NAVIGATION THE GAP: EXPLORING LOW ADOPTION OF FINANCIAL MOBILE APPS IN RURAL AREAS OF DEVELOPING COUNTRIES AND ENHANCING USER EXPERIENCE

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Abstract

This study investigates the factors contributing to the low adoption of financial mobile applications among rural populations in Bangladesh. Through a survey including almost 300 respondents from diverse backgrounds, the research identifies significant barriers such as low literacy rates and exceedingly intricate app designs.. It focuses on popular platforms such as Bkash, Nagad, Rocket, and UPAY, looks at usage patterns, and makes suggestions to make the platforms more accessible and easier to use, especially for older adults and less literate customers.The proposed solutions leverage state-of-the-art technologies such as artificial intelligence, natural language processing, and notions of human-computer interaction to enhance user experiences. The proposed solution demonstrates a significant improvement in the performance of the financial app compared to the conventional method, as indicated by a t-score of approximately -6.47 and a p-value of 0.000115. Even though financial mobile apps have improved access to effective money management and revolutionized global financial ecosystems, Bangladesh's rural areas are still disproportionately represented in this digital revolution. This study offers focused solutions that support inclusivity, especially for excluded groups, and aims to address the root causes of poor adoption. Through overcoming these obstacles, the study advances the more general objective of promoting economic growth and financial independence in Bangladesh's rural areas. The results underscore the significance of user-centered design and focused interventions in closing the digital gap and optimizing the influence of mobile financial technologies on international initiatives for financial inclusion.

Keywords: Human Computer Interaction, Natural Language Processing, User Experience, Accessibility, Artificial Intelligence, Usability, Digital inclusion, User-centered design.

Introduction

Worldwide changes in how individuals manage their money have been greatly influenced by the use of mobile apps in recent years. However in areas of Bangladesh there is still a lack of participation in this digital

transformation. The growth of the economy relies heavily on making financial services available to all in regions where access to traditional banking is limited. Akter et al. (Akter & Kim, 2019), mentioned it in their studies. This research aims to explore why rural residents in Bangladesh are not embracing apps and propose solutions to bridge this gap. The digital revolution has brought changes, to the financial sector and opened up new opportunities for financial inclusion and economic growth that were previously unheard of.The impact of this revolution has not been evenly distributed across all segments of society; in areas of Bangladesh and other developing countries where certain groups have not reaped the full benefits yet.In these regions the use of mobile apps faces obstacles to adoption that limit access, to essential financial services despite the proliferation of such applications. Understanding the root reasons behind this inequality is crucial for advancing financial empowerment initiatives and enhancing access to resources.

Related Work

The issues of engaging mobile users, their usability and user experience scope has been comprehensively explored before in particular with respect to developing countries. Specifically, Bhowmik et al (Bhowmik et al, 2022). Considering subjects such as all round app layout, linearity in navigation as well as user satisfaction just goes to show the importance of apps in Bangladesh. These issues arise more prominently where the inherent need for usability testing and development of user centered design approaches is quite needed to make the apps user friendly for the rural folk. Building on this foundation, Belay (Belay et al., 2016) investigates the design of mobile interfaces which would be deployable for individuals with low literacy levels which is a clear concern in most developing societies. Regarding bkash services (MFS) applications, Khan et al. (Khan et al., 2020) assessed the mediation, relationship of the variables concerned with the customer satisfaction and perceptions of service quality in Bangladesh with a view to improving bank services for customers and users of mobile banking platforms, bringing rich information to researchers and high rank bank sector and financial regulatory bodies. Akter et al. (Akter & Kim, 2019), while doing comparison of mobile banking services in Bangladesh and South Korea, has observed similar kinds of problems in both countries because of lack of proper education regarding internet banking facilities. More studies of this kind help to understand the specific problems of mobile interface, navigation and usability design in Bangladesh and prepare ground for other researches aiming to improve the digital inclusiveness and empowerment of disadvantaged populations. In addition, Gupta et al. Earlier studies, Alhassan et al. 2021 Pvt. carried out in rural regions of India, stressed the need to understand local needs and demands concerning how and why users embrace mobile applications. Similarly, Rahman et al. They investigate the barriers to digital financial services in Bangladesh, concentrating especially on socio-economic and technology readiness related determinants of the user engagement. Further, Zaman et al. will do the same as what they have been doing Nov. 2020 Cultural loafing brief. They explored the cultural challenge to the emerging field of mobile banking and observed that a large proportion of the determinants regarding how often users use financial applications are influenced by users' cognition.

Methodology

This research employed a structured survey to collect data from the rural population of Bangladesh. The survey participants consisted of the rural population in Bangladesh aged 20-80 years. Even the basic gender

information of the respondents was obtained to ensure the sample is not skewed in any way. The study focused on the usage patterns of three of the most popular mobile financial applications – Nagad, bKash, and Upay. Given the need for more detailed information, the research employed direct interviews and surveys. These assisted an understanding of the frequency with which people use the apps, the reasons they use or do not use the apps and the problems experienced. This approach provided a clear picture of the factors influencing the adoption and use of mobile financial apps in rural areas. The questionnaire covered the following topics:

- Demographic details
- Financial app usage patterns
- Constraints faced while using financial apps

To ensure representation across different age groups, literacy levels, and socioeconomic backgrounds, data was collected from a diverse sample. Analyzing this data revealed the key challenges users face and the trends in how these apps are utilized.

Observations

Through a comprehensive survey (Data Collection Survey.xlsx) of diverse individuals, we gathered valuable insights, which are detailed in the following sections. The survey results provide a deeper understanding of key factors influencing user behavior and app adoption.

Distribution of Financial Service Usage : The survey revealed the market shares for different financial apps among the rural population :

- Bkash : 53.3%
- Nagad : 18.7%
- Rocket : 20.6%
- UPAY : 7.5%

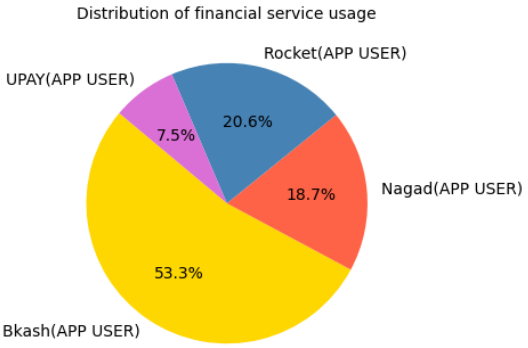

Fig.1 : Distribution of Financial App User

Constraints : The primary constraints identified in the survey are as follows :

- Complex Functionality : 41.8%
- Elderly : 27.6%
- Illiteracy : 27.2%
- No Complexity : 27.2%

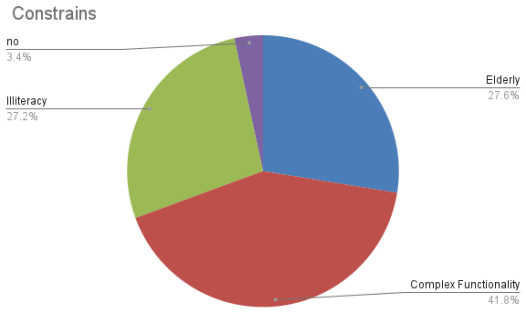

Fig. 2 : Constraints

Complex Functionality (41.8%) : The features of financial apps are often too complex for many consumers to understand. This intricacy consists of hidden features, technical language, and several stages needed to finish transactions. These apps' designs frequently put extensive functionality ahead of ease of use, which makes them less approachable for people who are not comfortable with digital technology.

Illiteracy (27.2%) : The poor literacy rates of a large segment of the rural population make it difficult for them to read and comprehend the instructions on the app.Financial apps might be difficult for illiterate individuals to use efficiently due to their text-heavy interfaces and lack of visual or audio assistance.

Challenges Faced by the Elderly (27.6%) : A few of the particular difficulties faced by older persons are blurred vision, impaired motor function, and a general lack of experience with contemporary technologies.Without specialized assistance and accommodations, senior users may find it challenging to adjust to new digital tools due to the physical and cognitive deterioration that comes with aging.

No Constraints (3.4%) : A tiny portion of consumers said they had no problems at all using financial apps. These users probably have better access to instructional materials or are more tech-savvy, which enables them to successfully use digital interfaces.

Furthermore, the poll highlights differential usage patterns and preferences across these platforms, revealing a considerable gap between users of various financial mobile applications and classic dial-up services.

Bkash :

- App User : 30.8%
- Dial-up User : 69.2%

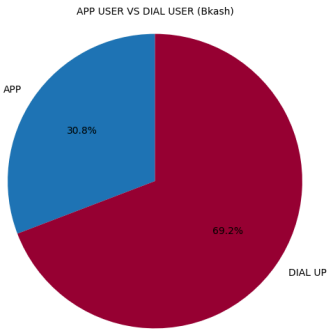

Fig. 3 : App User Vs Dial-up User (Bkash)

Nagad :

- App User : 23.5%

- Dial-up User : 76.5%

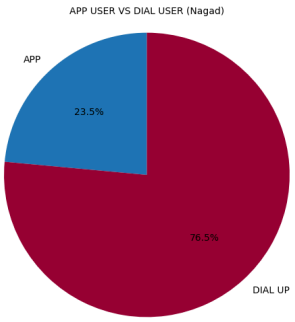

Fig. 4 : App User Vs Dial-up User (Nagad)

UPAY :

- App User : 42.1%
- Dial-up User : 57.9%

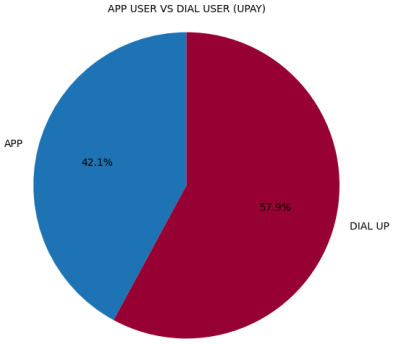

Fig. 5 : App User Vs Dial-up User (Upay)

Rocket :

- App User : 56.4%
- Dial-up User : 43.6%

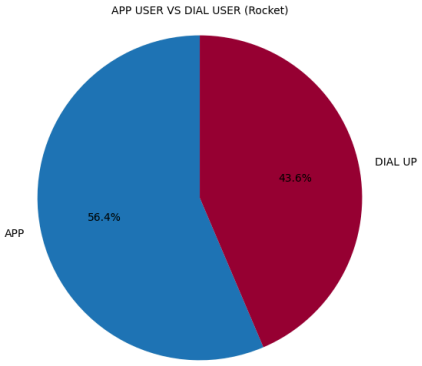

Fig. 6 : App User Vs Dial-up User (Rocket)

Proposed Solutions

To address the challenges faced by elderly users, several targeted solutions have been proposed, including:

Larger Font Size : Presbyopia, which makes it challenging to see small print, is a common condition among older persons. Maintaining a minimum font size of 16 pixels improves legibility and lessens strain on the eyes. Set the font's base size to at least 16 pixels using CSS, and let users make any adjustments as needed.

Increased Color Contrast : Users with deteriorating vision can distinguish between elements more easily when there is a greater contrast between the text and background. Choose dark text on a light backdrop or vice versa; stay away from fading hues like light blue. To help guarantee appropriate contrast ratios, resources like the contrast checker on Web AIM can be used.

Large Button Size for Easy Clicking : Bigger buttons are designed to compensate for elderly individuals' frequently diminished dexterity and coordination. In order to make buttons easier to tap, touch target guidelines indicate that buttons have a minimum size of 44x44 pixels.

Reminders, Alerts, and Clear Feedback : Clear, timely reminders and feedback to help older persons navigate and finish tasks within the app may be beneficial. Set up audible and visual alerts for critical notifications, and give succinct, unambiguous feedback on actions performed, like transaction completions. Give users quick, clear feedback so they can verify their interactions were effective.Confirm tasks such as sending payments, finishing transactions, and changing settings with both visual and audio prompts. Provide this lesson in your mother tongue as well. To efficiently interpret attitudes in several languages, incorporate a multilingual natural language processing (NLP) model such as mbert.

Auto Complete : Enhance the NLP auto-completion element of our banking application for rural customers by providing the necessary and affordable solutions promptly as they type in text to search. This approach seeks to enhance customer satisfaction and reduce time taken to complete financial management processes such as filing tax returns in order to abate the challenges posed in rural areas.
Focused therapy has been located for such societal ailment as illiteracy, including:

Iconography: Employ the use of pictures which the user can easily relate to when carrying out tasks and conveying messages for users who cannot read. Use non-complex devices which are common to the majority of the populations like looking into transactions, making payments and changing profiles.

Voice Assistance : Voice assistance ought to be employed to probably cut down the overall dependence on the text based tutorials by walking one through various activities on the app. Incorporate voice assistants that will be used to read instructions, confirm actions taken by the user, and provide information when required.

Short Sentences : Text should be simplified as much as possible in order to help low level skilled users to carry out instructions and understand information. Use very simple phrases and pick your words carefully so that you do not over complicate phrases or use too many difficult ones.

Visual Instruction : In the initial sessions, simple program instructions, and instructions showing arrows may help in mastering the software. Provide the users with simple pictures they can gradually open and follow to understand the primary functionalities.

Evaluation Metrics Selection

The financial mobile applications were assessed for their efficacy in rural communities using the Intrinsic Motivation Inventory (IMI) as well as the Technology Acceptance Model (TAM). Efforts to compare these indicators in terms of user safety and motivational risks with more traditional methods of banking have attracted us.

Intrinsic Motivation Inventory (IMI)

Somewhat focusing on self-determination and utilizing the IMI as a method of examining motivation at the individual level under certain conditions [10]. Moreover, we were in a position to evaluate the extent to which users accepted the proposed solution with a use of the Technology Acceptance Model (TAM) [11]. So, we also monitored how long it would take rural users and how many attempts they would make to be able to use the software appropriately. Afterwards, T-scores and p-scores were used to compare which strategy is preferable.

Table 1 : IMI Questionnaire for Financial Apps

Subscales	**Questions/Statements**
Pressure or Tension	I feel anxious while using this app.
Task Efficiency	I easily complete tasks
Effort or Importance	I put effort into learning to use this app effectively.

Technology Acceptance Model (TAM)

The correlation between a user's perception of a technology in terms of its ease of use and its usage is determined with the help of TAM. Six constructs have been considered for the purpose of our research model: attitude, intention, satisfaction, perceived usefulness, perceived ease of use, anxiety and anxiety. The majority of participants were asked questions based on the TAM framework and were required to mark only ‘yes’ or ‘no’. An overview of the evaluation’s questions is provided in Table 2.

Table 2 : TAM Questionnaire for Financial Apps

Constructs	**Questions**
Attitude Towards Use	Would you prefer using this app over traditional methods?
Usefulness	Do you find this app useful for your needs?
Ease of Use	Is this app easy to navigate?
Intention to Continue	Would you like to continue using this app?
Anxiety	Do you feel overwhelmed when using this app?

Satisfaction	Are you satisfied with your experience using this app?

Through the application of these assessment criteria, we are able to conduct a thorough analysis of the influence that financial mobile applications have on user motivation and adoption, offering important new perspectives on their efficacy in rural environments.

Discussion

For the recently suggested solution, the IMI and TAM models produced favorable results. When compared to the conventional approach, the suggested solution showed a notable advantage in the IMI model in terms of user interest. In the meantime, the TAM model showed that rural residents had a strong propensity and readiness to use the new solution app during the learning phase. In order to evaluate how well the revised app prototype addressed the noted limitations, we polled Bangladeshi rural customers after the redesign. After the app redesign, the evaluation sought to quantify changes in perceived complexity, literacy issues, and usability gains. More than 43.3% of those who took part in the study said they thought the updated app prototype was simpler than the original. Users reported that the perceived reduction in complexity was mostly due to enhanced clarity in navigation, streamlined transaction processes, and less visual clutter. Additionally, 34.1% of participants reported a significant decrease in literacy obstacles, emphasizing the value of visual aids, clearer language, and user-friendly iconography in improving accessibility for people with poor reading levels. Furthermore, according to 22.6% of participants, the updated app prototype was easier for senior citizens to use. They attributed these gains to increased usability elements such button visibility, font size, and overall ease of use.

RESULTS AND ANALYSIS

The t-score in Table 3 was ry (before app) for a variety of financial chores. An improvement in performance using the app that is statistically significant is shown by a negative t-score and a p-value below 0.05.

Table 3 : Average time taken and the standard deviation for different task completion using after proposed solution App and the traditional method (Before Solution)

Task Completion	**Proposed App** (Mean Time, sec)	**Proposed App** (Std. Dev, sec)	**Before Solution** (Mean Time, sec)	**Before Solution** (Std. Dev, sec)
Transaction Transfer	9.0	1.2	12.0	2.0
Balance Inquiry	8.0	1.0	8.5	1.5
Bill Payment	11.0	1.5	15.0	2.5
Mobile Recharge	9.8	1.3	10.5	2.0
Loan Request	14.0	2.0	18.0	2.8

Fund Transfer	16.0	2.5	20.5	3.2
Account Update	10.5	1.8	12.5	2.3
Money Withdrawal	12.5	1.9	16.0	2.7
Tax Payment	13.0	2.2	17.0	2.9
Account Registration	15.0	2.4	19.5	3.3
T - Value			P - Value	
-6.47			0.000115	

Conclusion

This study emphasizes the major obstacles—such as complicated functioning, low literacy rates, and difficulties faced by the elderly—that hinder the adoption of financial mobile applications in rural Bangladesh. These barriers restrict these populations' access to digital engagement and financial inclusion. We can improve usability for rural consumers by incorporating user-centered design techniques like voice help, larger fonts, clear iconography, and streamlined interfaces. The user experience is further streamlined by the application of cutting-edge technology like artificial intelligence (AI), natural language processing, and human-computer interaction concepts, which increases the accessibility of financial apps for older and low-literate users.The conclusions make it apparent that targeted interventions and inclusive design are some of the effective approaches in bridging the digital divide. However, there is a need for constant efforts to measure the long – term success of the improvements. Further enhancement of these concepts should be longitudinal involving more participants, more extensive qualitative research and real-world tests. Preserving digital financial inclusion will also need addressing such broader issues such as social and economic factors, smartphone penetration and internet access. With the focus on these areas we should ensure that financial technology for mobile devices advances and supports self-sufficiency and economic growth within the rural population of developing countries.

Limitations

Since, as already pointed out, some deficient issues must be disclosed in any research paper, it is then necessary to state the obvious – the research paper has some limitations that should be considered. Initially, and foremostly, there’s a possibility that the sample size and its representation of the population in Bangladesh is small which may reduce the level of external validity of the findings to an extent! Also, when survey data is used in research, certain limitations should be acknowledged such as response biases or inaccuracies like recall bias or social desirability bias. The main focus of the analysis is, on the application of mobile applications in the digital era, while factors such as the presence of the internet and the ownership rate of the smartphone as well as the attitude of the population to the banking sector are not considered.. Additionally,

Related Work: (Gumus et al., 2021). Cross-cultural and language barriers may still be a problem, which both affect the effectiveness of the app and the usability of rural users, and have not been well addressed. Other factors, including the sociocultural background of rural people and the disparity in the price or availability of technologies, are likely to influence how rural groups use apps. (Zhang & Chen, 2018). Changes over time such as changes in user habits or technology innovations may render the findings obsolete in the future. It would also be helpful for the researchers to consider the app level into their analysis in order to look at potential differences in the effects of specific app features on user experience. There, however, are issues with generalizing these findings to areas outside of Bangladesh due to multivariate coordinate, variability and generality spatial issues.

Future Work

This study highlights the need for longitudinal studies which enable the researchers to understand the progress of the app further studies and practice advancing participant needs over time. Such outcomes would be meaningful given a sufficiently large sample size and cover diverse rural settings from different regions. It is also useful to employ these methods such as focus groups and interviews to investigate single issues in more detail and from various angles. For example, comparing the two developing countries may be able to reveal an evidence base to some parts of the developing world and help create suitable interventions. In addition, initiation also intends the carrying out of pilot projects. Iteratively tested designs oriented on the user are necessary for the development in promoting universal access to finance by measuring the impact of the envisioned start-ups.

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