



**Daffodil**  
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**Analyzing the usability and user satisfaction of  
mobile banking apps in Bangladesh**

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
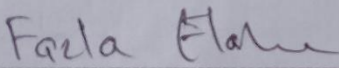
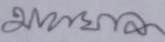
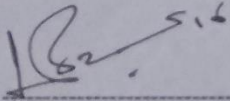
Department of Software Engineering

A thesis submitted in partial fulfillment of the requirement for the degree of Master of  
Science (M.Sc.) in Software Engineering

# APPROVAL

This thesis titled “**Analyzing the usability and user satisfaction of mobile banking apps in Bangladesh**”, submitted by **Md Thowhidul Islam Molla, ID: 221-44-238** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in software Engineering and approved as to its style and contents.

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# THESIS DECLARATION

The thesis entitled “**Analyzing the usability and user satisfaction of mobile banking apps in Bangladesh**” is done under the supervision of Mr. Md. Shohel Arman, Assistant Professor, Department of Software Engineering, Daffodil International University.

I declare that this thesis is my original work for the degree of M.Sc. in Software Engineering and that neither the whole work nor any part has been submitted for another degree in this or any other university.



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## **ABSTRACT**

This thesis paper examines the usability and user satisfaction of mobile banking apps in Bangladesh. As mobile banking has become increasingly popular and accessible in the country, it is crucial to assess the effectiveness and user experience of these apps to ensure they meet the needs and expectations of their users. The study employs a quantitative research approach, utilizing an online survey distributed through various social platforms, including Facebook pages, to gather information from mobile banking app users in Bangladesh. We have used a Likert scale rating system to gather quantitative data on users' perceptions of the system's usability. Participants were asked to rate their level of agreement or disagreement with each statement. The statements capture various aspects of usability, user satisfaction, ease of use, integration of functions, technical support, consistency, learning curve, and confidence. By collecting quantitative data, we can analyze the responses statistically to gain insights into users' overall satisfaction and specific aspects of the system's usability. The outcomes of this study contribute to the field of mobile banking app design and development, particularly in the context of Bangladesh. By identifying the key factors that affect usability and user satisfaction, this research can guide app developers, financial institutions, and policymakers in enhancing the mobile banking experience for the population of Bangladesh, ultimately promoting financial inclusion and digital empowerment.

Keywords: usability testing, banking apps, SUS, usability variables.

# Chapter 1: Introduction

## 1.1 Introduction

The rapid growth of technology, combined with the widespread usage of smartphones, has revolutionized the way people access and use banking services. Mobile banking apps have evolved as simple and accessible tools that allow users to perform a variety of financial transactions and manage their accounts at any time and from any location. Mobile banking apps have achieved substantial popularity and have become an integral part of the financial ecosystem in Bangladesh, a country witnessing an enormous rise in mobile phone usage.

With the increasing importance of mobile banking apps, it is crucial to evaluate their usability and user satisfaction to guarantee that these applications satisfy their customers' needs and expectations. Usability relates to an application's ease of use, efficiency, and efficacy, whereas satisfaction with the application represents users' overall contentment and positive experience with the app. Usability is critical in ensuring that these apps are efficient, effective, and enjoyable to interact with.

The ISO 9241-11 standard (ISO, 2018) defines usability as "the extent to which a system, product, or service can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" [19]. Any system, website, or mobile app's success is directly and significantly impacted by usability and its related elements. Efficiency is a measure of efficacy that results in the least amount of time and effort wasted, according to Nader Alber [20]. Groth and Haslwanter also connected effectiveness with task completion; when users struggle to finish a straightforward activity, this may be clear evidence that an application bug needs to be resolved [21].

The use of mobile applications, particularly mobile banking apps, and their adoption are greatly influenced by satisfaction, which is a crucial aspect. User satisfaction is vital for establishing trust, fostering loyalty, and encouraging continuous interaction with mobile banking apps.

Dongwon Lee stated that satisfaction is a fleeting emotional reaction to a user of a mobile phone's [22]. According to Ravendran, users who are happy with their m-banking experience are more inclined to make an order from their banks[23]. Customers that are happy with the service they receive repurchase products and share their positive experiences with others. consumers who are only marginally satisfied with services may



not leave but nevertheless complain, in contrast to consumers who are profoundly unsatisfied with services [24].

One of the primary reasons for app and software failure is the lack of a method to meet the users' defined goals and measure their level of satisfaction. As a result, usability testing has become an essential part of every app or software development [25]. There are various ways for assessing usability, the most well-known of which is the System Usability Scale (SUS). The SUS scale was created to be a quick and easy tool to evaluate usability [26]. It comprises ten statements, five positive and five negative, which participants are asked to rate. The scores obtained from the SUS scale can be interpreted using percentage ranges or a grading system [27].

The Likert scale is used as a valuable tool in this study to analyze user satisfaction in the context of mobile banking apps in Bangladesh. We have acquired systematic and quantitative data on user perceptions, opinions, and levels of satisfaction by delivering surveys or questionnaires using Likert scale items. The Likert scale replies allowed us to measure customer satisfaction levels, allowing us to obtain insights into their overall contentment with the mobile banking apps.

Understanding the usability and satisfaction levels of mobile banking apps in Bangladesh is critical for a number of reasons. For starters, it offers vital insights to app developers and financial institutions on how to improve the design and functioning of their applications, thereby boosting the entire user experience. Second, it enables policymakers and regulators to identify areas that require further support and direction to guarantee the safe and efficient deployment of mobile banking services. Finally, it assists consumers by allowing them to make informed choices when selecting and using mobile banking apps that meet their needs and preferences.

By doing this research, we hope to add to the expanding body of knowledge about mobile banking app usability and user satisfaction. The findings of this study can be a helpful resource for app developers, financial institutions, policymakers, and consumers in advancing the mobile banking environment in Bangladesh and assuring its alignment with users' increasing requirements and expectations.

## **1.2 Background**

Bangladesh has seen substantial growth in mobile banking services, owing to the rapid increase of mobile network coverage and the availability of affordable smartphones. The government and financial institutions have launched a variety of efforts to promote digital financial services and increase financial inclusion. As a result, mobile banking

apps have become an essential channel for accessing financial services such as fund transfers, bill payments, account management, and more.

### 1.3 Motivation

- **Increasing popularity of mobile banking:** Mobile banking has become popular in Bangladesh, making it crucial to evaluate the usability and user satisfaction of these apps.
- **Enhancing financial inclusion:** Evaluating the usability and user satisfaction of mobile banking apps can identify areas for improvement, enhancing their effectiveness as a tool for financial inclusion.
- **Improving customer experience:** Mobile banking apps are an important touchpoint for banks and customers, so evaluating their usability and user satisfaction can improve the overall customer experience.
- **Ensuring security:** Evaluating the usability and user satisfaction of mobile banking apps can identify security concerns and ensure that these apps are safe and secure for users.

### 1.4 Research Questions

- What are the key factors that contribute to user satisfaction in the context of mobile banking apps, and how can app developers prioritize these factors to maximize overall user experience?
- How do the design and interface features of mobile banking apps in Bangladesh affect user perception of usability and overall satisfaction?

### 1.5 Objectives

The primary objectives of this thesis are as follows:

- Using recognized usability concepts and guidelines, assess the usability of mobile banking apps in Bangladesh.
- To assess the level of user satisfaction with mobile banking apps while considering the many aspects that influence user experiences.
- To identify the issues and barriers that users have when accessing and using mobile banking apps.
- To investigate the relationship between usability and user happiness and financial inclusion and customer loyalty.
- To make recommendations and provide guidelines for increasing the usability and satisfaction of mobile banking apps in Bangladesh.

## **1.6 Scope**

The purpose of this thesis is to measure user satisfaction with mobile banking apps in Bangladesh using quantitative surveys. The study's goal is to collect data from a representative sample of mobile banking app users in order to assess their level of satisfaction. In this study, the Likert scale will be used in the quantitative survey to analyze user satisfaction levels with various components of mobile banking apps. Participants will be asked to score their agreement or disagreement with statements about app performance, usability, features, security, and overall satisfaction. The average System Usability Scale (SUS) score will be used for providing an adjective assessment of user satisfaction with mobile banking apps in Bangladesh in this thesis. In addition, the mean and standard deviation of each app for individual questions will be determined. This study will provide insights into specific aspects of mobile banking apps that contribute to customer satisfaction or dissatisfaction. Researchers can find areas of strength and weakness in each app by looking at the mean scores. The standard deviation numbers will illustrate the level of agreement or disagreement among users for each question, demonstrating the consistency or diversity in their responses.

## Chapter 2: Literature Review

### 2.1 Literature Review

Mobile banking has evolved as a crucial channel for financial transactions in Bangladesh, where mobile phone usage is thriving. This literature review explores prior research on the usability and user satisfaction of mobile banking apps, with an emphasis on studies conducted in Bangladesh and abroad. The inclusion of relevant research literature in this section aids in the identification of variables associated with the usability and user satisfaction of banking apps, which were mentioned earlier in the study. User satisfaction is an important aspect of the success and acceptance of mobile banking apps.

Fergo, A.G. and Ratnasari, C.I. (2023) conducted usability testing on the Octo Mobile by Bank CIMB Niaga application to enhance its quality. The study aimed to assess usability and user experience, providing insights for the application's development. The test involved 39 Octo Mobile users who were interviewed and asked to complete a 10-statement questionnaire. The SUS method yielded a score of 58.5%, placing the application's acceptability in the marginal low range. The overall rating was considered OK, and the grade scale was categorized as class F. The research revealed challenges faced by Octo Mobile users, including issues with loading times, login errors, OTP code failures, missing features like BI-Fast and auto logout, delayed notifications, and more [31].

N Setiyawati, DH Bangkalang (2022) stated that the banking sector in Indonesia is experiencing rapid digitalization, evident from a 46.72% surge in digital banking users, particularly in mobile banking. However, this growth necessitates a focus on enhancing user experience (UX) and usability of banking apps, as these factors influence user satisfaction and continued usage. To evaluate this, a study measured the UX and usability of four mobile banking apps in Indonesia using the User Experience Questionnaire (UEQ) and System Usability Scale (SUS). The results, presented and compared, demonstrated that all four apps received at least a neutral rating in UX, while usability was rated as good. This suggests that users generally find the mobile banking apps usable and are accepting of their functionality [32].

DF Qurniawan, NM Ali, MHM Salim, S Othman (2022) focuses on the development and assessment of the mobile application "WESIHAT 3.0," which aims to enhance the cognitive abilities of older adults. With advancements in software development technology, a variety of interactive mobile applications have emerged for users of all ages. The study investigates the usability and user experience of the initial design of WESIHAT 3.0 using the System Usability Scale (SUS) instrument. The goal is to ensure

that the app is user-friendly and well-received by its intended audience. The research findings will guide improvements to WESIHAAT 3.0's usability and user experience, enhancing its acceptability among older adults [33].

NA Hidayah, KY Salsabilla (2023) identifies that the M.TIX mobile application offers accessible features but faces user complaints about its outdated and unattractive UI/UX design. This study aims to evaluate user satisfaction with the ticket purchasing function of M.TIX using the System Usability Scale (SUS) method and propose interface improvements. Data was collected from 61 respondents through Likert scale questionnaires distributed online. Findings reveal an average SUS score of 68.5, categorizing the ticket purchasing function as "Very High, OK" (Title D). This suggests a need for UI/UX enhancement and further assessment of the application's performance [34].

GD Rembulan, PM Akhirianto, D Priyono (2023) aims to assess the usability of an e-grocery application interface design before and after making enhancements using the Human-Centered Design (HCD) approach. Usability testing and the System Usability Scale (SUS) questionnaire are employed for evaluation. The improvements led to over 20% effectiveness increase and a 30% efficiency enhancement, accompanied by a substantial reduction in task processing time (more than 900 seconds). The post-improvement satisfaction level, as indicated by the SUS score, rose significantly by 30 points compared to the initial evaluation of the e-grocery application's usability. Recommendations for interface enhancement were derived from the Human-Centered Design methodology [35].

Malik, Muhammad, and Sajid (2021) identify common issues in the app's user interface that affects the overall usability and user experience. The study finds that complex navigation, irregular layouts, and cluttered interfaces negatively affect the overall usability of mobile banking applications. When processing transactions, periodic delays and technological issues impact the overall customer experience. As areas for development, the author mentions inadequate support for assistive technologies and inadequate consideration of accessibility requirements [13].

Tabiaa and Madani (2021) states that users rate the user interface based on its efficiency in facilitating their banking chores and improving the overall user experience. design, layout, and ease of navigation within the app garners attention from users. The clarity of menus and options, as well as the overall visual appeal, all contribute significantly to user satisfaction. Users appreciate a mobile banking app with clear and simple menus and options [17].

Moumita Bhowmik and Fardeen Ashraf (2022) states that to avoid confusion, use icons and symbols that are relevant, meaningful, and widely understood. Zoom-in capabilities can improve visibility and readability. Simplifying UI design is crucial for improving the usability of applications [18].

Sangar and Rastari (2015) proposes a complete model with four main dimensions to improve the usability of mobile banking apps on smartphones. Interface design, security, performance, and customer support are among these dimensions. The study underlines the necessity of a user-friendly and intuitive interface when it comes to interface design. To improve usability, it proposes including simple navigation, clear labeling, and visually appealing design features. To protect user information and transactions, it suggests using authentication procedures, encryption techniques, and secure data transmission protocols. The model focuses on optimizing the performance of mobile banking apps in terms of speed, responsiveness, and reliability. It recommends reducing latency, minimizing loading times, and assuring efficient transaction processing. Furthermore, the model emphasizes the need for good customer support, recommending features such as in-app help, FAQs, and responsive customer service to handle user issues and concerns [14].

Alhejji and Albarrak (2022) focuses on three usability factors: satisfaction, effectiveness, and efficiency. Authors highlight serious issues in user interfaces and app functionality, particularly in apps that often receive updates. Customer dissatisfaction results from a lack of customer support [16].

Jahan and Shahria (2022) identify that the effectiveness of mobile banking services continues to be a major factor in determining client satisfaction. Customer satisfaction is found to be positively impacted by aspects of the mobile banking platform such as the efficiency of transactions, ease of use, reliability, and security. Convenience continues to be viewed as an important factor influencing customer satisfaction with mobile banking. Customer satisfaction is increased by features such as anytime accessibility, ease of registration, simplicity of transaction procedures, and the availability of varied financial services on the mobile platform. Data security measures, privacy protection, and a trustworthy, transparent interface are all factors that build trust. Users continue to express greater levels of satisfaction when they view mobile banking to be beneficial in terms of time savings, cost-effectiveness, and convenience. According to Jahan and Shahria's study from 2022, social influence, perceived value, trust, and service quality continue to be important factors in deciding how satisfied young people are in Bangladesh with mobile banking [3].

Khan, Lima, and Mahmud (2021) investigate many aspects of service quality, such as reliability, responsiveness, assurance, empathy, and tangibility. In the context of mobile banking, these factors work together to influence how overall service quality is assessed. Reliability and responsiveness are the most important elements impacting customer satisfaction among the service quality criteria. Client satisfaction continues to be greatly influenced by the timely and reliable operation of the mobile banking service as well as prompt attention to client needs. In order to increase customer satisfaction, the author underlines the continued importance of focusing on service quality dimensions, particularly reliability, and responsiveness [4].

Sheikh Majedul Huq (2022) indicates that with the exception of tangibles, four out of the five SERVQUAL criteria—namely, reliability, assurance, empathy, and responsiveness—remain positively connected with client satisfaction. This implies that in the mobile banking industry, customer satisfaction is still significantly influenced by the perceived quality of the service [5].

Khan, Rana, and Hosen (2022) examine the impact of trustworthiness on the usage of mobile banking apps among Bangladeshi consumers. The study reveals a number of factors that continue to support the credibility of mobile banking apps. These factors include the app's reliability, security precautions, privacy protection, transaction transparency, and the app developer's perceived reputation. Building consumer trust through strong security measures, privacy protection, and transparent operations can lead to better app adoption and usage rates [6].

B. Maseke (2018) highlights the positive relationship between mobile banking usage and customer satisfaction, emphasizing the significance of developing mobile banking services to improve client experiences and loyalty. Customers that utilize mobile banking services are more satisfied because of the convenience, ease of use, and accessibility that these services provide [7].

Kavishemi and Thavakumar (2020) state that the multiple regression analysis continues to show that reliability, security, ease of use, responsiveness, and convenience have a substantial and positive influence on customer satisfaction. However, efficiency continues to have a negligible impact on consumer satisfaction among mobile banking app users. Numerous issues continue to be blamed for efficiency's negligible effect on customer satisfaction. These include the creation of positive user experiences, the simplicity and ease with which the mobile banking application registration procedure may be completed, and the reasonably quick service delivery time [8].

Hossain and Hossain (2015) highlight reliability and responsiveness as major factors of customer satisfaction. Consistency in service delivery and rapid response to customer requests is critical for establishing trust and satisfying customers [9].

Sagib, G.K. and Zapan, B. (2014) suggest that when targeting new Bangladeshi customers, the emphasis should be on dependability and response, followed by efficiency and convenience. This strategy strives to attract and retain clients by making mobile banking services dependable and responsive to their demands [10].

Sampaio, and Santini (2017) state that in the context of mobile banking, it analyzes the relationship between app quality, perceived usefulness, perceived ease of use, and customer happiness. According to the findings, app quality, perceived usefulness, and perceived ease of use all have a favorable impact on customer satisfaction. In order to improve customer satisfaction, banks should focus on increasing the quality of their mobile banking apps and ensuring they are seen as useful and easy to use [11].

According to Kahandawa, and Wijayanayake (2014), mobile banking services improve customer satisfaction. Mobile banking's convenience and accessibility contribute greatly to customer satisfaction. Furthermore, the study identified major predictors of customer satisfaction as ease of use, reliability, security, and responsiveness of mobile banking services. The findings emphasize the need to deliver efficient and dependable mobile banking services in order to improve client satisfaction in the banking industry [12].



## Chapter 3: Research Methodology

### 3.1 Variables of Usability

This thesis includes an analysis of the usability and user satisfaction of mobile banking apps in Bangladesh, using Nielsen's stated usability criteria. The study specifically evaluates the learnability, efficiency, memorability, errors, and satisfaction aspects of these apps. Using these important criteria, the research seeks to identify the strengths, weaknesses, and opportunities for improvement of the country's mobile banking apps.

Nielsen defines usability as five important variables: learnability, efficiency, memorability, errors, and satisfaction [2]. The learnability of an application relates to how quickly users can understand and navigate its features and functions. The speed and ease with which users can do tasks within the app is referred to as efficiency. Memorability assesses whether users can quickly recall how to utilize an application after a period of inactivity. The quantity and severity of errors made by users while engaging with the app are referred to as errors. Finally, satisfaction represents users' total subjective experience and fulfillment.

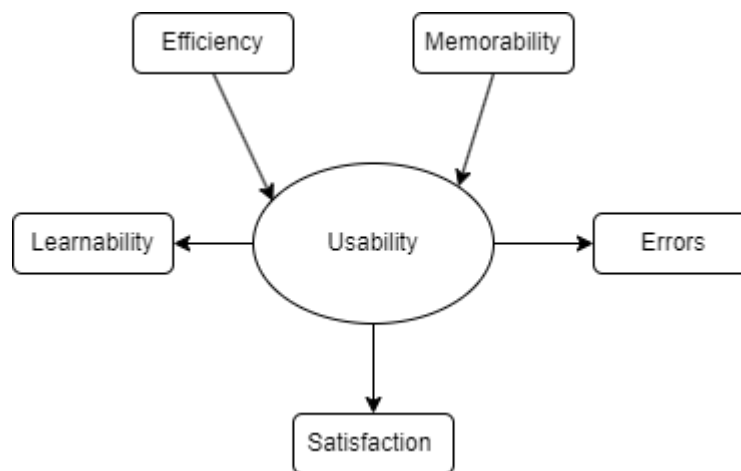


Figure 3.1 Usability Variables for the Banking Apps

### 3.2 Research Approach

#### Quantitative Analysis Approach:

In this thesis, a quantitative research approach was chosen to systematically collect and analyze data about the usability and user satisfaction of mobile banking apps in Bangladesh. This method involves numerical data and statistical techniques, aiming to draw objective conclusions that can be generalized to a larger population.

### **Data Collection via Online Survey:**

To gather data, an online survey was employed, distributed to mobile banking app users in Bangladesh. This facilitated the inclusion of a diverse range of participants who regularly use these apps for their financial activities, ensuring a comprehensive perspective.

### **Significance of Likert Scale Ratings:**

A key methodological aspect was the utilization of Likert scale ratings, a widely recognized system. Participants expressed their opinions using a range of response options, from "Strongly Disagree" to "Strongly Agree." These responses provided a structured way to quantify perceptions across various dimensions such as usability, satisfaction, integration, and more. This systematic approach yielded quantifiable data that could be statistically analyzed, enhancing the study's rigor and providing valuable insights.

### **3.3 Experimental Design**

This thesis' experimental design followed a methodical process that included numerous key elements. The first step was to identify the issue, which was the usability and user satisfaction of mobile banking apps in Bangladesh. Following that, a thorough literature study was carried out to collect essential material and insights from the existing research and frameworks. A Likert scale questionnaire is used to collect quantitative data to assess various areas of usability and user satisfaction based on specific variables learned in the literature review [1][2]. The Likert scale replies provide systematic and quantitative data that allows for the measurement of user views and experiences [28]. The collected quantitative data is analyzed by data analysis. To summarize the responses of the participants, descriptive statistics such as mean, median, and standard deviation are calculated. These statistical measures provide a summary of the data's major tendencies and variability, providing insights into participants' perceptions and experiences with usability and user satisfaction. The data analysis results are analyzed to highlight common usability issues, strengths, and areas for improvement in mobile banking apps. These findings are linked to the literature research and usability variables in order to provide insights into specific elements of usability and user satisfaction. A full knowledge of the strengths and shortcomings of mobile banking apps and their impact on user satisfaction is gained by correlating the results to current literature and stated variables [1]. Suggestions for improvement are made based on the results and conclusions. These recommendations attempt to improve the usability of mobile banking apps in Bangladesh and are informed by the identified usability concerns and feedback from participants. The usability of mobile banking apps can be improved by addressing the specific areas of improvement indicated in the study, leading to increased user satisfaction and overall user experience.

### 3.4 Survey Method

A 5-point Likert scale and the System Usability Scale (SUS) questionnaire are used in the study to gain information on the usability and user satisfaction of mobile banking apps [1][28][29]. The survey includes participants from three different age groups: 18-24 years (44.1%), 25-34 years (41.9%), and 35-44 years (14%). The survey also has a total sample size of 237 participants, representing users from 29 different banks. Among the participants, 52% are employed, 45.4% are students, 2.18% are homemakers, and 0.43% are unemployed. In terms of gender, 66.1% of the participants are male and 33.9% are female.

Percentage of Male and Female Participants

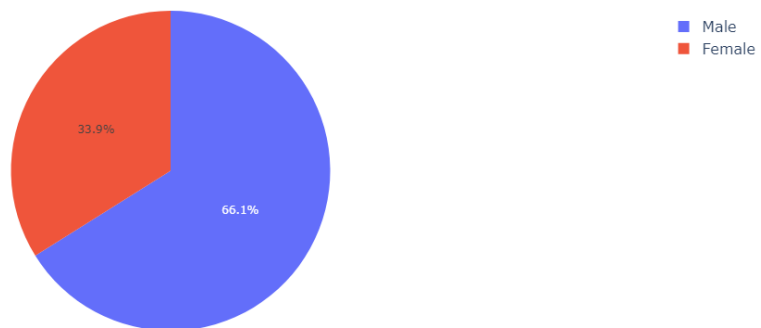


Figure 3.2 Percentage of Male and Female Participants

Percentage of Age Ranges of Participants

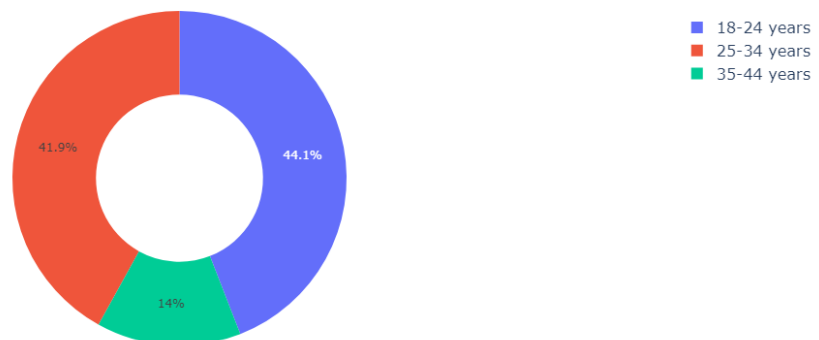


Figure 3.3 Percentage of ages of the participants

Percentage of Profession of Participants

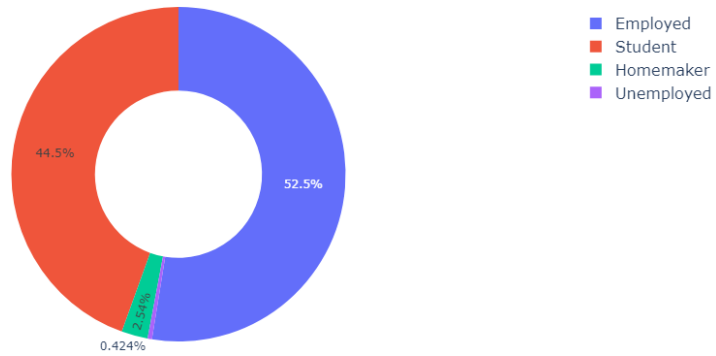


Figure 3.4 Percentage of profession of the participants

Percentage of Bank Apps Used by Survey Participants

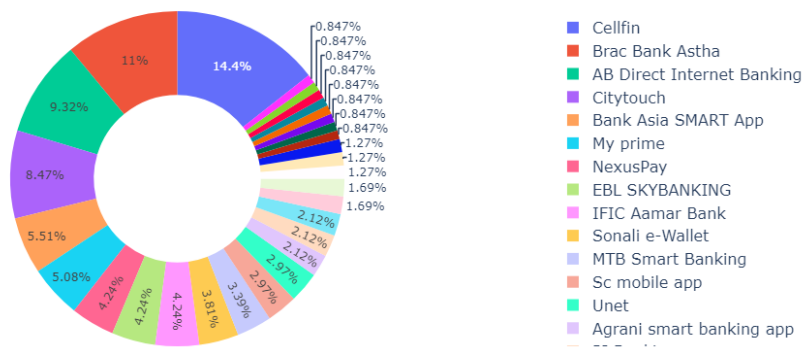


Figure 3.5 Percentage of Bank Apps Used by Survey Participants

### 3.5 Questionnaire

The questionnaire used in this study consists of two parts. The first part focuses on gathering demographic information from the participants, including age, gender, profession, bank name, and the duration of their usage of the mobile banking app. The second part of the questionnaire is designed to obtain the participants' viewpoints and assess their level of satisfaction or dissatisfaction.

To measure the usability of mobile banking apps, the researchers employ the System Usability Scale (SUS) questionnaire [1][28][29]. The SUS is a widely used survey consisting of 10 questions that provide qualitative calculations of system usability. It is recognized as a reliable tool for evaluating the usability of various systems.

By utilizing the questionnaire, this study aims to collect relevant data from the participants, understand their perspectives, and calculate their satisfaction levels with the mobile banking apps.

Table 3-1 presents the mean and standard deviation of each app for each question utilized in the research. It provides a statistical overview of the responses of the participants and enables a comparison of the apps based on the measured variables. The mean values provide the average scores for each question, but the standard deviation values reveal the variability or dispersion of the replies within each app. This data adds to a quantitative assessment of the applications' performance and aids in the identification of any notable differences or patterns among them.

Apps	Q 1 (Mean)	Q1 (Standard Deviation)	Q 2 (Mean)	Q2 (Standard Deviation)	Q 3 (Mean)	Q3 (Standard Deviation)	Q 4 (Mean)	Q4 (Standard Deviation)	Q 5 (Mean)	Q5 (Standard Deviation)	Q 6 (Mean)	Q6 (Standard Deviation)	Q 7 (Mean)	Q7 (Standard Deviation)	Q 8 (Mean)	Q8 (Standard Deviation)	Q 9 (Mean)	Q9 (Standard Deviation)	Q 10 (Mean)	Q10 (Standard Deviation)
Brac Bank Astha	4.08	0.89	1.92	0.93	4.54	0.65	1.65	0.94	4.12	0.91	1.88	1.11	4.27	0.78	1.58	0.76	4.46	0.76	2.08	1.16
Midland online	1.00	0.00	2.00	1.41	1.50	0.71	3.50	0.71	3.50	0.71	1.50	0.71	1.50	0.71	2.00	1.41	2.00	1.41	2.00	1.41
NexusPay	4.30	0.67	1.90	1.29	4.20	1.03	2.00	1.15	3.40	1.26	2.40	1.07	4.10	1.45	2.20	1.32	4.10	1.45	1.90	1.20
Citytouch	4.10	1.25	1.70	1.17	4.40	1.05	1.55	0.83	4.20	0.82	1.85	1.18	4.40	1.05	1.95	1.10	4.60	0.50	2.00	1.10
Ejana ta	1.00	0.00	3.67	2.31	2.00	1.73	1.00	0.00	1.33	0.58	1.67	1.15	1.00	0.00	1.33	0.58	1.00	0.00	1.00	0.00
Magpie	1.00	0.00	3.00	2.83	1.00	0.00	2.00	1.41	1.00	0.00	3.00	2.83	3.50	0.71	2.00	1.41	2.00	1.41	2.00	1.41
IFIC Aamar Bank	1.00	0.00	4.90	0.32	2.70	1.25	2.60	1.65	1.50	0.71	3.90	1.37	1.10	0.32	3.70	1.70	1.70	0.82	2.90	1.79
Cellfin	4.12	1.09	1.65	1.01	4.44	1.08	1.68	1.12	4.09	1.19	1.82	1.06	4.44	0.96	1.76	1.10	4.68	0.68	1.91	1.31
AB Direct Internet Banking	2.23	1.63	3.27	1.75	4.18	0.96	1.50	0.86	2.91	1.51	2.59	1.33	2.95	1.91	2.23	1.34	2.91	1.93	1.50	1.10
Bank Asia SMART App	2.15	1.82	3.77	1.79	3.54	1.39	2.31	1.49	2.54	1.69	3.08	1.55	2.23	1.92	2.62	1.56	2.38	1.89	2.15	1.72
Agrani smart banking app	1.80	1.79	4.20	1.10	2.40	1.52	3.20	1.48	2.00	0.71	4.00	0.71	2.00	1.00	2.80	1.30	2.40	0.89	2.20	1.30
Trust money	2.50	2.12	4.00	1.41	4.00	0.00	1.50	0.71	3.00	1.41	3.00	0.00	2.00	1.41	1.50	0.71	2.50	2.12	1.50	0.71

My prime	2.92	1.51	2.92	1.73	4.42	0.67	1.17	0.58	3.25	1.14	1.92	0.90	3.25	1.76	1.92	0.90	3.50	1.88	1.50	0.90
One bank app	2.67	0.58	2.67	0.58	4.33	1.15	1.67	1.15	3.00	0.00	2.00	1.00	4.33	1.15	2.00	1.00	4.33	1.15	1.67	1.15
Sonal i e-Wallet	1.67	1.41	4.33	1.32	3.89	0.60	1.56	0.88	2.78	1.09	2.89	0.78	2.00	1.50	2.56	0.73	2.44	1.81	1.67	1.12
Sc mobil e app	3.71	1.70	2.14	1.07	4.43	0.79	1.00	0.00	3.57	1.27	1.57	0.98	4.57	0.53	1.86	0.90	4.71	0.49	2.00	1.15
EBL SKY BANGKING	4.00	1.33	2.40	1.07	4.70	0.67	1.30	0.67	3.60	1.35	1.90	1.10	4.70	0.67	1.40	0.70	4.70	0.67	1.60	0.84
Fsibl cloud banking	2.00	1.41	4.00	1.41	1.50	0.71	2.50	0.71	1.00	0.00	3.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	2.00	1.41
PI Banking	1.00	0.00	3.80	1.79	1.40	0.89	3.00	1.22	1.00	0.00	3.40	2.19	1.00	0.00	1.80	1.10	2.20	1.79	1.40	0.89
Union	3.00	2.31	2.50	1.91	4.25	0.96	1.50	1.00	3.25	2.06	1.75	0.96	3.75	1.89	1.75	0.96	3.75	1.89	1.50	1.00
Unet	3.57	1.81	2.57	1.81	3.86	1.35	1.29	0.49	3.00	1.53	1.71	0.95	3.57	1.90	2.00	0.82	3.57	1.81	1.43	0.79
MTB Smart Banking	2.88	1.81	2.38	1.30	3.50	1.77	1.88	1.46	3.12	1.89	2.88	1.55	3.25	1.75	2.62	1.77	3.62	1.77	2.12	1.36
Shadin	1.50	1.00	4.00	0.82	2.75	0.96	3.00	1.41	1.50	0.58	3.50	0.58	2.00	1.15	3.75	1.26	2.00	0.82	2.75	1.26
Sibl now	2.80	2.05	3.20	2.05	4.20	0.84	1.40	0.89	3.00	1.87	2.40	1.34	2.80	2.05	2.20	1.10	3.00	2.05	1.20	0.45
Dhaka bank go	3.67	2.31	3.67	2.31	4.67	0.58	1.00	0.00	4.00	1.73	2.33	1.15	3.00	2.00	2.33	0.58	3.67	2.31	1.33	0.58
Exim ewallet	3.50	2.12	3.00	1.41	4.00	1.41	2.50	0.71	2.50	0.71	1.00	0.00	3.00	2.83	2.00	0.00	3.00	2.83	1.00	0.00
Nbl apps	2.00	1.41	5.00	0.00	1.50	0.71	2.50	0.71	1.00	0.00	4.00	1.41	1.00	0.00	3.00	2.83	2.00	1.41	1.50	0.71
Mbl rainbow	1.50	0.71	4.50	0.71	3.00	0.00	2.00	1.41	1.50	0.71	3.00	2.83	1.00	0.00	3.50	2.12	1.00	0.00	2.00	1.41
Meghna bank ibanking	1.00	0.00	2.00	1.41	1.50	0.71	2.50	2.12	2.50	2.12	1.50	0.71	1.50	0.71	1.00	0.00	2.50	2.12	1.00	0.00

Table 3-1: Mean and Standard Deviation for Each Question of Bank Apps

<b>Apps</b>	<b>Overall SUS Score</b>
AB Direct Internet Banking	65.68
Agrani smart banking app	67.50
Bank Asia SMART App	66.92
Brac Bank Astha	76.44
Cellfin	76.47
Citytouch	76.88
Dhaka bank go	74.17
EBL SKYBANKING	75.75
Ejanata	37.50
Exim ewallet	63.75
Fsibl cloud banking	47.50
IFIC Amar Bank	65.00
MTB Smart Banking	70.62
Magpie	51.25
Mbl rainbow	57.50
Meghna bank ibanking	42.50
Midland online	51.25
My prime	66.88
Nbl apps	58.75
NexusPay	76.25
One bank app	71.67
PI Banking	50.00
Sc mobile app	73.93
Shadin	66.88
Sibl now	65.50
Sonali e-Wallet	64.44
Trust money	63.75
Unet	66.43
Union	67.50

Table 3-2: Overall SUS Scores of Apps

### 3.6 Data Collection Procedure

The data collection procedure for this study involved gathering responses from 237 participants located in various regions of Bangladesh during May 2023. The participants were requested to provide their feedback on 10 questions related to the banking applications they use. The questionnaire utilized a 5-point Likert scale, with a rating range from 1 (strongly disagree) to 5 (strongly agree) [1][28][29]. The participants' responses were subsequently collected and recorded for further analysis.

### 3.7 Data Analysis

After collecting the survey data, the data preprocessing stage involved utilizing the System Usability Scale (SUS) [28][29]. SUS is a global assessment of usability aspects (effectiveness, efficiency, and satisfaction) which are subjectively experienced by the users [36]. The SUS consists of 10 Likert scale questions, where each question is rated on a scale from 1 to 5 to assess a user's satisfaction towards different aspects [28][2]. The data analysis involved calculating the SUS score for each respondent, providing insights into how the applications under study compare to the industry average.

To calculate the SUS score, several steps were followed. Firstly, the scale values were converted into numerical values for each of the 10 questions, based on the defined SUS questionnaire scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. Secondly, the calculations were performed as follows: X represented the summation of responses for all odd-numbered questions minus 5, and Y represented 25 minus the summation of responses for all even-numbered questions. The SUS score was then obtained using the equation:  $SUS\ Score = (X + Y) \times 2.5$ . In this equation, positive responses were associated with odd-numbered questions, while negative responses were associated with even-numbered questions.

In the third step, the SUS score was used to evaluate the usability performance of the system based on predefined usability variables. Table 3-3 provides general guidelines for interpreting the SUS score [30]. Scores ranging from 86 to 100 are assigned the Letter Grade 'A' and the Adjective Rating 'Best Imaginable.' These scores are deemed 'Acceptable' in terms of usability. Similarly, scores in the range of 74 to 85 receive the Letter Grade 'B' and the Adjective Rating 'Excellent,' which are also considered 'Acceptable.'

Scores falling within the range of 52 to 73 are assigned the Letter Grade 'C' and the Adjective Rating 'Good.' Although labeled as 'Marginal,' they still maintain an acceptable level of usability. However, scores in the range of 40 to 51 are categorized as 'Not Acceptable' with the Letter Grade 'D' and the Adjective Rating 'Ok.'



Scores ranging from 26 to 39 are assigned the Letter Grade 'E' and the Adjective Rating 'Poor.' These scores are considered 'Not Acceptable' in terms of usability. Finally, scores falling within the range of 0 to 25 are given the lowest Letter Grade 'F' and the Adjective Rating 'Worst Imaginable.' These scores are also labeled as 'Not Acceptable.' These guidelines served as a framework for assessing the usability of the surveyed banking applications based on the obtained SUS scores.

<b>SUS Score</b>	<b>Letter Grade</b>	<b>Adjective Rating</b>	<b>Acceptability</b>
86-100	A	Best Imaginable	Acceptable
74-85	B	Excellent	
52-73	C	Good	Marginal
40-51	D	Ok	Not Acceptable
26-39	E	Poor	
0-25	F	Worst Imaginable	

Table 3-3: Grading Scale of SUS Scale

## Chapter 4: Result and Discussion

With the use of our data set, we conducted an experiment to determine the state of Bangladesh's mobile banking apps at the moment. 237 people made up the survey's overall sample size, representing customers from 29 different banks. 52% of the participants are employed, 45.4% are students, 2.18% are housewives, and 0.43% are unemployed. 33.9% of participants are female and 66.1% of participants are male.

<b>Apps</b>	<b>SUS Score (Highest)</b>	<b>SUS Score (Lowest)</b>	<b>SUS Score (Mean)</b>	<b>Grade</b>
AB Direct Internet Banking	82.5	52.5	65.68	C
Agrani smart banking app	77.5	52.5	67.5	C
Bank Asia SMART App	80.0	52.5	66.92	C
Brac Bank Astha	100.0	67.5	76.44	B
Cellfin	100.0	55.0	76.47	B
Citytouch	95.0	52.5	76.875	B
Dhaka bank go	87.5	52.5	74.17	B
EBL SKYBANKING	87.5	70.0	75.75	B
Ejanata	52.5	25.0	37.5	E
Exim ewallet	77.5	50.0	63.75	C
Fsibl cloud banking	50.0	45.0	47.5	D
IFIC Amar Bank	85.0	35.0	65.0	C
MTB Smart Banking	82.5	30.0	70.625	C
Magpie	55.0	47.5	51.25	D
Mbl rainbow	65.0	50.0	57.5	C
Meghna bank ibanking	52.5	32.5	42.5	D
Midland online	52.5	50.0	51.25	D
My prime	77.5	52.5	66.875	C
Nbl apps	67.5	50.0	58.75	C
NexusPay	87.5	67.5	76.25	B
One bank app	75.0	70.0	71.67	C
PI Banking	67.5	25.0	50.0	D
Sc mobile app	82.5	65.0	73.93	B
Shadin	82.5	52.5	66.875	C
Sibl now	77.5	52.5	65.5	C
Sonali e-Wallet	90.0	52.5	64.45	C
Trust money	75.0	52.5	63.75	C
Unet	85.0	52.5	66.43	C
Union	75.0	52.5	67.5	C

Table 4-1: Adjective Grading of SUS Score

**Excellent-rated Apps (SUS Score Range: 74-85):**

Brac Bank Astha, Cellfin, Citytouch, Dhaka bank go, EBL Skybanking, NexusPay, and Sc mobile app received an "Excellent" rating. Users expressed a high level of satisfaction (Q1) and confidence (Q9) in Cellfin and Citytouch. Brac Bank Astha and EBL Skybanking received moderate satisfaction ratings, while Sc mobile app had a slightly lower satisfaction score. Dhaka bank go had the lowest satisfaction rating among these apps, with significant variability in user responses [28].

**Apps with Marginal Acceptability (SUS Score Range: Below 74):**

AB Direct Internet Banking, Agrani smart banking app, Bank Asia SMART App, Exim ewallet, Amar Bank, Mbl rainbow, My prime, Nbl apps, Shadin, Sibl now, Sonali e-Wallet, Trust money, Unet, and Union received an "Ok" rating with marginal acceptability. User satisfaction varied across these apps, with some receiving moderate scores (AB Direct Internet Banking, Bank Asia SMART App, Nbl apps, Trust money, and Sibl now) and others having lower satisfaction levels. The perceived complexity (Q2) and the need for technical support (Q4) varied among these apps, with some indicating lower complexity and self-sufficiency and others suggesting a need for improvement in these areas. User perceptions of learnability (Q3, Q7, Q8, Q10) and effectiveness (Q5, Q6) also varied across these apps, with some indicating easier learning and better integration of functions, while others suggested room for improvement [28].

**Ejanata:**

Ejanata received a poor SUS score of 37.50, indicating a negative perception of usability. It scored low across all usability variables (Q1-Q10), suggesting the need for significant improvements.[28]

The analysis conducted on the mobile banking apps in this survey revealed that none of the apps met the criteria for the "Best Imaginable" rating in the SUS score range of 86-100. This indicates that even the apps rated as "Excellent" have room for improvement in terms of achieving the highest level of usability and user satisfaction. Overall, the apps rated as "Excellent" demonstrated higher user satisfaction and confidence, while those with marginal acceptability varied in their performance across different usability variables. Ejanata showed poor usability performance and requires substantial improvements.

## **Chapter 5: Conclusion and Limitation**

### **5.1 Conclusion**

In this study, we conducted a comprehensive analysis of the usability survey data for a set of apps. The findings shed light on the different aspects of usability, including learnability, effectiveness, efficiency, satisfaction, and consistency. By examining specific questions and their associated usability variables, we gained valuable insights into the users' perceptions and experiences with these apps.

Our analysis revealed that there are both excellent and marginal performing apps in terms of user satisfaction and usability. The study identified seven mobile banking apps that received an "Excellent" rating, including Brac Bank Astha, Cellfin, Citytouch, Dhaka bank go, EBL Skybanking, NexusPay, and Sc mobile app. These apps demonstrated higher levels of user satisfaction and confidence. Specifically, Cellfin and Citytouch received praise for their usability, with users reporting a high likelihood of frequent usage.

On the other hand, there were 14 mobile banking apps that received a "Marginal" rating, indicating room for improvement in their usability. These apps included AB Direct Internet Banking, Agrani smart banking app, Bank Asia SMART App, Exim ewallet, Amar Bank, Mbl rainbow, My prime, Nbl apps, Shadin, Sibl now, Sonali e-Wallet, Trust money, Unet, and Union. Users' satisfaction with these apps varied, and areas such as complexity, learnability, and effectiveness showed room for enhancement.

Furthermore, the analysis highlighted Ejanata as an app with poor usability, as indicated by its low SUS score of 37.50. This app exhibited shortcomings across all usability variables, emphasizing the need for significant improvements to enhance user satisfaction and usability.

To improve the overall usability of mobile banking apps, it is crucial for app developers and banking institutions to focus on addressing specific areas of concern highlighted in the analysis, such as complexity, learnability, and effectiveness. By incorporating user feedback and continuously evaluating and refining app features, banks can enhance the user experience and increase customer satisfaction.

This thesis paper provides valuable insights into the current state of mobile banking app usability, enabling banking institutions to make informed decisions regarding app development, design, and user experience enhancements. Future studies could delve deeper into specific usability aspects and incorporate a larger sample size to gain a more comprehensive understanding of mobile banking app usability in different contexts.

## **5.2 Limitations**

While this study provides valuable insights into the usability of the studied apps, there are several limitations to acknowledge:

First, the survey sample size was relatively small and may not represent the entire user population. Therefore, the findings should be interpreted with caution and may not be generalizable to all users of these apps.

Second, the survey data relied on self-reported responses, which are subject to biases such as perception bias or recall bias. Participants' responses may have been influenced by their individual preferences or experiences, which could have affected the accuracy of the findings.

Third, the analysis is done focusing only on the banking apps of 29 banks and may not capture the full spectrum of usability issues across all bank apps. Different apps may have unique features, functionality, and user bases, which can influence their usability characteristics.

Fourth, the survey instrument itself may have limitations. The design of the questionnaire and the selection of usability variables could have influenced the participants' responses and the subsequent analysis.

These limitations provide avenues for future research. Further studies with larger and more diverse samples, along with mixed-method approaches, can provide a more comprehensive understanding of usability across a broader range of apps and user groups. Additionally, refining the survey instrument and incorporating additional metrics may enhance the accuracy and depth of usability evaluations.

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