Mobile Banking Application Usage Analysis in Sri Lanka

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***Abstract*—Mobile banking [1] is a service provided by some financial institutions which enable users to use a mobile device to carry out financial transactions. This service enables users to do various transactions, which may vary depending on the institution. Currently, most of the Sri Lankan banks are offering this mobile banking service to the customers. This survey was done to investigate the factors that affect mobile banking applications. One hundred sixty participants have randomly participated in this survey. Data is analyzed and visualized, and then those data were used to derive some useful insights for the banking services to adapt their service towards customers better. This study will be helpful to implement user-friendly mobile banking [2] applications in Sri Lanka.**

[1] ***Index Terms*—Mobile Banking Application, Statistical Inference, Descriptive analysis, Customer satisfaction**

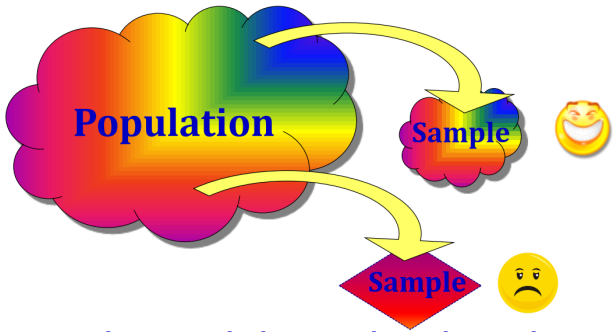

Fig. 1. Sampling bias in statistics.

I. Introduction

THE history of banking goes far back to 2000BC. The first prototype banks were the merchants, who gave grain loans to farmers and traders who carry the goods between cities. Later during the Roman Empire, lenders based on temples gave loans while accepting deposits and performing the change of money. Development of banking spread from northern Italy throughout the Holy Roman Empire, and in the 15th and 16th century to northern Europe.

Banking was introduced to Sri Lanka by the British colony (1802-1948), with mainly branches of foreign banks being set up. The CBSL was established in 1950 under the MLA No.58 of 1949, which was a major milestone in Sri Lanka's economic history. It was renamed the Central Bank of Sri Lanka (CBSL) in 1985. The Central Bank was given broad powers to administer and regulate the country's entire money, banking, and credit system. Later many other banks were established in Sri Lanka over time.

Sri Lankan banking industry was changed during the late 1980s with the introduction of automation by private banking corporations. Few foreign banks were using interactive electronic customer interfaces such as automated teller machines (ATMs). These facilities were limited to higher-end customers. In 1986, Sampath Bank (which is a local bank) opened, offering customers access to their account from any branch, instant money transfers within cities, and access to automated teller machines (ATMs). Today, the entire banking sector in Sri Lanka offers automated banking systems with ATMs for customers, for faster and after-hour services.

Telephone banking and internet banking facilities have become more popular [3] added features of the banking industry with the growing popularity of modern telecommunication technology among Sri Lankans. The latest welcome to this banking technology is the mobile banking facility. Mobile banking is a service provided by banks that enable users to use a mobile device to carry out financial transactions. This enables users to do various transactions without physically going to the bank. These changes helped private banks to expand rapidly while increasing profitability.

Types of mobile banking services [4] can be categorized into following

1) Account information access
2) Transactions
3) Investments
4) Support services
5) Content and news

The main focus of this project is to get meaningful and valuable information out of this user data. My main goal is to analyze these data and give a good recommendation to the bank in order to improve the overall user engagement with the mobile banking application. Using this information bank can encourage users to use their mobile application, which will reduce the overall operation cost of the transactions as well as this will able to serve many more customers that

[1]Link to the github page. https://github.com/DulanGit/CS5651-Statistical-Inference-Project

are about to join with the bank in the near future. When looking from the customer point of view, the customers get an appealing application which most of the time serves their purpose without physically going to a bank branch, which will be convenient in every other angle.

II. Methodology

The questionnaire was created in a google form, and it was shared among different groups. There were altogether 160 responses. First, all the data was extracted to a CSV file. Then all the pre-processing and visualizations were done using popular python libraries such as Pandas and Seaborn. Statistical analysis was then done to get the overall movement on mobile banking and figure out the required improvements to do on the banking side to get this service to the next level.

Statistics is all about data, and this can be divided mainly into three categories.

1) Collecting DATA
   The first stage of any statistical study is to collect the data. There are many methods used to collect or obtain data for statistical analysis. Three of the most popular methods are Direct Observation, Experiments, and Surveys.
   Observation is done to understand something in its natural settings. In contrast, an experiment is done to test a causal relationship. The survey is done in order to understand the general characteristics or opinions of a group of people.
2) Describing DATA
   Categorical and Quantitative are the main data types in this domain. Data expressed in numbers and summarized using statistics to give meaningful information is referred to as quantitative data. A categorical variable is a variable that can take on one of a limited, and usually fixed, number of possible values
   The case, sample, and population are the three terms used in statistics with the data. The case is an individual element of data where the population is the complete dataset. However, given a study, we will never be able to get hold of the population. A sample is a portion of the population that can be used to represent the population.
3) Analyzing DATA
   Data analytics focuses more on viewing the historical data in context, while data science focuses more on machine learning and predictive modeling. This involves analyzing data to answering questions generated for better business decision-making.

III. Data Collection and Processing

Initially, the survey was divided into two groups. The first group will look for the people who are not using a mobile banking application and the second group is analyzing the people who use mobile banking applications to do the transaction. This particular survey was conducted towards people who use mobile applications. Because of that, the population for this survey is the general users who use Mobile Banking applications.

The questionnaire is the main instrument for collecting data in survey research. For this research, a questionnaire was generated with two different language formats English and Sinhala. For those who are less familiar with English, the Sinhala questionnaire was supplied. The questionnaire was consists of 23 questions about demographics and about mobile banking experience in Sri Lanka. This questionnaire was mainly shared through digital media.

The main challenges that we face using these online platforms are where we can only reach a part of the entire population. This is One of the major issues when collecting data is that the data can have sampling bias. In order to avoid this bias we should take a random sample. When collecting the data the questionnaire was shared between different groups such that it wont limit to a certain type of people. This questionnaire was having the Volunteer Bias because we cannot force people to take the survey.

Even after having a good sample there can be other forms of bias. When collecting data question wording, context and inaccurate responses are some of those. These questions are created in such a way that the questions will not bias the people's choice.

The survey had four sections. First section is created to understand each person's demographics such as age, gender, location, occupation, and income, which we think will directly affect mobile banking usage. Then section 2 consists of how each person's usage of the mobile application. Tired section is dedicated to get the overall feedback of the features of the current mobile banking application. Furthermore, the last section is about the suggestions of the users to improve the overall banking experience.

IV. Descriptive Analysis

Descriptive analysis is the first important step for conducting statistical analysis. It gives an idea of the data distribution; it also helps to detect outliers and typos and enabling to identify associations among variables, thus making data ready to conduct statistical analysis. Descriptive analysis can be divided into two types.

1) Descriptive analysis for each individual variable
2) Descriptive analysis for combinations of variables

A. Gender distribution

Figure 2 represents the data distribution concerning gender. Looking at that graph, most of the people who use mobile banking applications tend to be males. This is later analyzed using statistical methods to obtain the significance of this value. Most of the males are fast-moving with the technology.

B. Age distribution

Then figure 3 shows the age ranges the people use the mobile banking system. 78% of the users are below 30 years of age are using this facility and15.5% of users are within 31-40 years of age. Only 3% of the entire sample is above 40. This is an exciting statistic; most of the young generation adopted this mobile banking technology. One primary reason

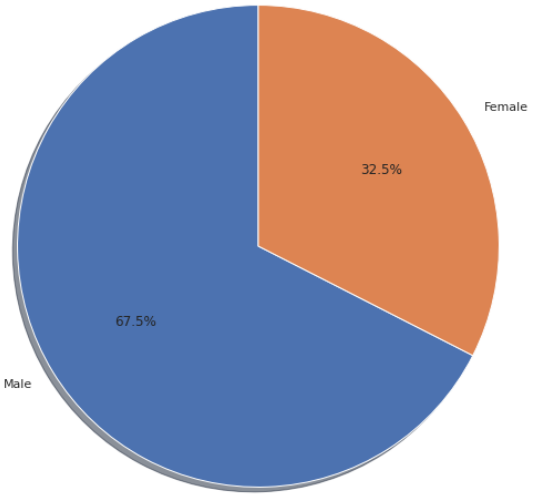

Fig. 2. Gender distribution.

for this move would be the technology is quickly adopted by the young generation rather than the old generation. Thus, it is evident that most of the people who use mobile banking are young people

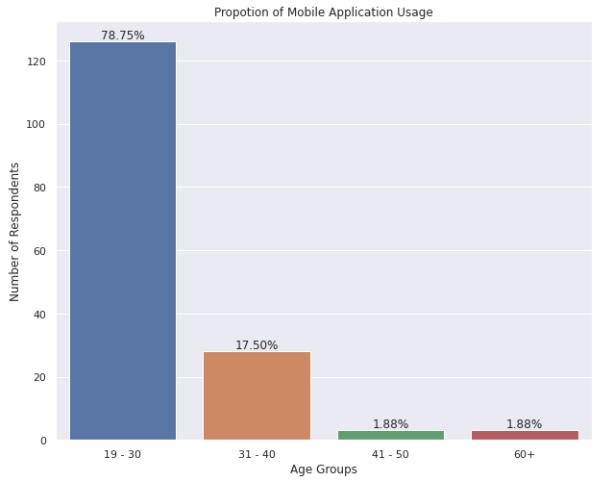

Fig. 3. Age distribution

C. User Location

Most of the users who use mobile banking application are from western province(Figure 4). More than 1/3 of the total responses from Colombo district. This can be not only the usage of the mobile banking apps but instead most of the people are also from the Colombo area.

D. Education Level

Figure 5 shows the education level of people who use mobile banking. This type of graph was generated may be due to the sampling bias. The data was collected using groups on various online platforms. Most of the time, the people who

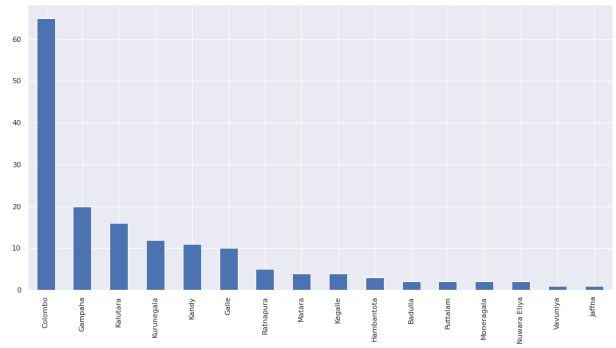

Fig. 4. Location

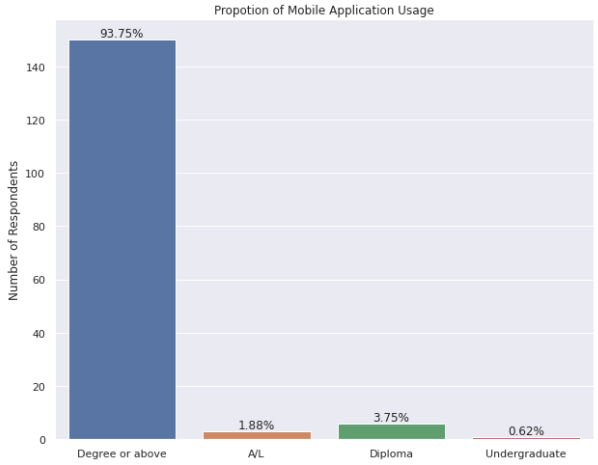

Fig. 5. Education level

responded to this questionnaire would be those who did higher studies. Most of the people who go with the technology would also definitely have done at least a degree.

E. Income Level

Figure 6 chart shows the income of the survey participants. Here some vital trend is observed. Despite of the income range, most people are tend to use mobile banking applications. This means the service is not limited to the high-income people, low and middle-income people also use the service very well.

F. Types of services

In this graph(Fig 8), you can see the types of services obtained by the users. Most of the users are interested in checking their mobile balance and transfer money to other accounts. Also, utility bill payments a primary selected option in this category.

G. Mobile banking influence

The Figure 7 shows how the users heard about mobile banking. This should be one of the main reason for users to use the mobile banking application [5]. As we see in this graph moist of the users heard about mobile banking through the

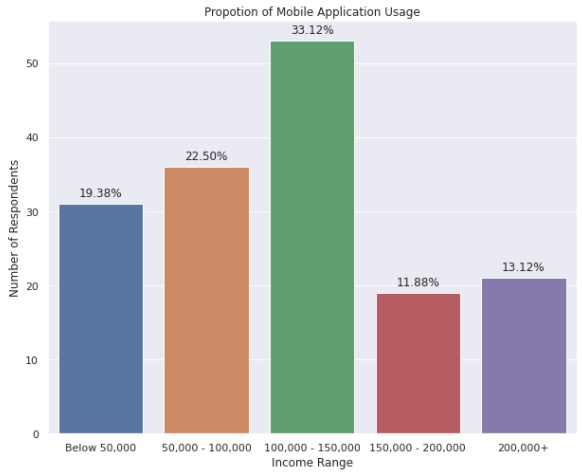

Fig. 6. Income level

actual bank. This means banks are promoting users to use the mobile banking application since that will reduce the resource that needs a bank to maintain the customer base.

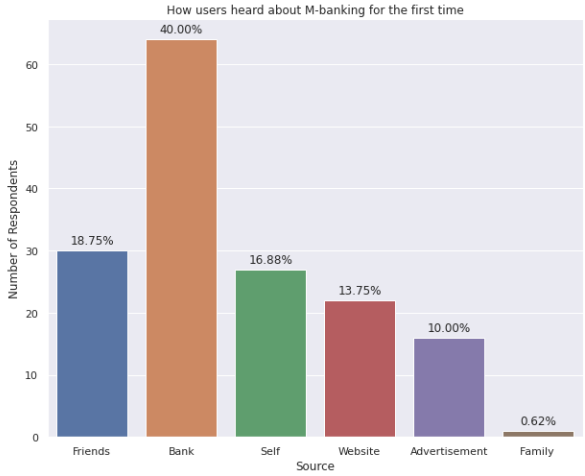

Fig. 7. Promotions

H. Other questions

Some other questions were asked from the customers to get direct feedback about the banking application. These are some insights that got from those responses.

- What customers most liked about online banking?
  24x7 Accessibility
- What customers saw as the biggest barrier for mobile banking?
  Technological Barriers
- What customers most requested necessity?
  Keep mobile banking application simple

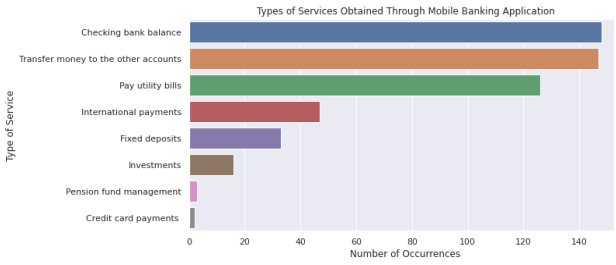

Fig. 8. Mobile banking services.

V. Statistical Analysis

Statistical data analysis is a procedure of performing various statistical operations. It is a kind of quantitative research, which seeks to quantify the data, and typically applies some form of statistical analysis. Quantitative data basically involves descriptive data, such as survey data and observational data. If the data in statistical data analysis is multiple in numbers, then several multivariate can be performed. These are factor statistical data analysis, discriminant statistical data analysis, etc. Similarly, if the data is singular in number, then the univariate statistical data analysis is performed. This includes t-test for significance, z test, f test, ANOVA one way, etc.

Here in this analysis, following tests were done.

- Statistically Significant
  Statistical significance is a determination by an analyst that the data results are not explainable by chance alone. Statistical hypothesis testing is done to check this result. This test provides a p-value, which is the probability of observing results as extreme as those in the data, assuming the results are truly due to chance alone. A p-value of .05 or lower is often considered to be statistically significant.
- Chi-Square Test for independence
  A chi-square test for independence compares two variables in a contingency table to see if they are related. It tests to see whether distributions of categorical variables differ from each another in a more general sense. Here, the null and alternative hypothesis is also defined, and the p-value is calculated to check whether the null hypothesis is significant.
- Two sample T-test
  Two sample t-tests are done to check whether there is a difference between the two population means. The null hypothesis is often defined such that the means are equal, whereas the alternative hypothesis says otherwise.

A. Is the Majority of Mobile Banking users are men?

P1 = Percentage of male users using mobile banking applications P2 = Percentage of female users using mobile banking applications

Gender	No of responses
Male	108
Female	52
Total	160

Hypothesis Test

$$H0 : p1 = p2$$

$$Ha : p1 > p2$$

$$Pvalue = .00001 < .05$$

Since the p value is less than the significant value we reject H0. Based on this data, there is a strong evidence that most of the mobile banking users are Male.

B. Is the income level associated with the mobile banking frequency?

H0 – There is no association between income level and mobile banking frequency

Ha – There is an association between income level and mobile banking frequency

Income vs Freq	Daily	Weekly	Monthly
High	7	11	21
Middle	6	17	29
Low	7	25	35

Chi-Square value is 1.867 with DF 4, p-value is 0.7602 which is less than .05 The result is not significant, and We cannot reject the null hypothesis.

C. Is the distance to the bank associated with the mobile banking frequency?

H0 – There is no association between distance to the bank and the mobile banking frequency

H0 – There is an association between distance to the bank and the mobile banking frequency

Income vs Freq	Daily	Weekly	Monthly
Near (¡100m)	6	14	25
Far	14	39	60

Chi-Square value is 0.1698 with DF 2, p-value is 0.9168 which is less than .05 The result is not significant, and We cannot reject the null hypothesis.

D. User Satisfaction

The figure shows what the features that users requested the most are. The most requested feature is security, which has an average rank of 5. Then users expect the availability and user-interface and so on.

Then each user marked their satisfaction level with the mobile application, where 60% of the users gave a 4-star rating. Here, the users had to be divided into two groups. The first group is the users who are highly satisfied with mobile banking applications. The second group is the users who have a low satisfaction with mobile banking.

Satisfaction	Rating
High	Rating 5 or 4
Low	Rating below 4

After dividing the user group into those two groups, the difference in means test was made to identify why the low satisfied user feels that way compared to the highly satisfied user. This is the statistic that this test is going to find. T-test statistic was calculated for all the different requirements which were requested by the users. And for each test P value was calculated, and then it was used to find each requirement's significance. The results which were obtained are in table 2.

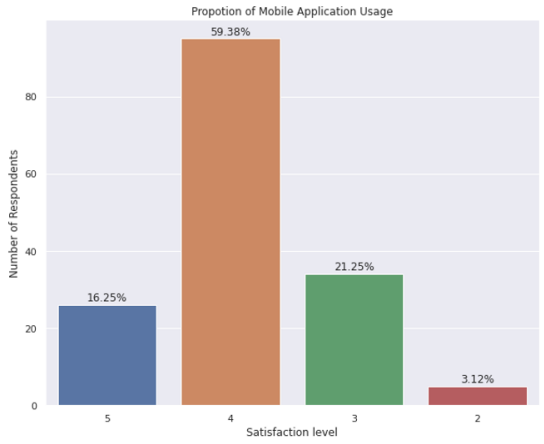

Fig. 9. Mobile banking user satisfaction

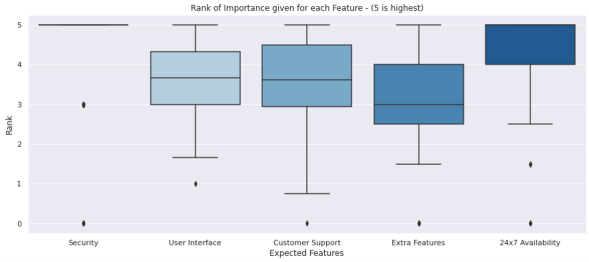

Fig. 10. Mobile banking user requirements

User Requirement	Test statistic t	P value	Significance
Security	0.2316	0.8172	Not significant
User Experience	2.3556	0.0198	Significant
Customer Support	0.2037	0.8388	Not significant
Extra Features	2.3027	0.0226	Significant
24x7 Availability	0.4859	0.6278	Not Significant

We can conclude from this test that the Mean Difference of Satisfaction score between recommenders and Non-recommenders significant for the User Experience and Extra Features. This means that banks should give more attention to the User Experience and Extra Features more than the others.

VI. Conclusion

Mobile banking is an efficient tool that can be used to facilitate financial transactions. This project's main objective is to identify the user groups that actively use the mobile banking application and make some suggestions to improve the experience of that service. According to the survey, most of mobile banking users are male users. There are significantly more users under thirty years of age. From the Chi square test, there is no direct relationship between mobile banking frequency vs. distance to the bank or the user's income.

The results from the user satisfaction level noted that User Experience and Extra features make more users satisfied. Therefore the Mobile Banking service providers need to

improve those aspects of the service to retain current users and onboard new users to the platform.

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