ represents the observed variables describing constraints to digital payment usage.

The components with eigenvalues greater than one were retained, as they explain a meaningful proportion of the variance in the dataset. Components with lower explanatory power were excluded. This approach allowed the study to identify the most significant clusters of constraints affecting the usage of digital payment services among women, youth, and rural populations in Rwanda.

IV. RESULTS AND DISCUSSIONS

IV.1 Descriptive Analysis

Figure 1: Digital Payment Platforms Usage among Women, Youth and Rural Populations in Rwanda



Source: Authors' illustration using finscope data

In Rwanda, digital payment systems include; MTN Mobile Money and Airtel Money (mobile money services), bank mobile and internet banking systems and Visa/Mastercard card payment services offered by commercial banks and the Irembo platform used to pay government services and fees. Mobile money platform is the most popular digital payment platform in Rwanda, and more than 70 percent of women, youth and rural population actively engaged with it. This validates the fact that Rwanda is doing well in terms of utilization of digital payment platforms particularly mobile money platforms to increase financial inclusion. This observation is consistent with the World Bank Global Findex 2021, which identifies Sub-Saharan Africa as the most mobile money-adopting region in the world, with Rwanda being one of the most successful countries (Demirgüç-Kunt *et al.*, 2021). The similarity of national and global evidence confirms the credibility of the digital financial inclusion strategy of Rwanda and puts mobile money as the most important gateway to the formal financial system.

In the case of women, the results display fairly use of mobile money (73%), but very low use of banking and card-based platforms (17%) and Government and digital service payment platforms (43%). Among the youth, mobile money is the most used (78%), with banking and card-based platforms usage being low at 22%. The findings complement the Global Findex 2021 data published by the World Bank, which revealed that youth in Sub-Saharan Africa are significantly more likely to have mobile money accounts than traditional bank accounts or cards. The Findex data supports the trend towards young people using mobile money as it is low cost, minimal documentation and available for informal income streams. The alignment indicates that the youth behaviour observed in Rwanda is representative of a national pattern in which mobile money is filling in the gap in accessing digital payment services, while banks and cards are not.

Nevertheless, underutilization of banking and card-based platforms is evident as shown in the Figure1 above. The usage is less than 23% among women, youth and rural populations in Rwanda. This trend is reflected in the results of FinScope Rwanda (2024) which record that, despite having access to financial services (92% of adults), only approximately 65% of adults are active users. This is to the larger idea of inactive financial inclusion in which people are financially included in the sense of access but not used. The Consultative Group to Assist the Poor (CGAP, 2023) also makes similar arguments, indicating that in numerous developing nations financial inclusion has moved to the phase of inactivity, especially in digital financial services.

Banking and card-based platforms are relatively low among women, youth and rural communities with usage of 17%, 22% and 14% respectively. This trend aligns with CGAP (2023) that women and youth worldwide experience structural barriers in the form of disrupted income, low financial autonomy, and financial products that are not best suited to their requirements. These aspects diminish their involvement in wide ranges of digital payment services such Utility bill payments, Merchant payments, Savings and investments, and Loan repayments among others using banking and card-based platforms.

Government and digital service payment platforms usage among women, youth and rural communities stand at 43%, 50% and 35% respectively. This is indicative of the ongoing structural and institutional constraints to digital payment services among the underserved groups. Similar results can be found in the International Monetary Fund Financial Access Survey (IMF, 2023) that states that populations in Sub-Saharan Africa are more dependent on community-based financial institutions because of trust concerns, physical distance to financial institutions, and physical infrastructure. These results indicate that financial inclusion among the underserved groups remains highly skewed towards semi-formal and informal financial systems as opposed to being fully institutionalized in formal financial systems.

Table 1: Access–Usage Gap in Digital Payment Services among Women, Youth, and Rural Populations in Rwanda

Group	Access (%)	Usage (%)	Gap (%)	Usage given access (%)	p-value (Usage difference)	Interpretation
Women	96	73	23.96%	76	0.031** (<0.05)	Significant gender-based usage gap; access not fully translating into usage
Youth	95	78	17.89%	82	0.118 (>0.05)	No statistically significant difference; relatively efficient conversion of access into usage
Rural	94	70	25.53%	74	0.001** (<0.05)	Highly significant rural disadvantage; strongest access–usage disconnect

Source: Authors' own computation using finscope data & Global index database

The identification of the access and usage gap in digital payments in this study was mainly based on mobile money services. The findings demonstrate a stable trend among all population groups (women, youth and rural): accessibility to digital payment services is rather high in

Rwanda, yet it is not completely reflected in the active use, which proves the existence of access-use gap. The access is in general above 90 percent on more specifically to mobile money services, but is used systematically less, with discrepancies of about 17-26 percent. This helps sustain the argument in the general financial inclusion literature that increasing access does not necessarily result in its effective use. Specifically, the reports released by the World Bank Global Findex (World Bank, 2025) are constantly highlighting that numerous developing economies have already attained the level of near-universal access, but nevertheless, they have issues with meaningful and frequent use of digital payment services.

For women, there is a moderate, statistically significant gap of 24 percentage points ($p = 0.031$) with 96 percent of women reporting having access but only 73 percent using digital payment services actively. This implies that women are part of the financial system but are not enjoying the full benefits of the financial system regarding active use. The reason is the same as what Zins & Weill, 2016 discovered, that women in Africa are less inclined to actively utilize digital payment services because of the limitations in terms of their income, financial independence, and financial literacy. The finding is confirmed by Demircuc-Kunt *et al.*, 2021 who recorded that there are ongoing gender disparities in the use of digital payment services over developing nations despite relative equality in the levels of access. However, a few recent fintech-related articles indicate that digital payment services are assisting in closing gender gaps. In spite of that, the findings contradict this optimistic opinion to some extent by revealing that even with the increased access, there is a substantial usage gap, which suggests that digital inclusion is yet to be completely converted into functional inclusion of population in Rwanda.

For the youth, the findings show the least gap (17 percentage points) between access (95%) and use (78%), and the gap is not statistically significant ($p = 0.118$). This indicates that young people are comparatively more effective in access to use than any other group. The insignificant gap between access and use among young people in Rwanda is because of their high exposure to digital technologies and engagement in the digital economy in Rwanda. Most youths are digitally literate owing to the incorporation of ICT in their education and the use of the smart phone for day-to-day activities, while they use mobile money services like MTN Mobile Money and Airtel Money for everyday activities like payment of transport fares, money transfer, and purchases.

Karangwa *et al.* (2024) reiterates this finding, demonstrating that convenience and security increase the intensity of adoption, whereas youth with small, irregular and often informal incomes

tend to use mobile money as a tool that suits their needs best, translating access into usage. In addition, platforms like IremboGov are also popular among the youth to access and pay for services provided by the Government, including an application for a birth certificate, National ID Application, driving licence services, passport applications, education institutions' services, civil registration online and others. This habit of convenience towards digital platforms means that after gaining access to digital payment services, young people learn and are using these services regularly and effectively, leaving the gap between accessibility and usage almost negligible.

For rural population, the access-usage gap is approximately 26 percentage points with very high statistical significance ($p = 0.001$). Although access is relatively high (94%), only 70% of the population actively uses digital payment services, meaning that there is a significant gap between access and use. This observation is well in line with the empirical data by the World Bank and other studies like Zins & Weill, 2016 which repeatedly demonstrate that the rural population is structurally hindered in their financial inclusion due to lack of liquidity in the agents, inadequate network coverage and income volatility among others. Meanwhile, these results are in opposition to more optimistic interpretations in mobile money literature that argue that digital payment services have mostly broken-down geographical boundaries. For this study, the rural divide implies that the concept of geographical inclusion remains mostly symbolic, rather than operational, such that physical or online access does not automatically imply any meaningful consumption.

Overall, the results add to the existing discussion of financial inclusion by supporting one of the major distinctions, highlighted in recent sources: A person may have access without being included, but cannot be included without access. Although Rwanda has achieved significant success in increasing access to digital payment services, in particular, mobile money, banking and card-based platforms and Government and digital service payment platforms, the fact that statistically significant differences in usage persist, particularly among women and rural populations, indicates there are other structural, economic, and behavioral limitations.

IV.3 Factors Influencing Digital Payment Services Usage

IV.3.1 Pairwise correlation test

The pairwise correlation results presented in Table 2 indicate that there are weak to moderate positive correlations of digital payment usage among women, youth, and rural populations in Rwanda (0.24 - 0.29), which means that to some degree usage patterns have the same direction, but the relationships are weak. It implies that there are certain less common

underlying conditions which define the use of digital payments among the three groups, however, more crucially, every group has different behavioral patterns which are motivated by various real-life conditions like access to infrastructure, income level, and digital literacy. Thus, the findings indicate that the usage of digital payment is not spread evenly, as it varies between population groups according to the existing socioeconomic and access-related disparities.

Table 2: Pairwise Correlation Matrix of Digital Payment Usage

Variables	Women	Youth	Rural
Women	1.0000		
Youth	0.29	1.0000	
Rural	0.24	0.27	1.0000

IV.3.2 Empirical results

Table 3 presents the Heckman selection model results of the factors influencing digital payment usage among women, youth, and rural populations in Rwanda.

Table 3: Factors Influencing Digital Payment Services Usage Among Women, Youth and Rural Populations in Rwanda

Variable	Women (Use)	Youth (Use)	Rural (Use)
Age	0.014 (0.011)	0.020* (0.012)	0.016 (0.011)
Household size	-0.007 (0.007)	-0.011 (0.008)	-0.009 (0.007)
Married	0.028 (0.032)	0.012 (0.030)	0.022 (0.031)
No schooling	-0.065 (0.046)	-0.085 (0.050)	-0.095* (0.052)
Secondary+ education	0.150** (0.062)	0.170 (0.068)	0.130* (0.062)
Employed	0.190*** (0.048)	0.270*** (0.052)	0.230*** (0.050)
Self-employed	0.085* (0.047)	0.150*** (0.052)	0.095* (0.048)
Student	0.110* (0.052)	-0.190*** (0.062)	0.115* (0.056)
Retired	-0.085* (0.052)	-0.095 (0.057)	-0.090 (0.052)
Household income (log)	0.490** (0.082)	0.460** (0.072)	0.410* (0.067)
Asset index	0.110*** (0.036)	0.260*** (0.047)	0.130*** (0.042)
Mobile phone ownership	0.620*** (0.095)	0.560*** (0.088)	0.500*** (0.090)
Internet access	0.150** (0.058)	0.190** (0.063)	0.135** (0.062)
Agent network density	0.420*** (0.095)	0.270*** (0.082)	0.470** (0.100)
Transaction costs (fees)	-0.260*** (0.072)	-0.190** (0.067)	-0.290*** (0.078)
Financial literacy	0.740* (0.062)	0.760** (0.062)	0.725* (0.058)
Savings group membership	0.130* (0.072)	0.140* (0.072)	0.150* (0.077)
Constant	0.340* (0.120)	0.360* (0.115)	0.320* (0.118)

Note: Standard errors in parentheses. The asterisk ***, ** and * Represents 1%, 5%, and 10% significant levels, respectively

The Heckman second-stage findings indicate that enabling factors like technological access, affordability, infrastructure, and economic capacity are the main determinants of usage of digital payment services in Rwanda and not demographic factors. The result aligns with the broader digital finance literature as it highlights that since people have embraced a service, the strength of its use is determined by the factors that enable it (Aron, 2018). Meanwhile, it is also confirmed that the women, young people, and rural residents are disproportionately underprivileged in the circumstances, which is why there are still differences in usage results.

Ownership of mobile phone and Financial literacy appear to be the most important determinants. The use of digital payments in Rwanda is still essentially mobile-based, and the ownership of personal devices allows conducting transactions more often and independently. GSMA (2020) emphasizes that mobile access is the most important in mobile money utilization worldwide, whereas FinScope Rwanda (2024) confirms that individual ownership (not shared access) is crucial especially with individuals who need to have control over devices. This highlights the fact that technology ownership and control is the key to continued use. The use of digital payment services is also driven by financial literacy, as it provides individuals with the knowledge and understanding of risks, benefits, and transaction processes, boosting their confidence and usage of these services (Oktafian, 2022).

The results confirms that the density of agent networks, remains indispensable in Rwanda's "cash-linked" ecosystem. Despite the digital nature of payment systems, physical access points are essential for facilitating regular transactions, especially cash-in and cash-out. Evidence has indicated that the closer agents, the higher the frequency of transaction due to the reduction of time and effort (Aron, 2018; Bachas *et al.*, 2022). The greater impact that is seen in rural areas indicates the relevance of infrastructure availability in determining usage patterns.

Economic capacity is also a contributing factor. The most common factor that affects the frequency of using digital payment services is employment, income stability, and asset ownership. The people who have constant inflows of income make transactions more frequently, which aligns with World Bank (2022) results that the intensity of use is strongly connected with income regularity. Younger people exhibit higher coefficients in Rwanda, indicating that, although young people are technologically skilled, their application remains reliant on economic activity, specifically, the employment rates and this, is supplemented by (ILO, 2025). More specifically,

the study showed that a 1% increase in digital payment services usage is associated with 46% increase in the youth income holding other factors constant and this relationship is statistically significant at the 5% level.

Human capital aspects such as education and financial literacy have a positive influence on usage. Educated and financially literate individuals tend to get more actively involved in using digital payment services, which demonstrates a stronger sense of confidence in using digital platforms. Such a result is in line with Lusardi & Mitchell (2014), who argue that financial capability enhances decision-making. The fact that these effects are moderate in size, implies that knowledge is not enough without the support of infrastructure and economic conditions.

Among the youth, behavioral impact is especially clear with peer networks having a strong and statistically significant impact. This implies that the usage is partially influenced by social interactions with people who are more likely to utilize services when their peers do. Batista & Vicente (2020) demonstrate the existence of these network effects in digital finance, as financial behaviors can be transmitted via social connections. The lesser impact among women and rural people indicates that social processes are different among groups, which are different in social structures and connectivity.

Lastly, infrastructure factors like internet connectivity and electricity are also a positive factor to usage albeit in moderate proportions. The fact that Rwanda can use USSD based systems decreases reliance on high-level connectivity, yet better infrastructure makes it easier and more predictable. This result coincides with the research of Aron (2018), who states that digital payment services are complemented by infrastructure since it minimizes the operational frictions.

IV.4 Digital Payment Services Usage Constraints

Principal Component Analysis (PCA) was used to reduce and summarise 14 observed constraints into a smaller number of interpretable components. PCA identified the four major components of the observed payment usage constraints: access and infrastructure constraints, cost and affordability constraints, capability and literacy constraints, and trust and reliability constraints.

The mean scores indicate that cost and affordability constraints, as well as capability and literacy constraints, were the most significant constraints on digital payment usage. This was followed by trust and reliability constraints. The least severe constraints were access and infrastructure constraints, meaning that despite the availability of mobile money and other digital

payments, women, youth and rural communities limit their use because it remains expensive and difficult to use. Fear of fraud and failed payments, also prevent full trust in digital payments for routine transactions, such as remittances, bill payments or shopping.

Table 4 presents the descriptive statistics of the principal components of digital payment usage constraints limiting digital payment usage among women, youth, and rural populations in Rwanda.

Table 4: Principal Component Structure and Descriptive Statistics of Digital Payment Usage Constraints among Women, Youth, and Rural Populations in Rwanda

Component	Mean	Std. dev.	Constraints
Component 1: Capability and literacy constraints	2.94	0.26	Cash preference/cultural habits Low financial literacy Difficulty in using digital platforms Dependence on others for transactions
Component 2: Cost and affordability constraints	2.94	0.18	High transaction fees Cost of getting an account/wallet Unpredictable service charges
Component 3: Trust and reliability constraints	2.79	0.32	Fear of fraud/scams System errors/failed transactions Lack of trust in providers Poor complaint resolution systems
Component 4: Access and infrastructure constraints	2.01	0.34	Distance to access points (agents) Poor network coverage (rural areas) Limited availability of agents/services

The eigenvalues of the principal components of digital payment constraints faced by women, youth and rural people in Rwanda are shown in Table 5. A total of 14 components were extracted, with the first four satisfying the Kaiser criterion (eigenvalues > 1), and thus kept for interpretation. The first four components account for 72.49% of the total variance in the data, suggesting that most differences in digital payment constraints among women, youth and rural people can be explained by a few underlying factors. The remaining components explain modest amounts of variation, and thus, do not make significant contributions to the pattern of constraints across the three population groups.

Table 5: Results for Principal Components of Digital Payment Constraints among Women, Youth, and Rural Populations in Rwanda Based on Eigenvalues

Component	Eigenvalue	Proportion (%)	Cumulative (%)
Comp1	4.6310	33.08	33.08
Comp2	2.9556	21.11	54.19
Comp3	1.4405	10.29	64.48
Comp4	1.1218	8.01	72.49
Comp5	0.7575	5.41	77.90

Comp6	0.7987	5.06	82.96
Comp7	0.6907	4.93	87.90
Comp8	0.5884	4.20	92.10
Comp9	0.4211	3.01	95.11
Comp10	0.3115	2.23	97.33
Comp11	0.2644	1.89	99.22
Comp12	0.0799	0.57	99.79
Comp13	0.0188	0.13	99.93
Comp14	0.0101	0.07	100

Note: Comp = component

To determine the number of principal components to retain, this study used the Scree Plot, with the Kaiser criterion (eigenvalues ≥ 1). The Scree Plot is shown in figure 2 with components on the x-axis and eigenvalues on the y-axis. The number of components to retain is determined by the bend in the curve from a steep drop to a gentler slope. Hence, the first four components were selected, and the 14 constraints have been reduced to four principal components that represent the major patterns of variation.

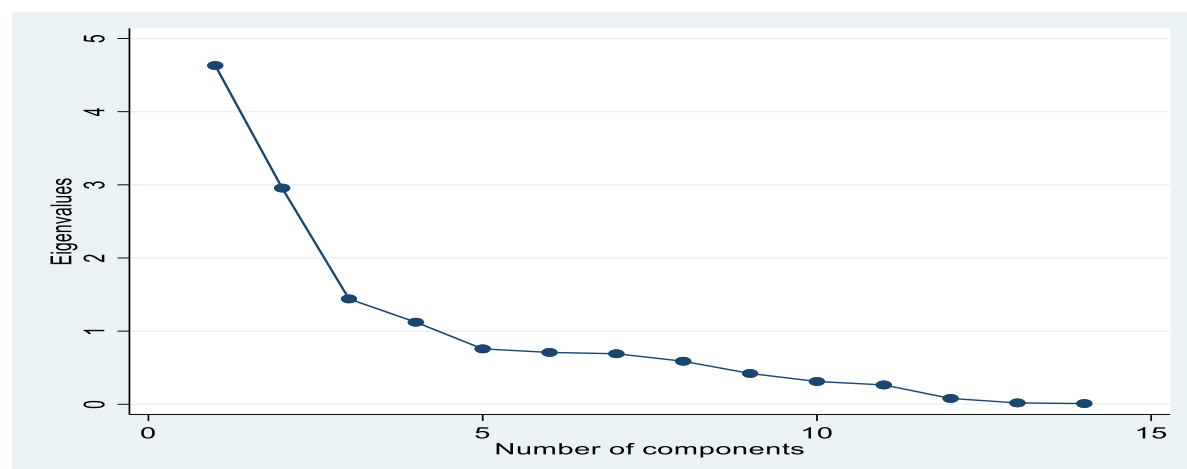


Figure 2: Scree plot of eigenvalues

Table 6 reveals that in Rwanda, the constraints on the use of digital payments among women, youth and rural communities are not only organized into four components, but they are also structured, with high and distinct factor loadings, revealing distinct mechanisms of exclusion. A key finding is that constraints are systemically clustered rather than randomly distributed.

The capability and literacy together with cost and affordability components are the most influential and coherent components, where cash preference/cultural habits, low digital literacy, low financial literacy, low mobile platform usability and reliance on others heavily co-vary. This reveals that even when access is provided, it is constrained by functional capability. The cost

component is an economic constraint related to mobile data, airtime and account fees; this shows that cost is a limiting factor in sustaining usage more than in initial adoption.

The trust and reliability component is more focused but strongly coherent, centered on fraud and technical glitches. This implies that trust constraints reflect not general attitudes but a consistent and solid barrier that impacts transactional behavior. Access and infrastructure constraint is the least influential and coherent component, which would indicate that access to infrastructure, network access and reach, service use and information exchange are a less coherent effect on whether people are able to use digital payments or not. This suggests that access and infrastructure constraints are not logistical problems but create a barrier.

In summary, the loading structure reveals that the constraints surrounding digital payments in Rwanda are complex but distinct, and can be grouped into structural (access), behavioral (capability), confidence (trust) and economic (cost) constraints, with access constraints having the greatest impact on overall exclusion (33.08% of variance).

Table 6: Rotated Component Loadings of Digital Payment Constraints in Rwanda

Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
Cash preference/cultural habits	0.4557	-0.0081	-0.0058	0.0221	0.0368
Low financial literacy	0.4390	0.0114	-0.0017	0.0109	0.1070
Difficulty in using digital platforms	0.4350	0.0086	0.0192	-0.0292	0.1247
Dependence on others for transactions	0.4526	0.0031	0.0106	-0.0105	0.0524
High transaction fees	0.4496	-0.0083	-0.0061	0.0232	0.0619
Cost of owning an account/wallet	0.0295	-0.0484	-0.1008	0.7599	0.2934
Unpredictable service charges	-0.0469	0.0892	0.1277	0.6209	0.4148
Fear of fraud/scams	0.0078	0.4095	-0.0679	-0.0791	0.5173
System errors/failed transactions	-0.0059	0.4169	-0.0310	-0.0982	0.5054
Lack of trust in providers	0.0023	0.4903	-0.0544	0.0105	0.2957
Poor complaint resolution systems	-0.0013	0.4664	0.1624	0.1207	0.2734
Distance to access points (agents)	0.0030	0.4350	-0.0443	-0.0114	0.4509
Poor network coverage (rural areas)	0.0120	0.0135	0.6923	-0.0617	0.3483
Limited availability of agents/services	-0.0082	-0.0222	0.6759	0.0193	0.3691
Eigen value	4.6310	2.9556	1.4405	1.1218	
Proportion (%)	33.08	0.2111	0.1029	0.0801	
Cumulative (%)	33.08	0.5419	0.6448	0.7249	

Bartlett test of sphericity:

Chi-square = 4862.297

Degrees of freedom = 91

P-value = 0.000

V. CONCLUSION AND RECOMMENDATIONS

V.1. Conclusion

This research paper aimed to examine the access-usage imbalances of digital payment services among women, youth, and rural population in Rwanda. With objectives aimed at: identifying the types of digital payment platforms utilized, the assessment of the access-usage gap, the factors influencing digital payment adoption, and the analysis of the limitations to usage. The results have shown that although financial inclusion has grown considerably due to mobile money and other digital payment platforms-based solutions, there are still significant differences in terms of access-usage gap particularly among women and rural populations. The discussion highlights that digital payment services are embraced where convenience, affordability and social networks influence adoption, however systemic factors still limit the adoption to those with limited financial capacity, digital illiterate, distrust in digital systems, and infrastructural related challenges.

The contribution of this study is threefold. First, it gives an empirical analysis of digital financial inclusion in Rwanda particularly among women, youth, and rural population. Although Rwanda has achieved much in increasing financial access by using mobile money and other digital financial platforms, there is limited research done to investigate how various population groups utilize these services. Through these groups, the research brings out differences in the adoption and use of digital payment services according to socio-economic and demographic groups. In line with the recent findings that caution against the use of access indicators only (Khera, 2019; Ji *et al.*, 2021), the study highlights the need to comprehend whether people with access to digital payment services can utilize them on a regular and effective basis. Second, the paper offers policy-supported implications on enhancing digital financial inclusion in Rwanda. Third, the study supports the Rwanda's effort to achieving SDGs 5 and 10 and aligning with Rwanda's NST2, NFIR, and Vision 2050 agenda for inclusive and sustainable development.

V.2. Recommendations

The recommendations emerged are aligned with the specific objectives' results. First, A major recommendation to bridge the digital payment access-use divide in Rwanda is to increase affordable and interoperable digital payment infrastructure, especially those in underserved areas. Point of Sale (POS) machines, agents, QR code payment, mobile money acceptance points, enhanced interbank and inter-mobility money/MTN services among others. This would boost interoperability among banks, mobile money operators, SACCOs and MFIs to improve the

convenience, accessibility and ease of use of digital payments for women, youth and rural populations. This would facilitate the shift from cash to greater adoption of electronic payments, with the responsibility for the costs falling mostly on telecom operators, fintech companies and commercial banks, while the National Bank of Rwanda (NBR) would coordinate regulatory action and set technical standards.

Second, there is need for coordinated action between the public and private sector to boost the adoption of digital payment services among women, youth and rural populations in Rwanda. This is because, usage is multi-dimensional and demands joint interventions, where the public sector strengthens enabling infrastructure, supporting regulating and digital inclusion policies, and the private sector, including banks, mobile money operators, SACCOs, and fintech companies, deliver low-cost and user-friendly service offerings that are demand driven. These services should be streamlined, low-cost and tailored to the financial realities of underserved user groups, so as to increase both the intensity and diversity of use.

Third, targeted initiatives in digital and financial literacy are recommended, allowing for the enhancement of skills, trust, and effective use of digital payment services, as encouraged by Government institutions (NBR, MINEDUC, and local authorities) and reinforced by development partner and private sector Corporate Social Responsibility (CSR) initiatives, in recognition of the mutual advantages of greater access and meaningful usage of digital payment services across the financial sector. In essence, to achieve sustainable financial inclusion through digital payment services will require a coordinated and collaborative approach between the government, financial institutions, and the private sector as they will help build trust in digital systems while ensuring that populations that are currently underserved can access all the benefits of fintech innovations.

V.3. Further research

Further research is needed to assess access–usage gap of digital financial services in Rwanda and empirically study the specific determinants that explain why individuals especially women, youth and rural people have access to digital financial accounts but low or inactive usage. This would ensure both breadth and depth of evidence to support a broader and comprehensive understanding of financial inclusion in Rwanda.

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