Analysing the Role of Mobile Financial Services (MFS) in Financial Inclusion: A Data-Driven Exploration of CDIP's Journey

Original Research Article

Aims: This study explores how mobile financial services (MFS) have developed and impacted the work of the Centre for Development Innovation and Practices (CDIP), a mid-sized Bangladesh NGO-MFI. CDIP has worked for financial inclusion and social development through microfinance since 1995.
Study design: Bridging traditional microfinance with digital financial ecosystems has advanced significantly with the strategic integration of MFS into CDIP's microfinance operations, piloted through collaborations with Nagad, bKash, and Upay to establish financial inclusion.
Methodology: This study evaluates adoption rates and MFS usage trends among CDIP borrowers using data from 83,329 transactions collected over a 23-month period using a basic moving average model.
Results: The data shows significant changes in transaction volume, ticket size distribution, and client behaviour and also apparent increase in microfinance clients managing their own transactions. Subsequently, a cost-benefit analysis using discounted cash flow techniques shows that the operational efficiency, customer financial literacy, and long-term strategic gains balance by its short-term financial expenses. The MFS project has a negative net present value (NPV).
Conclusion: This paper emphasises how revolutionary MFS may be in increasing financial inclusion as well as operational efficiency in the microfinance industry, in spite of the fact that there are financial challenges to overcome in order to implement it.

Keywords: NGO, Microfinance, MFS, Social Development, Financial inclusion, Digitization

1. INTRODUCTION

The target audience for microfinance is small enterprises and people without access to traditional banking and associated services. To marginalized populations it includes microcredit, which offers small loans, savings facility, microinsurance and related services (Chikwira et al., 2022). Since the late 1970s, microfinance interventions in Bangladesh have positively impacted low-income populations. As of June 30, 2023, MFIs functioning as non-governmental organizations (NGOs) had USD 12.97 billion in outstanding loans, with a significant total loan disbursement of USD 21.49 billion (MRA, 2023). Microfinance in Bangladesh has empowered millions, particularly women, by providing them with the financial resources to establish enterprises, better their living conditions, and contribute to the

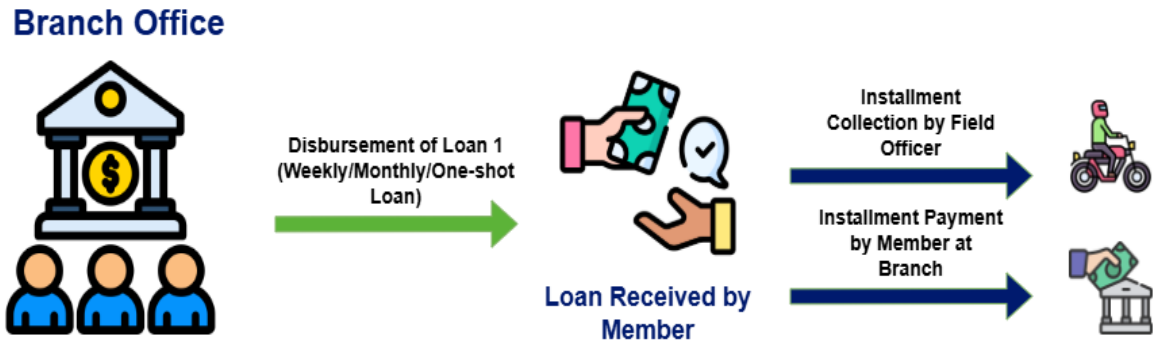

Figure 1: Traditional Microfinance Collection Flow

economy. The sector has developed tremendously, with thousands of microfinance institutions (MFIs) operating throughout the country, even the most rural locations(Mia, 2017; van Rooyen et al., 2012). Leading NGO-MFIs in Bangladesh, including BRAC, ASA, Grameen Bank, Shakti Foundation, BURO Bangladesh, CDIP and many more are driving the country's microfinance sector, which is essential to reducing poverty and promoting financial inclusion(Bhavana Srivastava et al., 2019). Since its founding in 1995, Centre for Development Innovation and Practices (CDIP), a mid-ranged NGO-MFI in Bangladesh has operated 226 branches in 30 districts, offering healthcare, education, and microcredit to foster social development.

Mobile financial service (MFS) is a fast-expanding industry within the emerging economies of Asia, Africa, and the Middle East. It can help those who are left out of official financial channels and economically marginalized (Afroze & Rista, 2022; van Rooyen et al., 2012). Around the world, countries such as Kenya, with its M-Pesa platform, have demonstrated how revolutionary MFS can be by allowing not just payments but also savings, loans, insurance, and other services (Ndung'u, 2021). Bangladesh is rapidly entering the digital era and its socioeconomic characteristics are changing as a result of the remarkable rise in digitalisation that has occurred in the nation in recent years. The Mobile Financial Services (MFS) providers are a major force behind Bangladesh's transition to a digital economy. It has been successful in integrating a sizable portion of the impoverished people who had no access to formal banking into the system (Akhter & Khalily, 2020). These individuals, who reside in both rural and urban areas, have long been denied access to traditional

financial services. In 2012, Dutch Bangla Bank Limited launched mobile banking services across the country, marking the start of a ten-year journey (Md Asaduz Zaman, 2024). Additionally, the central bank started granting MFS licenses in an effort to encourage financial inclusion for anyone. MFS is a replacement payment mechanism that is now provided by ten banks and three of their subsidiaries. The following companies provide MFS services: Islamic Wallet, Meghna Pay, Nagad, FSIBL FirstPay SureCash, Upay, OK Wallet, Rocket, bKash, MYCash, Islami Bank mCash, and Trust Axiata pay (tap) (Bhavana Srivastava et al., 2019; Md Asaduz Zaman, 2024; Parvez et al., 2015).

Since its founding in 1995, Centre for Development Innovation and Practices (CDIP), a mid-ranged NGO-MFI in Bangladesh has operated 226 branches in 30 districts, offering healthcare, education, and microcredit to foster social development. The strategic decision by CDIP to integrate MFS into its microfinance operations will be examined in this paper as a major step towards closing the gap between traditional microfinance and the digital financial ecosystem. Traditional microfinance transactions, are still primarily non-digital. As shown in Figure 1, savings and loan transactions are normally completed in one of two ways: either

members visit the branch, or field agents travel to members' houses to collect payments (Pal et al., 2023).CDIP was largely inspired by 2020 COVID 19 scenario for loan collection, as lockdown was ongoing CDIP field officers couldn't physically go to member's home to home and that created decent organizational loss and inspired CDIP to need analysis and think about effective way to mitigate such financial risk. 2020 Covid-19 pandemic was a pivotal scenario for CDIP to rethink its loan collection approach. As lockdown was in the run, field officers were unable to collect instalments from member's houses which led to organizational losses. Later CDIP conducted a need analysis with the goal of exploring effective and resilient way to mitigate economic shock in the future.

CDIP is leveraging technology to enhance service delivery and broaden its outreach to marginalised communities. To further its goal of financial inclusion, CDIP has piloted the Nagad MFS provider as an alternative collection channel across all of its 226 branches, the bKash MFS provider in 54 of its branches and Upay MFS provider in 5 of its branches. Through integration, the communities that CDIP is dedicated to empowering will benefit more from increased financial inclusion, increased operational efficiency, and improved service. To guarantee sustained growth in Bangladesh's MFS sector, a unique mix of opportunities and difficulties accompany this shift.

The paper flow will be maintained as follows. Section 2 describes literature review on the field of financial inclusion. Section 3 gives a detailed go through with CDIP's MFS journey. And finally details of relevant analysis shows in Section 4.

2. STATE OF THE ART WORK AND METHODOLOGY

Policymakers and financial institution researchers have generally acknowledged the importance of operational resilience and financial inclusion. Numerous studies emphasise how digital financial services help underbanked areas close the financial gap. The Global Financial Index (Demirgüç-Kunt et al., 2020) stated that a lot of people do not have access to formal financial services, notably in developing nations. Financial illiteracy as well as inadequate banking infrastructure are mostly associated with this lack of inclusion. However, the COVID-19 pandemic has shown how important operational resilience is, especially for small financial service providers and microfinance institutions (MFIs) (Zheng & Zhang, 2021).

One of the most important ways to improve financial inclusion, especially in rural and impoverished areas, is to include digital money into microfinance (Dorfleitner et al., 2022). To solve the issues with microfinance, including high transaction costs, information asymmetries, and restricted accessibility, some organizations and nations have embraced digital alternatives. The growth of rural microenterprises in Malaysia has been greatly aided by microfinance, with digital finance acting as a link to raise the productivity and sustainability of these businesses (Al-Shami et al., 2014). Empirical studies that demonstrate how important fintech adoption is to growing financial services without jeopardizing MFIs' mission have also linked the digital transformation of MFIs to greater social performance and financial sustainability (Awaworyi Churchill, 2020). The extent to which digital finance can help the impoverished, however, is also up for debate.

Existing research highlights the potential of digital money in microfinance, but there are few institution-level studies on its actual application and financial sustainability. Most studies focus on theoretical benefits and macroeconomic trends, ignoring borrower behaviour and real transaction data. Furthermore, even while digital banking is known to improve accessibility and reduce costs, nothing is known about the financial trade-offs it poses for microfinance organisations. This article addresses these gaps by providing empirical insights into MFS adoption inside an NGO-MFI and investigating cost-benefit dynamics, transaction trends, and operational performance. It encourages a more comprehensive understanding of the implications of digital finance integration for institutional resilience and financial inclusion by offering a realistic perspective on the challenges and strategic benefits of doing so.

2.1 Data and Methodology

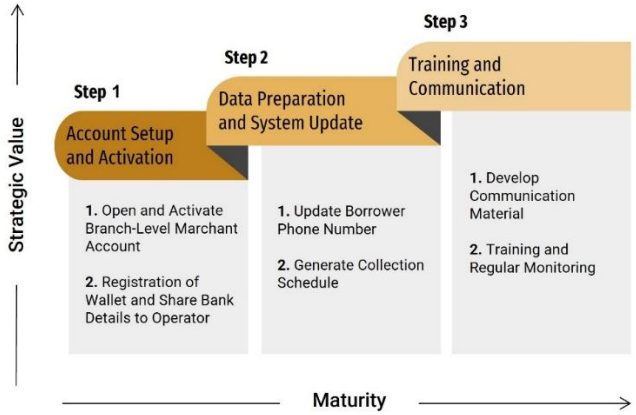

Figure 2: MFS Piloting Phases

The financial analysis section of this paper presents a detailed breakdown of the costs and financial outcomes associated with implementing Mobile Financial Services (MFS) within CDIP. The average ticket size of collections, growth trends, patterns of transactions carried out directly by members, and the timing of these collections were among the many topics that have been examined through analysis of 83,532 detailed transaction records.

Analysis of the adoption rate taken from borrowers of CDIP MFI who made transactions without any outside help. Data spanning of 23 months have been taken and a simple moving average model was fitted to smooth out trends by filtering out the noise from random short-term fluctuations.

The basic formula for simple moving average model is written as Equation (1) -

$$\hat{y}_t = \frac{1}{k}\sum_{i=1}^{k} y_{t-i}\,, \qquad (1)$$

Where y_t is an actual value and $\hat{y}_t$ is a forecast for the observation t and k is the length of the simple moving average model (Svetunkov & Petropoulos, 2018).

The cost-benefit analysis was conducted over a 23-month period from the very inception of MFS at CDIP, examining the financial impacts from both cost and benefit perspectives. The analysis of the data with a series of equations was used to calculate the Net Present Value (NPV) in a cost-benefit analysis (Jason Fernando, 2024).

2.1.1 Model Description:

1. Discount Factor Calculation:

$$Discount\ Factor = \frac{1}{(1+Discount\ Rate)^{Month}} \qquad (2)$$

2. Discounted Net Benefit:

$$Discounted\ Net\ Benefit = Net\ Benefits \times Discount\ Factor \qquad (3)$$

3. Net Present Value:

$$NPV = \sum Discounted\ Net\ Benefits \qquad (4)$$

Costs included the monthly service charge that organization paid to MFS operators, along with initial integration costs. Benefits were measured primarily through three key indicators:

1. **Client Literacy**: Enhanced client understanding of digital financial tools, reducing the need for frequent staff assistance.
2. **Staff Time Savings**: Decreased time spent by staff on educating clients and processing transactions, resulting in increased operational efficiency.

3. **Staff Travel Cost Savings**: Reduction in travel expenses due to the implementation of MFS, which allows staff to handle more transactions remotely rather than requiring in-person visits to clients or branches.

In order to understand the operational efficiency, samples of 165 field staff data were taken with the concerning parameters of the *Distance of Borrowers from the Branch* and the *Number of Collections Made*.

Definition of Variables

Variable	Description
Own Transaction	The total number of financial transactions conducted by the MFI borrowers using their own mobile number.
Other MFS Models	Total number of transactions processed through MFS Agents.
Simple Moving Average Model	A simple moving average (SMA) is calculated by taking the arithmetic mean of a given set of values over a specified period.
Discount Factor	The discount factor is calculated by taking the reciprocal of one plus the discount rate raised to the power of the number of periods.
Discounted Net Benefit	The net benefits for each period (which is the difference between benefits and costs) are multiplied by the corresponding discount factor to convert them into present value terms.
Net Present Value	The NPV is computed by summing all the discounted net benefits across all periods.

Table 1: Definition of Variables

3. RESULTS AND DISCUSSION

3.1 Transaction Volume Analysis

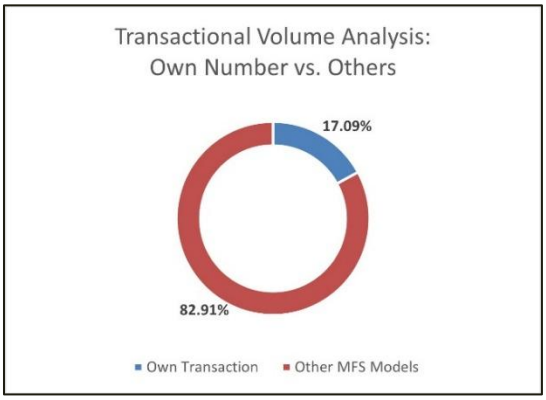

Figure 3: Transactional Volume Analysis

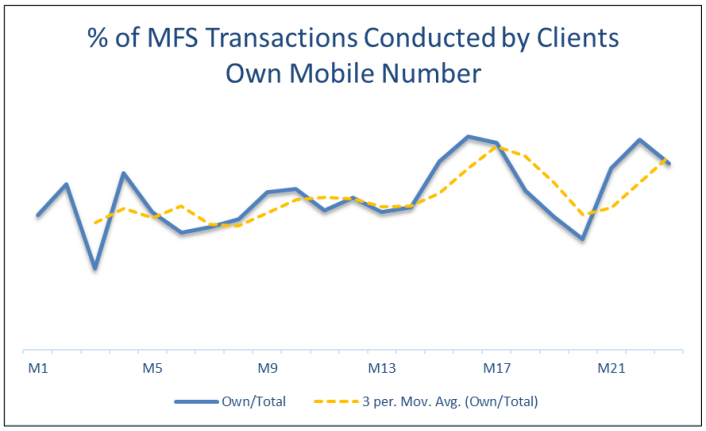

Figure 4: MFS Transaction Growth

Since the inception of Mobile Financial Services (MFS) at CDIP, our core mission has been to enhance client financial literacy. As illustrated in Figure 2, a significant stride towards this goal have been made. Currently, 17.09% of CDIP's borrower are independently conducting transactions using their own mobile numbers—a clear indicator of growing confidence and understanding of digital financial tools. However, the majority, 82.91%, still rely on agents or

other family members/close relatives to complete their transactions. This demonstrates both the achievements to date and the prospects ahead to further empower our clients in their financial endeavours.

Figure 3 highlights the month-by-month progress in client own made transaction of Mobile Financial Services (MFS) at CDIP. With the actual data (the blue line), there are significant monthly variations, suggesting that clients' usage of their own mobile numbers for transactions may be influenced by various factors, such as seasonal effects, promotions, or other external conditions. The moving average shows a gradual increase in the percentage of transactions completed by clients using their own numbers over time. This suggests that, overall, client literacy and confidence in using their own devices for transactions have been improving.

Key Periods:

- **Month 1 to Month 3:** Initial volatility with a noticeable incline in usage.
- **Month 6 to Month 9:** A sharp rise in the adoption rate, followed by another dip.
- **Month 14 to Month 21:** Another increase, showing a possible seasonal or campaign-related spike in MFS usage.

Ticket Size of Collection		
Segment	**Count**	**Amount (USD)**
Less than or equal to 5000	5,660	1,98,298
5001-25000	67,152	66,83,852
25001-45000	9,074	23,62,870
45001-65000	1,173	4,95,627
65001-85000	167	1,01,802
85001-150000	96	82,040
More than 100000	7	9,942
Total	83,329	99,34,431

Table 2: Ticket Size of Collection

Data on transaction ticket sizes was analysed to understand the distribution of transaction amounts, identify the most common transaction sizes and the contribution of each ticket size category to the total collection. The majority of transactions fall within the 5001-25000 ticket size range, accounting for USD 66,83,852 in collections, which represents the largest portion of the total collected amount.

3.2 Cost-Benefit Analysis

3.2.1 Cost Breakdown

The costs associated with the MFS implementation included the initial development and integration cost and the service charge that MFIs bear for each transaction. Each transaction carried out through MFS incurs a 1% service charge, which is borne by the MFI. This charge represents a direct cost to the organization for providing this service to borrowers. Service charges and integration came to a total of USD 98,423 during the last 23 months. Without any financial assistance from other MFS operators, CDIP covered all of the associated costs.

3.2.2 Benefit Analysis

The primary benefits identified were the savings in staff time and the increased operational efficiency resulting from improved client literacy. The staff time savings were quantified by evaluating the reduction in hours spent by staff on time consuming tasks, such as door to door collection from clients. While these savings don’t yield a direct financial return, they play a

crucial role in boosting long-term operational efficiency and elevating client literacy. Consequently, our model indicates no immediate financial gain, but the strategic value lies in the sustained improvements these factors bring to the organization's overall performance.

3.2.3 Discounted Cash Flow Analysis

Given the long-term nature of the project, a discount rate of .1% was availed by one of the MFS operators after continuation of 15 months of the project. CDIP availed this offer only for 8 months with our data range for this analysis.

The last 8 months discount rate derived from the annual rate was approximately 0.10%. Using this rate, the net benefits for each month were discounted, resulting in a present value analysis that provides a clear picture of the project's financial viability.

3.2.4 Results

The net present value (NPV) of the MFS implementation was found to be negative. This indicates that the benefits of the MFS project, outweigh the costs over the 23 months period.

- **Integration cost (Twice in the time frame of 23months):** USD 3,553 (approx.)
- **Net Present Value (NPV):** USD -68,585 (approx.)

This negative NPV indicates that, from a purely financial standpoint, the MFS implementation did not generate a financial return sufficient to cover the initial and ongoing costs. While the cost-benefit analysis of implementing mobile financial services (MFS) shows a negative net benefit, CDIP believe that the strategic, operational, and social advantages far outweigh the immediate financial losses.

Data was analyzed from a sample of 165 field staff who are in charge of collecting instalments from borrowers on a daily basis. Our insights revealed that when a borrower within a 2 km radius makes a payment via Mobile Financial Services (MFS), it saves the field staff 19 minutes of collection time. Similarly, significant time savings are observed for borrowers located at greater distances. By analyzing data from branches with the highest and lowest MFS collections, it was observed that, on average, field officers in high-collection branches manage 29 more members than those in low-collection branches.

Distance of Borrower from Branch (km)	Required Collection Time per Borrower (minutes)
2	19
5	34
8	49
9	54

Table 3: Collection Time Based on Distance

Benefits in operational implications

- **Increased Capacity:** The time saved by using MFS can be redirected to other productive tasks. For example, field staff could use this time to serve additional borrowers, complete administrative work, or reduce their working hours, leading to better work-life balance.
- **Client Financial Literacy:** From our analysis its evident that clients are making their transaction by their own. This shift suggests that they are gradually becoming more financially literate, as they gain confidence in using digital financial tools.
- **Client Satisfaction:** Borrowers benefit from the convenience of MFS, potentially leading to higher satisfaction and retention rates. This is also incredibly easy for them

because they don't have to pay any additional fees for the transaction and they can complete it using their own mobile as well as with available agent points.

- **Reduced Cash Handling Risk:** As the payment is conducting via cashless system, the risk associated with handling cash are significantly lowered. Specially in the evening hours, as shown in table 2, a considerable amount of transaction which is 28,171 transactions, occur between 6.00 PM to 11.59 PM.

4. CONCLUSION

The incorporation of MFS within the microfinance framework of CDIP signifies a noteworthy development in the direction of connecting the digital financial ecosystem and conventional microfinance models. With collaborations with bKash, Upay, and Nagad, CDIP has set out on a revolutionary path to improve client empowerment, operational effectiveness, and financial inclusion. The study's findings point to several significant problems. Firstly, the increase in self-approached transactions suggests that there has been a noticeable shift in client behaviour since MFS was implemented. This tendency suggests a gradual change in favour of growing client financial literacy and greater digital financial autonomy. Secondly, the analysis of transaction volumes and patterns reveals that MFS usage is influenced by a variety of factors, not only seasonal trends and time of day. Despite the analysis's negative net present value (NPV), the cost-benefit analysis shows that the long-term strategic benefits—such as increased client literacy and operational efficiencies—outweigh the short-term financial drawbacks. The results underscore the need for persistence and steadfast commitment to the digital transformation, as the actual importance of MFS surpasses immediate financial benefits. Thirdly, from an operational standpoint, the implementation of MFS has resulted in a significant decrease in staff time and travel costs. This has an impact on CDIP's overall cost-effectiveness as well as its capacity to service a larger clientele and achieve its goal of social development. The improved customer experience and satisfaction with MFS use further support the strategic decision to devote resources to digital financial services.

Even though MFS integration at CDIP has a financial cost, the broader benefits it provides—such as financial inclusion, client empowerment, and operational efficiency—illustrate its revolutionary potential in the microfinance sector. The CDIP with MFS journey demonstrates the challenging but beneficial path towards digital transformation in microfinance, where the emphasis is on sustainable growth, social impact, and financial inclusion. Further research endeavors could delve further into the intricacies of consumer behavior, difficulties related to scaling, and the integration of progressively complex digital tools to enhance the effectiveness of MFS in comparable microfinance contexts.

COMPETING INTERESTS DISCLAIMER:
Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

CONSENT (WHERE EVER APPLICABLE)

Not applicable. This study does not involve any patient data, clinical case reports, or identifiable human subjects.

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

Not applicable. This study did not involve any human participants or animal experiments.

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. https://doi.org/10.1108/QRFM-06-2021-0095

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. https://doi.org/10.1177/0973703020946706

Al-Shami, S. S. A., Majid, I. B. A., Bin Abdul Hamid, M. S. R., & Rashid, N. A. (2014). Conceptual framework: The role of Malaysian microfinance on thewellbeing of users' servicesfrom the perspective of (AIM) and (TEKUN). *World Applied Sciences Journal*, *30*(30 A), 382–394. https://doi.org/10.5829/idosi.wasj.2014.30.icmrp.54

Awaworyi Churchill, S. (2020). Microfinance financial sustainability and outreach: is there a trade-off? *Empirical Economics*, *59*(3), 1329–1350. https://doi.org/10.1007/s00181-019-01709-1

Bhavana Srivastava, Ravi Kant, Ishita Tarun Sharma, Sivakumar Krishnan, & Sonal Agrawal. (2019). *Digital Transformation of MFIs in Bangladesh Opportunities, challenges and way forward About this report Background*.

Chikwira, C., Vengesai, E., & Mandude, P. (2022). The Impact of Microfinance Institutions on Poverty Alleviation. *Journal of Risk and Financial Management*, *15*(9). https://doi.org/10.3390/jrfm15090393

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2020). The Global Findex Database 2017: Measuring Financial Inclusion and Opportunities to Expand Access to and Use of Financial Services*. *The World Bank Economic Review*, *34*(Supplement_1), S2–S8. https://doi.org/10.1093/wber/lhz013

Dorfleitner, G., Forcella, D., & Nguyen, Q. A. (2022). The digital transformation of microfinance institutions: an empirical analysis. *Journal of Applied Accounting Research*, *23*(2), 454–479. https://doi.org/10.1108/JAAR-02-2021-0041

Jason Fernando. (2024). *Net Present Value (NPV): What It Means and Steps to Calculate It*. Investopedia.

Md Asaduz Zaman. (2024). How mobile money is reshaping financial inclusion in Bangladesh. *The Daily Star*.

Mia, M. A. (2017). An Overview of the Microfinance Sector in Bangladesh. *The East Asian Journal of Business Management*, *7*(2), 31–38. https://doi.org/10.13106/eajbm.2017.vol7.no2.31

MRA. (2023). *MICROFINANCE IN BANGLADESH MICROCREDIT REGULATORY AUTHORITY*.

Ndung'u, N. (2021). *A Digital Financial Services Revolution in Kenya: The M-Pesa Case Study*.

Pal, A., Dey, S., Nandy, A., Shahin, S., & Singh, P. K. (2023). Digital Transformation in Microfinance as a Driver for Sustainable Development. In W. Leal Filho, A. M. Azul, F. Doni, & A. L. Salvia (Eds.), *Handbook of Sustainability Science in the Future: Policies, Technologies and Education by 2050* (pp. 251–271). Springer International Publishing. https://doi.org/10.1007/978-3-031-04560-8_74

Parvez, J., Islam, A., & Woodard, J. (2015). Mobile Financial ServiceS in bangladeSh A Sur vey of Current Ser vices, Regulations, and Usage in Select USAID Projects. In *Mobile Financial Services in*.

Svetunkov, I., & Petropoulos, F. (2018). Old dog, new tricks: a modelling view of simple moving averages. *International Journal of Production Research*, *56*(18), 6034–6047. https://doi.org/10.1080/00207543.2017.1380326

van Rooyen, C., Stewart, R., & de Wet, T. (2012). The Impact of Microfinance in Sub-Saharan Africa: A Systematic Review of the Evidence. *World Development*, *40*(11), 2249–2262. https://doi.org/10.1016/j.worlddev.2012.03.012

Zheng, C., & Zhang, J. (2021). The impact of COVID-19 on the efficiency of microfinance institutions. *International Review of Economics and Finance*, *71*, 407–423. https://doi.org/10.1016/j.iref.2020.09.016