

Financial Inclusion in Rural Bangladesh: The Impact of Mobile Financial Services on the Rural Population

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Abstract

The growth of Mobile Financial Services (MFS) is becoming more popular now as a tool for increasing access to financial services in developing countries, including Bangladesh. This paper evaluates the roles of MFS in empowering the unbanked, especially in rural areas, while investigating its impact on reducing gender disparities and addressing demographic differences in financial inclusion. Participants from both rural and urban areas were surveyed through personal interviews from Savar Upazila, Dhaka, with a total 404 head participants. To consider hypotheses about MFS usage and its impact on financial incorporation, one sample t-test, two-sample t-test and chi-square test were employed. Findings reveal that MFS has enhanced the provision of financial mobile services among rural folks. Nevertheless, the level of MFS usage is significantly higher among people who were previously enrolled with formal banks, proving that MFS is integrated into the conventional financial systems. While MFS has improved financial inclusion for women, significant gender disparities persist, requiring targeted initiatives to close the gap. The study proves that the MFS has played a vital role in enhancing financial inclusion. Further research is essential to address the technological gaps and other demographic barriers to maximize the potential of mobile financial services in promoting inclusive economic growth

Introduction

The modern world is increasingly recognizing the potential of safe and affordable financial intermediation—such as credit facilities, savings services, insurance providers, and other banking products—as vital tools for promoting development and eradicating poverty (Demirgüç-Kunt et al., 2018a; Pazarbasioglu et al., 2020). Mobile Financial Services (MFS) is the reply to the bringing about of financial inclusion, mainly in a country where the majority of the population is rural and has no access to traditional banking services (Donovan, 2012; Saeed & Donkoh, 2024). In many developing countries, the financial sector has undergone a significant transformation due to the advent of Mobile Financial Services (MFS). In Bangladesh, MFS has enabled individuals to access financial services that were previously unavailable, thereby enhancing their ability to manage personal finances more efficiently while ensuring greater security (Sarpong & Agbeko, 2020). MFS enabled by mobile technology has opened up access to financial systems for those who have been excluded from formal banking (Kopala, 2010). New avenues for financial inclusion have been made possible by using mobile devices to monitor, and conduct financial transactions in places without banking infrastructure (Aker & Mbiti, 2010; Koffi, 2016). MFS refers to the flexibility of engaging in various financial transactions using Mobile devices, for instance transaction of money, payment of bills, saving, obtaining credits (Jack & Suri, 2014; Schilling & Seuring, 2023).

Bangladesh is a prime example of how MFS affects financial inclusion. The previous several years have seen a flourishing in mobile financial services, with over 100 million



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Copyright: © by the authors. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution 4.0 (CC BY 4.0) International license. mobile phone users and a developing fintech industry (Dona et al., 2014; Rahman, 2021). Well-known companies like bKash, Rocket provide a variety of financial products for different demographics to extend a convenient package of financial services utilizing mobile technology that is safe, efficient and inexpensive (Ahmed, 2019). These services have improved social equity, overall economic development, and transaction ease for the unbanked and underbanked population (Aziz & Naima, 2021; Hasan, 2024). MFS has opened the door for millions of people to the services of financial transaction, remittances and bills payments which are mainly beneficial to the countries such as Bangladesh, where traditional banking infrastructure is mainly missing in rural areas (Bangladesh Bank, 2017). It is even more beneficial to the settlers in the rural areas and the low-income earners since these cannot afford to access the conventional banking services due to distance, fee charges, and other documents they are required to produce (Chakrobortty & Sultana, 2023; Md. M. Rahman, 2021; Sultana, 2023). In this regard, by eliminating these barriers, MFS can become a valuable tool that can increase people's access to finance and let them engage with the economy more actively.

Research demonstrates that MFS reduces financial exclusion by expanding the number of people who can use a mobile phone to save, receive credit, and conduct basic economic transactions (Rayed et al., 2023; Zaman, 2024). Rural residents, who make up the majority of the nation's unbanked and underbanked population, will particularly benefit from this accessibility (Aziz & Naima, 2021; Poojar, 2020). For example, the 2011 introduction of bKash marked the beginning of a new era in Bangladesh's financial system. One of the biggest segments of the non-banking financial sector today is MFS, and by 2022, bKash will have more than 60 million active users, demonstrating its impressive success (Jamil, 2022). They found that the platform is effective in offering affordable, easily accessible finance services that can be relevant to a large market share of users especially the rural or barely reaching banking facilities segment (Hossain, 2020). However, several challenges have been identified that may hinder the successful adoption of Mobile Financial Services (MFS). These include low literacy levels among users, a lack of necessary knowledge about financial technology, and the absence of user-friendly interfaces on devices such as smartphones(Campbell et al., 2017; Lakshminarayanan et al., 2015; Maketo et al., 2023). Digital literacy is one of the main impediments, particularly the old and rural citizens, who despite its benefits struggle to adopt MFS (Aziz & Naima, 2021). Therefore, the ability of user to adopt and use the MFS also differs from one demography to the other. Currently, MFS users are reckoned to be young, living in the urban areas and with higher income levels than their counterparts in the rural and the older generations (Donovan, 2012). Beyond this, security and privacy concern are till now top most threat for using MFS (Gazi et al., 2024). The Bangladesh Bank has laid certain guidelines for the operation of MFS sector and the services being offered must be secure, and fast, as well as to incorporate people from all the layers of the society (Bangladesh Bank, 2022). The aim of the above regulations is to safeguard consumers meanwhile encouraging development and competition in the sector. However, balancing technological innovation and regulatory oversight still represents a challenge for policymakers (Mazer & Rowan, 2016).

To unlock the full potential of MFS in fostering financial inclusion, we must address these barriers. It is important to enhance digital literacy as well as trust in the platforms for mobile financial services so that they can have a wider coverage and more people may benefit from them (Afroze & Rista, 2022; Muchandigona & Kalema, 2023). Bangladesh also provides facts for this demographic gap, where urban users have embraced MFS more than the rural clients (Akhter & Khalily, 2020). So, it is essential to extend the knowledge of demographic differences in order to construct more effective measures for the increase of MFS utilization among people with different characteristics. Hearing about and understanding the particularities of other users can assist to deepen the usage of MFS and expand the level of the financial engagement among these communities (Mujeri & Azam, 2018).

Therefore, more research should continue where the findings have left to study the effect of MFS on the socio-economic status of the people in Bangladesh including young people, the elderly, the poor, and those who have poor or no access to the internet. In that regard, this research seeks to fill the gap in understanding the extent and impact of MFS platforms such as bKash, Nagad, Rocket and others to effectively employ a monetary solution that cuts across densely and scarcely populated areas to cater for the underbanked people. Most of the time conventional banking facilities remain unattainable to many especially in rural areas and this makes MFS be a probable remedy to acquire basic banking and financial products. This study may contribute to resolve the limitations and challenges exits for making MFS more reliable and accessible for the rural and remote area underbanked people in Bangladesh.

Hypothesis Development:

This research aims to examine the impact of Mobile Financial Services (MFS) on distinct population groups by formulating three hypotheses that explore the role of MFS in promoting financial inclusion. The first hypothesis investigates whether MFS has contributed to increased financial inclusion in rural areas, which have historically been underserved by the traditional banking system. The second hypothesis evaluates the extent to which MFS has been adopted by previously unbanked individuals, who have faced barriers such as high transaction costs, limited physical access to banking institutions, and stringent account-opening procedures. The third hypothesis focuses on the potential of MFS to reduce the gender gap in financial inclusion by providing women with enhanced access to financial services.

Hypothesis 1: MFS and Rural Financial Inclusion

Hypothesis: Mobile Financial Services (MFS) have significantly increased the level of financial inclusion among rural populations in Bangladesh.

Mobile Financial Services commonly regarded as MFS is believed to have played a huge role in the formation of financial inclusion where innovations such as MFS has enhanced the efficiency of providing financial services where it was near impossible to penetrate through the traditional banking methods (Saeed & Donkoh, 2024; Tang, 2024). The rural users have a unique issue with accessing the banking and financial services for various reasons including; geographic location of the users, level of income of the targeted group, and the availability of appropriate products in the market (Demirgüç-Kunt et al., 2018a). A similar situation can be observed with MFS as this technology can avoid the mentioned challenges because it does not necessarily need block infrastructure and can be delivered via mobile phones. This hypothesis seeks to find out if MFS have managed to extend the financial frontier of rural population, hence increasing its inclusion in the financial market as hypothesized by (Aker & Mbiti, 2010).

Hypothesis 2: MFS Usage Among Previously Unbanked Populations

Hypothesis: The usage of Mobile Financial Services (MFS) is higher among previously unbanked populations compared to those who already had access to traditional banking services.

Another idea of MFS is to help segments of the population that are not included in the banking system. The previously excluded clients define obstacles like strict procedures for opening the account, high charges, and low branch coverage (Jack & Suri, 2014).

MFS with their relatively easier access and entry barriers therefore are seen positioned as more viable and easier for these unbanked persons. This hypothesis questions the level at which MFS has gained access to banking services by persons who cannot be said to have been part of the banking system and MFS is most likely to be a tool that supports the financial inclusion agenda of many people (Aziz & Naima, 2021).

Hypothesis 3: MFS and Gender Gap in Financial Inclusion

Hypothesis: Mobile Financial Services (MFS) have reduced the gender gap in financial inclusion in Bangladesh.

The topic of financial exclusion according to gender is a pandemic problem, where women are likely to be locked out of the financial system than men. These hurdles are; Culture, Financial literacy, and lack of formal identification (Demirgüç-Kunt et al., 2018a). However, MFS has the capabilities to penetrate this restrictive gap and make female clients accessible and more convenience in, requesting for, and receiving financial products and services. In a nutshell, this hypothesis tries to explore one of the key propositions of this study that is- does MFS play any role to reduce gender gap in Bangladesh and increase women borrower's access to the financial system (Asian Development Bank, 2022).

Methodology

Research Design

This study employs a quantitative research approach to analyze the impact of Mobile Financial Services (MFS) on financial inclusion in Bangladesh. We considered to analyze the growth rates of various factors associated with Mobile Financial Services in both rural and urban areas to assess their impact on financial inclusion. Through rigorous hypothesis testing and descriptive statistics, we will prove or disprove the basis of some hypotheses developed throughout the research journey.

The questionnaires were mostly either

Dichotomous Questions: These are the yes/no questions. They offer two possible responses, usually "Yes" or "No", and are used for obtaining clear, binary information from respondents. Or

Likert Scale Questions: These questions measure the level of agreement or disagreement with a given statement on a symmetric agree-disagree scale, typically ranging from "Strongly Agree" to "Strongly Disagree".

Data Collection

We conducted a face-to-face survey using a structed questionnaire, where responses are recorded electronically through Google Form, making it a quantitative, surveybased approach. The participants in the survey were selected at random. The survey was conducted through in-person interviews in the both rural and urban areas not stranding far from target location Savar Upazila, Dhaka (Fig. 1). Ranging from selfemployed people businessmen or workers to aged housewives and students also. All respondents were adult. Finally, 404 respondents were recorded as primary data for our analysis.



Fig 1: Location Of Data Collection, Savar Upazila, Dhaka

Sample Size Determination

To determine the sample size for our study, we have used the most commonly used formula for estimating the sample size for a proportion.

Infinite sample size,

$$SS = \frac{Z^2 \cdot p \cdot (1-p)}{C^2}$$

Finite sample size,
$$n = \frac{SS}{1 + \frac{SS-1}{\text{Pop}}}$$

Explanation of Terms,

• SS : Sample Size for Infinite Population — The number of observations needed if the population were infinite.

- Z: Z-Score Represents the confidence level (e.g., 1.96 for 95% confidence).
- *p* : Proportion Estimated proportion of the population.
- C: Margin of Error The maximum acceptable difference between the sample proportion and the true population proportion.
- Pop : Population Size The total number of individuals in the population.

Given Parameters,

• Population size (Pop): approximately 831,546 (The adult population of Savar Upazilla is taken as Population size)

- Confidence level: 95% (so, Z≈1.96)
- Margin of Error (C): 5% or 0.05
- Proportion (p): 0.5 (for maximum sample size)

So, the Infinite Sample size, SS would be, $SS \approx 384.16$

If we adjust for our finite population size, $n \approx 382.1$

Analysis Strategy

Each hypothesis was analyzed using their appropriate hypothesis tests. The tests used

descriptive analysis, cross tabulations and hypothesis testing to determine the acceptability of each hypothesis. The tests used in this study were One Sample T-test, Two Sample T-test, Chi-square Test and to measure effect size Cramer's V for Chi-Square Test and Cohen's d for T-tests.

Technological Resources

Data were collected using Google Forms to reach a broad and diverse range of participants. Additional data were gathered through live interviews, with the responses subsequently integrated into the Google Forms dataset. Python was selected for data analysis due to its extensive range of libraries and user-friendly features. For data manipulation and transformation, Pandas and NumPy were primarily used, providing essential functions for effective data management. Furthermore, Matplotlib and Julius AI were employed to create advanced visualizations, enabling deeper insights into the dataset.

Data Analysis

The primary data in this study has been gathered to be employed in hypothesis testing, which may help to understanding the effect of Mobile Financial Services (MFS) on the financial inclusion in Bangladesh. The research work that encompasses the survey and interview of primary data is devoted to the study of specific hypotheses on MFS usage issues, for instance, the impact of MFS on financial inclusions, rural areas, gender differences, and barriers faced by users. In this case, the survey that is carried out could compare such groups as rural vs. urban, male vs. female and so largely reveal the existence of significant differences and trends in the study. Tools like t-tests and chi-square tests were then made use of as a way to figure out whether the differences observed were statistically significant which could serve as turning points by giving or taking evidence on the formed hypotheses. The data that is presented proves that the obstacles to MFS usage are identified and measured leading to a clearer understanding of the deficiencies in these areas.

Hypothesis 1:

Null Hypothesis (H0): Mobile Financial Services (MFS) have not significantly increased the level of financial inclusion among rural populations in Bangladesh. Alternative Hypothesis (Ha): Mobile Financial Services (MFS) have significantly increased the level of financial inclusion among rural populations in Bangladesh. To test this hypothesis, we'll use both descriptive statistics and hypothesis testing. We'll focus on the rural population and their use of Mobile Financial Services (MFS).

	proportion
Do you use any Mobile Financial Services (e.g., bKash, Rocket, Nagad)?	
Νο	56.16438356164384
Yes	43.83561643835616

Fig 2: MFS Users in Savar.

Interestingly, about 43.84% of the rural population uses Mobile Financial Services, while 56.16% do not.

	proportion
How has your access to financial services changed since you started using Mobile Financial Services?	
Significantly improved	46.875
Somewhat improved	31.25
No change	21.875

Fig 3: Changes in Access to Financial Services through Mobile Financial Services.

For rural MFS users, the change in access to financial services is quite positive:

- 46.88% reported significantly improved access
- 31.25% reported somewhat improved access
- 21.88% reported no change

Here's a visual representation of this data:



Fig 4: Change in Financial Services Access for Rural MFS Users

We conducted a one-sample t-test to determine if the proportion of rural MFS users reporting improved access (either significantly or somewhat) is significantly different from 50%.

One-sample t-test results:

- t-statistic: 3.787950821825889
- p-value: 0.0006561534787038849
- Effect size (Cohen's d): 0.6696214282285604

The t-test results show a statistically significant difference (p-value < 0.05), indicating that the proportion of rural MFS users reporting improved access is significantly higher than 50%. The effect size (Cohen's d) of 0.67 suggests a medium to large effect. These results indicate that Mobile Financial Services have had a positive impact on financial inclusion for the rural population in Bangladesh, with a significant majority reporting improved access to financial services.

Hypothesis 2:

Null Hypothesis (H0): The usage of Mobile Financial Services (MFS) is not higher among previously unbanked populations compared to those who already had access to traditional banking services.

Alternative Hypothesis (Ha): The usage of Mobile Financial Services (MFS) is higher among previously unbanked populations compared to those who already had access to traditional banking services. First, let's look at the MFS usage rates for previously banked and unbanked populations:

	Uses_MFS	
Had_Bank_Access		
0	0.6875	
1	0.9166666666666666	

Fig 5: Bank Account Access for MFS Users

These statistics show that:

- 68.75% of previously unbanked individuals use MFS
- 91.67% of previously banked individuals use MFS



Fig 6: MFS Usage Rates by Previous Banking Access

Contrary to our hypothesis, the data suggests that MFS usage is actually higher among those who had previous access to banking services.

We used a two-sample t-test to compare the means of two independent groups (previously banked and unbanked). This test helps us determine if there is a significant difference in MFS usage between these groups.

Two-sample t-test Results:

- t-statistic: -6.164383698126853
- p-value: 1.7226761556239027e-09
- Effect size (Cohen's d): -0.6592054966339806

The negative t-statistic (-6.16) indicates that the mean MFS usage for the unbanked group is lower than for the banked group. The p-value is extremely small (1.72e-09 < 0.05), suggesting strong evidence that the groups are not different, which is the null hypothesis. The effect size (Cohen's d) of -0.66 indicates a medium to large effect, with the negative sign confirming that the unbanked group has lower MFS usage.

We will use the chi-square test to examine the relationship between two categorical variables (previous banking access and MFS usage). This test helps us determine if there's a significant association between these variables.

Chi-square test results:

- Chi-square statistic: 33.17123408414607
- p-value: 8.438976283492485e-09
- Cramer's V: 0.28654321674010624

The chi-square statistic (33.17) and very small p-value (8.44e-09 < 0.05) indicate a significant association between previous banking access and MFS usage. Cramer's V (0.29) suggests a moderate effect size, confirming the strength of this association.

Based on the descriptive statistics and hypothesis tests, we must reject the hypothesis H2. The data provides strong evidence that the usage of Mobile Financial Services is actually higher among populations who already had access to traditional banking services compared to previously unbanked populations.

Key findings:

• MFS usage is higher among previously banked individuals (91.67%) compared to previously unbanked individuals (68.75%).

• The difference in MFS usage between these groups is statistically significant (p < 0.05 in both t-test and chi-square test).

• The effect sizes (Cohen's d and Cramer's V) indicate a moderate to strong relationship between previous banking access and MFS usage.

These results suggest that while MFS is contributing to financial inclusion by reaching previously unbanked populations, it is even more widely adopted by those who already had access to traditional banking services. This could indicate that MFS is complementing rather than replacing traditional banking services, or that those with previous banking experience are more likely to adopt new financial technologies.

Hypothesis 3:

Null Hypothesis (H0): Mobile Financial Services (MFS) have not reduced the gender gap in financial inclusion in Bangladesh

Alternative Hypothesis (H1): Mobile Financial Services (MFS) have reduced the gender gap in financial inclusion in Bangladesh.

Let's look at the financial inclusion by gender:

	Has_Bank_Account	Uses_MFS
Female	0.7291666667	0.7760416667
Male	0.8388625592	0.9099526066

Fig 7: Gender Differences in Bank Account Ownership and MFS Usage

This data shows that:

• 72.92% of females have a bank account, compared to 83.89% of males.

• 77.60% of females use Mobile Financial Services (MFS), compared to 91.00% of males.

We can visualize this data in the following graph:



Fig 8: Gender Differences in Financial Inclusion

We can see there is still a gender gap in both traditional banking and MFS usage. The gap appears to be slightly larger for MFS usage compared to bank account ownership. Both genders have higher participation in MFS than traditional banking.

We used Chi-square tests to check the relationship between gender and financial inclusion:

Chi-square test results for Gender and MFS Usage:

- Chi-square statistic: 12.838033119255345
- p-value: 0.00033964444667079676
- Cramer's V: 0.1784829448049352

Chi-square test results for Gender and Bank Account Ownership:

- Chi-square statistic: 6.567609927414819
- p-value: 0.010385132431268857
- Cramer's V: 0.1276589159727281

If we analyze the perception of MFS impact on women's financial inclusion:

	count
Do you think Mobile Financial Services have made financial services more accessible for women in your community?	
Agree	66.25310173697271
Strongly agree	24.56575682382134
Neutral	8.188585607940446
Strongly disagree	0.49627791563275436
Disagree	0.49627791563275436

Fig 9: Perceptions on Mobile Financial Services Accessibility for Women

We can interpret that the vast majority of respondents (90.82%) either agree or strongly agree that MFS has made financial services more accessible for women in their community. Only a small percentage (0.50%) disagree or strongly disagree with this statement. This indicates a strong positive perception of MFS's impact on women's financial inclusion.



Fig 10: Perception of MFS Impact on Women's Financial Inclusion

Based on this analysis, we can conclude there is still a gender gap in both traditional banking and MFS usage, with men having higher participation rates in both services. and contrary to our initial hypothesis, the gender gap appears to be slightly larger for MFS usage compared to traditional banking. This is evidenced by the larger difference in usage percentages (13.4% for MFS vs. 11% for bank accounts) and the higher Chi-square statistic and Cramer's V value for MFS usage.

Despite the persistent gender gap, MFS has increased overall financial inclusion for both genders. Both men and women have higher participation rates in MFS compared to traditional banking. There is a very positive perception of MFS's impact on women's financial inclusion, with over 90% of respondents agreeing that it has made financial services more accessible for women. While MFS has not reduced the gender gap in financial inclusion as hypothesized, it has significantly improved overall financial inclusion. The strong positive perception suggests that MFS is seen as a valuable tool for improving women's access to financial services, even if it hasn't yet closed the gender gap.

Discussion

The findings of this study indicate that Mobile Financial Services (MFS) have significantly enhanced financial inclusion in rural areas of Bangladesh. Notably, 43.84% of rural participants acknowledged that MFS plays a role in their financial activities. Among them, 46.88% reported experiencing significantly improved access to financial services, while 31.25% indicated moderate improvements, suggesting a positive shift in financial accessibility. These results are consistent with previous research, which highlights the critical role of MFS in extending financial services to rural populations traditionally underserved by conventional banking institutions (Saeed & Donkoh, 2024; Tang, 2024). The findings suggest MFS has helped overcome barriers such as geographic isolation and the lack of banking infrastructure, consistent with the theoretical framework proposed by Aker-Mbiti (2010). In direct contrast to the second hypothesis, MFS usage is much higher in groups that are already in the formal banking system. 68.75% of the previously unbanked had ever used MFS compared to 91.67% for the previously banked. Although MFS has promoted financial inclusion, this channel is primarily adopted by users who already have knowledge of financial products and services. This result is in line with findings by Jack and Suri (2014), who suggest that prior exposure to banking can help in the adoption of MFS. From the third hypothesis, the findings reveal that though MFS has promoted financial

inclusion among females, the gap between genders is still very huge. 77.60% of females reported using MFS, while 91.00% of males did, indicating that even now, men are more likely to use MFS than women. These findings are therefore consistent with the existing literature, which points to socio-cultural barriers, lower levels of financial literacy, and limited access to mobile phones as key factors that explain the gender gap in financial inclusion (Demirgüç-Kunt et al., 2018). The persistent disparity suggests that MFS has not fully succeeded in closing the gender gap, even though it has provided women with greater access to financial services than traditional banking methods. This finding aligns with research suggesting that technological interventions, while important, are insufficient to fully eliminate the gender gap in financial access (Asian Development Bank, 2022).

These results only go to demonstrate that even while MFS has tremendous potential in empowering financial inclusion, access is usually limited in very excluded sections, especially unbanked and female clients. These findings indicate that those who can adapt more easily to the use of MFS services already have previous exposure to basic concepts in financial literacy or have been clients of banking institutions through their conventional systems; thus, strategic efforts need to be laid out in the expansion of MFS toward excluded sections.

This is a very limited study as it is focused on one geographic area, Savar Upazila, and thus may not represent the entire rural area of Bangladesh. Also, self-reported information may be subject to bias, and there is no deeper exploration of the underlying socio-cultural factors. Further research is also needed on factors that hamper the adoption of MFS among unbanked and female populations, focusing on such aspects as digital literacy and trust in mobile financial platforms. Studies that place the impact of MFS in the context of long-term financial inclusion, especially beyond these areas of Bangladesh, would put the impacts of MFS into better perspective.

Conclusion

This paper aims to examine the role of Mobile Financial Services (MFS) in enhancing financial inclusion in Bangladesh. Findings from the empirical research suggest that MFS has played a significant role in delivering financial services to unserved and underbanked populations, particularly in rural areas. The data indicate that participation rates in MFS usage are higher for both men and women compared to traditional banking services. However, the findings also reveal a degree of gender disparity, suggesting that while MFS has broadened access, gaps in usage persist between the sexes (Donovan, 2012; Mas & Radcliffe, 2011).

Nevertheless, the technology issues described by the users have allowed for more extended and diverse economic participation through the provision of safe and accessible financial services (Aziz & Naima, 2021; Sarpong & Agbeko, 2020). The government of Bangladesh, through its central bank, Bangladesh Bank, has put in place measures and standards that have encouraged the emergence and use of MFS (Bangladesh Bank, 2012, 2017). To enable Mobile Financial Services (MFS) to reach their full potential in narrowing the financial inclusion gap, targeted strategies must be developed to enhance digital literacy, ensure security, and address gender-specific barriers. For future research, further studies are recommended to examine the socio-economic impacts of MFS across diverse demographic groups. Additionally, research should aim to identify the most effective strategies for leveraging MFS to improve financial inclusion at the national level.

Policy Recommendation

One of the main barriers to embracing MFS is illiteracy, which is more prevalent among users in rural areas. Some potential users have no prior experience using mobile technology and hence do not fully comprehend the working of the MFS platforms, particularly women and the elderly. It is suggested that the government and the financial institutions should devise specific professional trainings that focus on the practice on engaging mobile financial services. Such programs should ideally be designed to fit into specific categories, such as rural people and women. The barrier that was mentioned most frequently by the MFS users clarified that there is still the need to refine the efficiency and usability of MFS platforms by pointing to the choice of "Technical issues." It is also important that financial institutions need to invest in developing the technological strength to enable that MFS platforms are well secured and user-friendly. This involves challenges like the negative network signals, graphical interface, and the failure of transactions. Further, there is also a need to provide the service to the financial service providers to support their customers, where the users are struggling and stuck with some technical issues on the platforms. Currently, MFS has played a role in enhancing the financial rates for women but gender disparity still persists. In this regard, female-policy makers should come up with policies that will enhance the participation of women on MFS. This may entails using monetary incentives to encourage women to sign up for MFS accounts, developing financial products services for women, or launching crusade rallies that popularize MFS among women. More information has to be collected on how to increase the use of MFS by women since shortage of mobile phones is among the key drivers that encourage the use of MFS. To be able to take advantage of MFS, many people have the feeling that their transactions would not be secure and private. To increase user trust in MFS the implementing organisations should enforce strict security measures, including the use of passwords accompanied by other secondary features like two step verification or encrypted user data. Also, MFS providers should also clearly explain to the users how the data of the users will be utilized and how their privacy will be protected. There should also be public awareness to create demand for MFS by informing the users on the secures features of the MFS platforms and those that they may be afraid of falling victims to fraud or data theft. To encourage greater collaboration among the key players and to boost MFS usage among the citizenry, especially within rural areas, policymakers ought to ensure the availability of the required physical infrastructure underlying the MFS provision. This includes expanding accessibility and availability of mobile networks in some rural regions and providing affordable mobile phones to the people in those regions. Also, there is a need for the financial service providers to reduce the transaction fee for what they charge the rural users to encourage the use of MFS in the areas.

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Author contributions

Both authors contributed to the completion of this work. Md. Farhad Alam and Syeda Maria Rahman drafted the initial draft. Md. Saifur Rahman edited and reviewed the manuscript. Daiyaan Muhammad Fardeen Collected the data. Both authors approved this manuscript for publication.

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Data availability

Data will be available upon reasonable request.

Declarations

Ethical approval

Informed consent We prepared a consent form, discussed the research process, and provided this consent form to the participants before the interview. We listened to this consent form for those who didn't know how to read it. The participating respondents were notified in support of their consent process that their commitment was voluntary and confidential. We informed them that their names would not be revealed in the study and would be used in pseudonyms. All participants consented orally and signed this consent form.

Conflict of interest

The authors declared that no conflict of interest exists.

References:

Afroze, D., & Rista, F. I. (2022). Mobile financial services (MFS) and digital inclusion – a study on customers' retention and perceptions. Qualitative Research in Financial Markets, 14(5), 768–785. <u>https://doi.org/10.1108/QRFM-06-2021-0095</u>

Ahmed, L. (2019). Performance Analysis of Mobile Financial Industries; A comparative Analysis between bKash Limited and Dutch Bangla Bank Rocket.

Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. Journal of Economic Perspectives, 24(3), 207–232. <u>https://doi.org/10.1257/jep.24.3.207</u>

Akhter, N., & Khalily, M. A. B. (2020). An Analysis of Mobile Financial Services and Financial Inclusion in Bangladesh. Indian Journal of Human Development, 14(2), 213–233. <u>https://doi.org/10.1177/0973703020946706</u>

Asian Development Bank. (2022a). Gender Equality and Social Inclusion Diagnostic for the Finance Sector of Bangladesh. <u>https://doi.org/10.22617/TCS220566-2</u> Asian Development Bank. (2022b). GENDER EQUALITY AND SOCIALLINCLUSIONNDIAGNOSTIC FOR THE FINANCE SECTOR OFF BANGLADESH DECEMBER.

Aziz, A., & Naima, U. (2021). Rethinking digital financial inclusion: Evidence from Bangladesh. Technology in Society, 64. https://doi.org/10.1016/j.techsoc.2020.101509 Bangladesh Bank. (2012). Policy Paper Mobile Financial Services in Bangladesh: An Overview of Market Development 1. <u>https://www.bb.org.bd/pub/research/policy-paper/pp072012.pdf</u>

Bangladesh Bank. (2017). An Impact Study on Mobile Financial Services (MFSs) in Bangladesh. <u>https://www.bb.org.bd/pub/special/impact_mfs_27092018.pdf</u>

Bangladesh Bank. (2022). Bangladesh Mobile Financial Services (MFS) Regulations. https://www.bb.org.bd/mediaroom/circulars/psd/feb152022psd04e.pdf Campbell, J. I., Aturinda, I., Mwesigwa, E., Burns, B., Santorino, D., Haberer, J. E., Bangsberg, D. R., Holden, R. J., Ware, N. C., & Siedner, M. J. (2017). The Technology Acceptance Model for Resource-Limited Settings (TAM-RLS): A Novel Framework for Mobile Health Interventions Targeted to Low-Literacy End-Users in Resource-Limited Settings. AIDS and Behavior, 21(11), 3129–3140. <u>https://doi.org/10.1007/s10461-017-1765-y</u>

Chakrobortty, T., & Sultana, M. (2023). Financial Inclusion for Rural Community in Bangladesh Through Agent Banking. <u>www.ijfmr.com</u>

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018a). The Global Findex Database Measuring Financial Inclusion and the Fintech Revolution Asli The Global Findex Database.

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018b). The Global Findex Database Measuring Financial Inclusion and the Fintech Revolution Asli The Global Findex Database.

Dona, P. Das, Islam Mouri, S., Hasan, M., Zainal Abedin, M., Das Dona α , P., Islam Mouri σ , S., Hasan ϱ , M., & Zainal Abedin W, M. (2014). Significance of Exponential uses of Mobile Financial Services (MFS) in Bangladesh. Type: Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc, 14. www.wikipedia.com

Donovan, K. (2012). Mobile Money for Financial Inclusion: Vol. 61(1).

Gazi, M. A. I., Al Masud, A., Hossain, H., & Senathirajah, A. R. B. S. (2024). An investigation on the behavioral intention of existing bank clients in a developing country to use mobile banking services. Journal of Infrastructure, Policy and Development, 8(5). <u>https://doi.org/10.24294/jipd.v8i5.3255</u>

Hasan, Mahmudul. (2024, January 28). Changing landscape of mobile money in Bangladesh. The Daily Star. <u>https://www.thedailystar.net/supplements/mfs-and-financial-inclusion-bangladesh/news/changing-landscape-mobile-money-bangladesh-3530006</u>

Hossain, M. A. (2020). Acceptance of Mobile Financial Services in Bangladesh: An Overview of bKash LTD.

Islam, Md. A., Khan, M. A., Ramayah, T., & Hossain, M. M. (2011). The Adoption of Mobile Commerce Service among Employed Mobile Phone Users in Bangladesh: Self-efficacy as a Moderator. International Business Research, 4(2). <u>https://doi.org/10.5539/ibr.v4n2p80</u>

Jack, W., & Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. American Economic Review, 104(1), 183–223. https://doi.org/10.1257/aer.104.1.183

Jamil, M. Z. (2022). Impact of Mobile Financial Service on Financial Inclusion of Bangladesh: A case study on bKash.

Koffi, H. W. S. (2016). The Fintech Revolution: An Opportunity for the West African Financial Sector. Open Journal of Applied Sciences, 06(11), 771–782. https://doi.org/10.4236/ojapps.2016.611068

Kopala, M. (2010). Mobile Banking: A Tool of Financial Inclusion for India. https://doi.org/10.2139/ssrn.1674328

Lakshminarayanan, R., Ramalingam, M. R., Shimaz, M., & Shaik, K. (2015). CHALLENGES IN TRANSFORMING, ENGAGING AND IMPROVING M-LEARNING IN HIGHER EDUCATIONAL INSTITUTIONS: OMAN PERSPECTIVE.

Maketo, L., Issa, T., Issa, T., & Nau, S. Z. (2023). M-Learning adoption in higher education towards SDG4. Future Generation Computer Systems, 147, 304–315. https://doi.org/10.1016/j.future.2023.05.010

Mas, I., & Radcliffe, D. (2011). Mobile Payments Go Viral: M-PESA in Kenya (P. Chuhan-Pole & M. Angwafo, Eds.). The World Bank. https://books.google.com.bd/books?hl=en&lr=&id=4LlaYqIyAWAC&oi=fnd&pg=PA3 53&dq=Mobile+Payments+Go+Viral:+M-PESA+in+Kenya&ots=DWEpG8fycF&sig=a-UIBn25wJ7cK8bfBtKSnOcv94pU&redir_esc=y#v=onepage&q=Mobile%20Payments% 20Go%20Viral%3A%20M-PESA%20in%20Kenya&f=false

Mazer, R., & Rowan, P. (2016). Competition in mobile financial services: Lessons from Kenya and Tanzania. In The African Journal of Information and Communication (Vol. 17). AJIC. <u>http://creativecommons.org/licenses/by/4.0</u>

Muchandigona, A. K., & Kalema, B. M. (2023). The Catalytic Role of Mobile Banking to Improve Financial Inclusion in Developing Countries. International Journal of E-Services and Mobile Applications, 15(1). <u>https://doi.org/10.4018/IJESMA.317923</u>

Mujeri, M. K., & Azam, S. (2018). Role of Digital Financial Services in Promoting Inclusive Growth in Bangladesh: Challenges and Opportunities.

Pazarbasioglu, C., Mora, A. G., Uttamchandani, M., Natarajan, H., Feyen, E., & Saal, M. (2020). DIGITAL FINANCIAL SERVICES.

Poojar, N. B. (2020). Financial Systems is an important Component for Economic Rural Management-A Study (Vol. 7). JETIR. <u>www.jetir.org</u>

Rahman, M. F. (2021, January 17). The future of mobile financial services in Bangladesh. The Daily Star. <u>https://www.thedailystar.net/supplements/mobile-financial-services/news/the-future-mobile-financial-services-bangladesh-2028885</u>

Rahman, Md. M. (2021). Users' Experiences of Mobile Financial Services at Rural Areas of Bangladesh. Shirkah: Journal of Economics and Business, 6(2), 161. <u>https://doi.org/10.22515/shirkah.v6i2.409</u>

Rayed, M., Elahi, T., Arefin Shimon, S. S., & Ahmed, N. (2023). MFS Design in Appstore-enabled Smart Featurephones for Low-literate, Marginalized Communities. Conference on Human Factors in Computing Systems - Proceedings. <u>https://doi.org/10.1145/3544548.3580661/SUPPL_FILE/3544548.3580661-TALK-VIDEO.MP4</u> Saeed, M. M., & Donkoh, E. (2024). Mobile banking services and financial inclusion among customers of commercial banks: Evidence from an emerging economy. Business Strategy & Development, 7(4). <u>https://doi.org/10.1002/bsd2.70035</u>

Sarpong, N. A., & Agbeko, M. (2020). Optimizing Technology in Mobile Financial Services: User experiences and expectations in Ghana. International Journal of Computer Applications, 177(39), 1–7. <u>https://doi.org/10.5120/ijca2020919716</u>

Schilling, L., & Seuring, S. (2023). Mobile financial service-enabled micro-businesses driving sustainable value creation in emerging markets. Technological Forecasting and Social Change, 192, 122596. <u>https://doi.org/10.1016/J.TECHFORE.2023.122596</u>

Sultana, T. (2023). The Mobile Financial Services: Fast growing financial sector in Bangladesh.

Tang, N. (2024). P2P Lending and Mobile Payments: Disrupting Traditional Banking Systems and Expanding Financial Inclusion. <u>https://doi.org/10.54254/2977-5701/11/2024106</u>

Zaman, M. A. (2024, January 28). How mobile money is reshaping financial inclusion in Bangladesh. The Daily Star. <u>https://www.thedailystar.net/supplements/mfs-and-financial-inclusion-bangladesh/news/how-mobile-money-reshaping-financial-inclusi-on-bangladesh-3529986</u>