# CUSTOMER SATISFACTION SENTIMENT ANALYSIS FOR ONLINE TRANSACTIONS IN BANGLADESH USING MACHINE LEARNING

**BY**

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This Report Presented in Partial Fulfillment of the Requirements for

The Degree of Masters of Science in Computer Science and Engineering

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**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

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## APPROVAL

This Thesis titled "**CUSTOMER SATISFACTION SENTIMENT ANALYSIS FOR ONLINE TRANSACTIONS IN BANGLADESH USING MACHINE LEARNING**", submitted by Md. Almahmud Pias, ID No: 242310005103045 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 06-07-2024.

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## DECLARATION

We hereby declare that this research has been done by us under the supervision of **Dr. Fizar Ahmed, Associate Professor Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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# ABSTRACT

Online transactions are becoming increasingly popular in Bangladesh, starting from shopping, we transact online. Online payment plays a very important role in paying any shopping bill. To find any possible problems and enhance the user experience as a whole, it is crucial to comprehend the degree of client satisfaction with these kinds of transactions. With an emphasis on aspects including platform usability, transaction security, and overall customer experience, the poll sought to determine Bangladesh's degree of customer satisfaction with online transactions. A report based on a sample of customers through which we understood how customers are satisfied with online payment and got an idea to understand their opinion. survey's findings indicate that Bangladesh's mean consumer satisfaction rating for online transactions is 6.2096813773 out of 10. Through this we came to know that all the customers of Bangladesh are satisfied with online shopping and everyone can improve from everyone's place. Through this test, we can know more about the value and satisfaction of online transactions in Bangladesh. They have largely responded to improving customer experience and digital transactions. All in all, a satisfactory established informed that online shopping plays an important role.

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# CHAPTER 1
# INTRODUCTION

## 1.1 Introduction

Bangladesh's use of online transactions has significantly increased as a result of the widespread adoption of digital technology. A growing number of people are using the Internet for a range of purposes, from bill payment and shopping to financial management. Online transactions offer significant advantages in terms of accessibility and convenience, but it's also critical to understand consumer satisfaction levels in order to spot possible problems and enhance the user experience overall. Prior research has determined that a number of characteristics, such as platform usability, transaction security, and customer service accessibility, affect consumers' happiness with online purchases. Furthermore, it was shown that important factors influencing satisfaction were perceived dependability and security of the platform, as well as trust and faith in the service. This survey was done to find out how satisfied customers were Better understanding and improvement of the country's online situation has become possible with Bangladesh online transactions. Which we can identify is an important factor to advance the country's online platform. convenience of online payment options is crucial to online shoppers' happiness. The consumer experience is improved by a wide range of payment methods, security, and ease of use. Customers are more satisfied when the payment procedure is quick and easy because it saves them time and effort. One of the main components of happiness is consumer confidence, which is increased by the security of payment gateways and the protection of customer data. Customers can shop with greater convenience thanks to the availability of many payment methods like digital wallets, mobile banking, and credit/debit cards. Thus, client happiness rises in tandem with the online payment system's improving quality. Through the systematic collection and analysis of customer satisfaction data, significant insights into the factors influencing customer satisfaction and discontent can be obtained, and recommendations for resolving identified issues can be made. The ultimate goal of this research is to encourage the broad use of digital financial services and enhance the online shopping experience for customers in Bangladesh.

## 1.2 Motivation

This survey was done to find out how satisfied customers were Better understanding and improvement of the country's online situation has become possible with Bangladesh online transactions. Which we can identify is an important factor to advance the country's online platform. convenience of online payment options is crucial to online shoppers' happiness might yield insightful data that can guide initiatives to enhance user experience and encourage broader uptake of digital financial services. In addition to assessing the present situation of e-commerce in Bangladesh, the goal of this research is to pinpoint particular elements that influence customer happiness. Easier, faster, and safer buying is the primary goal of online shopping with online payment. Customers can buy a variety of goods and services from the convenience of their homes and make quick payments, which helps to provide a convenient shopping experience for them. Additionally, a variety of payment choices are offered by online payment systems, enabling users to make payments in accordance with their preferences. This encourages a cashless society and improves payment processing security and transparency. Ultimately, the primary goal of the online payment system is to save clients time and effort while offering a simple, safe, and straightforward buying experience. Key factors influencing satisfaction may be found by examining the survey results, and suggestions for resolving any problems may be made. This could enhance the general customer experience and promote internet shopping among Bangladeshis. Finally, concerning can benefit from the study's conclusions. Businesses or groups providing these services can utilize the findings to refine their offerings, and regulatory bodies can utilize the information to create policies or suggestions. Furthermore, this study can improve the global user experience of these services, add regarding and guide. Making the online payment process simple, quick, and safe for customers is the primary goal of online buying. Customers can buy products and services from the comfort of their homes with this approach, which saves them time and effort by allowing them to make instantaneous payments.

## 1.3 Objectives

Examining Bangladesh's online transaction satisfaction rate is the study's justification. An in-depth understanding of the elements that influence customer satisfaction and dissatisfaction as well as recommendations for how to resolve any problems found can be obtained by gathering and thoroughly evaluating data on customer satisfaction. At the end of the day, this research attempts to encourage the broad use of digital financial services and enhance the online shopping experience for Bangladeshis. For multiple reasons, it is crucial to comprehend Bangladesh's online transaction customer satisfaction level. First and foremost, the success and uptake of these services heavily depend on consumer pleasure. Enhancing the user experience and promoting more online transactions among Bangladeshis can be achievable by locating and resolving any problems that might be generating discontent. Furthermore, knowledge about Bangladeshi customers' satisfaction levels with online transactions can help with decision- and policy-making regarding these services. The results of this study can be utilized by companies or organizations who offer online transaction services to enhance their offerings, and regulators can utilize the information to create standards or suggestions. Lastly, this research, especially in light of Bangladesh, can add of information in online shopping. By including this information, it would be feasible global user and provide guidance for future study.

The main objective following steps can be taken to improve the customer experience of online shopping in online payments:

- Secure Payment Gateways: To protect consumers' financial information, use payment gateways with robust security features. It boosts client assurance.

- Various Payment Methods: Offering a variety of payment methods, such as cash on delivery, digital wallet, credit/debit card, and mobile banking. Clients are free to choose how they want to pay.

- Easy and Fast Payment Process: For instance, offering one-click payment choices and utilizing card information that has been preserved.

- Payment Confirmation and Receipt: Upon completion of payment, promptly send clients receipts and confirmation messages. Consumers can feel secure in their dealings.

- Fraud Prevention Mechanism: To stop fraud, use sophisticated measures like 3D Secure and OTP Verification

- Easy Refund Process: Providing easy and fast refund process in case of payment problem. This ensures a hassle-free experience for customers.

- Transparency and Information: Providing detailed information about the payment process, so that customers are informed at every step and there is no confusion.

- Personalized Payment Offers: Providing customers with special payment offers and discounts based on their purchase history and preferences. This encourages customers to make repeat purchases.

By taking these steps, the online payment process can be improved and secured, which improves the customer experience and increases their satisfaction.

## 1.4 Expected Outcomes

In addition to assessing the present situation of e-commerce in Bangladesh, the goal of this research is to pinpoint particular elements that influence customer happiness. Easier, faster, and safer buying is the primary goal of online shopping with online payment. Customers can buy a variety of goods and services from the convenience of their homes and make quick payments, which helps to provide a convenient shopping experience for them. Additionally, a variety of payment choices are offered by online payment systems, enabling users to make payments in accordance with their preferences. This encourages a cashless society and improves payment processing security and transparency. Ultimately, the primary goal of the online payment system is to save clients time and effort while offering a simple, safe, and straightforward buying experience. Key factors influencing satisfaction may be found by examining the survey results, and suggestions for resolving any problems may be made. This could enhance the general customer experience and promote internet shopping among Bangladeshis. Finally, concerning can benefit from the study's conclusions. This encourages a cashless society and improves payment processing security and transparency. Ultimately, the primary goal of the online payment system is to save clients time and effort while offering a simple, safe, and straightforward buying experience. Key factors influencing satisfaction may be found by examining the survey results, and suggestions for resolving any problems may be made. This could enhance the general customer experience and promote internet shopping among Bangladeshis. Finally, concerning can benefit from the study's conclusions. Businesses or groups providing these services can utilize the findings to refine their offerings, and regulatory bodies can utilize Hopefully through this we will get a good result. The benefits of people or customers have been taken into consideration. Which will help people to shop and buy. Moreover, in unique cases will play an important role. Always consider whether customers want to make it easier for them. If the system is easy to pay, then people will feel empowered. We all are used to online shopping so we can make the payment online after online shopping. For this, there are few mobile companies in our country that provide banking facilities, so this is very important. The information to create policies or suggestions. Furthermore, this study can improve the global user experience of these services, add regarding and guide. Making the online payment process simple, quick, and safe for customers is the primary goal of online buying.

## 1.5 Research Question

Evaluate Bangladesh's general customer satisfaction level with online transactions: envisaged would give comprehensive general degree of gathering & evaluating a consumer. Is feasible to have a better understanding of Bangladesh's online transaction situation as well as pinpoint any issues or prospective areas for development by responding to these study questions. Furthermore, through the examination of the survey data, recommendations for resolving any problems and enhancing the online transaction experience for customers in Bangladesh might be made. Topic is ways in which online payment systems can enhance the general online shopping experience and happiness of customers. It will examine the efficiency of various payment methods, safety precautions, usability, and extra features like customer service and simple returns. Finding the essential elements that lead to a happy and fulfilling online purchasing experience is the aim, especially with regard to the payment procedure.

## 1.6 Report Layout

There are a total of six chapters. Each chapter has multiple sections presented examined contents:

Chapter 1:

First, in this chapter, we have introduced the extent to which customers perceive online transactions as subscriptions. All the aspects of the customers and their comments and opinions are presented in this section. For which played an important role by giving importance to all the opinions of the customers, the role was important for this research result.

Chapter 2:

Chapter We Research Background Knowledge What type of data has been collected. It has been discussed and mentioned in the background. What kind of cityspection customers are mentioned considering all aspects of their comments customers. It will examine the efficiency of various payment methods, safety precautions, usability. By addressing these limitations and exploring future research directions, the field of customer satisfaction sentiment analysis can continue to evolve, providing deeper insights and more actionable information for businesses.

Chapter 3:

This chapter discusses what important requirements are needed. All information systems are presented here. Moreover, what methods and unique aspects have been discussed, especially some important information is given in this chapter. In particular, the analysis system is highlighted. The systems we have analyzed are discussed in this chapter. This chapter deals with some important analysis topics.

Chapter 4:

Will cover the tests carried out to assess the effects of various online payment system features on online shoppers' satisfaction. We will go over the data that was gathered, the analysis that was done, and the approach that was employed. The goal of this chapter is to give readers a thorough grasp of how online payment systems and customer satisfaction are related.

Chapter 5:

Explores how internet payment methods affect society on a social level. The way we conduct transactions has significant effects on people, businesses, and communities as internet buying becomes more and more common. The purpose of this chapter is to examine the wider societal effects of online payment systems.

Chapter 6:

In the last chapter we have discussed what kind of role our project is playing. It has been highlighted how important it is for the society and the environment, starting from the people. The last chapter also highlights the important information, the last stage which shows how satisfied the customers are with the online payment system and their final satisfaction.

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# CHAPTER 2

# BACKGROUND

## 2.1 Preliminaries

The following terms could be pertinent to an investigation on Bangladeshi consumers' satisfaction with internet transactions Online First we need to see how much customer satisfaction. Because our important thing is to work with customer satisfaction. If you are not satisfied, then it can be said that we get ideas from customers. Which aspect can develop. Next highlight the importance of using e-wallet. Because this wallet plays a very important role in online transactions. Through this the customer can pay directly online. This wallet which is very responsible for transactions and easy system it plays an important role in making the customer's shopping easier. Then there is the digital banking system through which an online customer can also make transactions through digital banking which is very important in terms of online payment. It is a comfortable and easy system. Next is to share a customer's experience. To know if there is any problem in his online transaction. Because if the user is facing any problem in online transaction then finding the solution to that problem. Because when the user faces a problem then he will not be interested in online payment later. It can be disruptive for us so keep an eye on it. Next Gaining Credibility in terms of online translation, online shopping must gain credibility from a customer. Otherwise a customer will never be interested in online shopping and will not be interested if he is a victim of any kind of fraud. So must gain credibility in this regard.

## 2.2 Related Works

Rising prevalence purchases sparked greater figuring out what aspects of these transactions make customers happy. A variety of characteristics, such as platform usability and security, transaction speed and efficiency, and customer assistance availability, have been linked according to prior study. In a study published in 2022, Karim et al. evaluated how satisfied Bangladeshi consumers were with e-wallet services using structural equation modeling and model. The study discovered that a crucial element of enjoyment was having faith in one's capacity to use technology. In order to ascertain how elements like mechanisms impact user carried out a survey. According the poll, consumer security concerns. An online poll was performed by Solarize et al. (2018) to gauge Bangladeshi consumers' satisfaction with a number of criteria, such as overall customer experience, usability, and reliability, affected customer satisfaction with mobile payments. Praveen et al. (2013) polled customers via a questionnaire about their satisfaction with Dutch-Bangla Bank's digital banking services in Bangladesh. According to the study, user satisfaction was significantly influenced by elements including security, dependability, transaction efficiency, customer assistance, and convenience of use. Baria et al. (2021) evaluated customer satisfaction and service quality with e-banking in Bangladesh through in-person interviews and a survey using standardized questions. According to the survey, client happiness with e-banking is significantly influenced by the quality of the services provided. Within Bangladesh All things considered, these studies indicate that a number of criteria, such as convenience, security, dependability, and overall customer experience, affect how satisfied Bangladeshi consumers are with online purchases.

## 2.3 Comparative Analysis and Summary

Research indicates that the number of online transactions in Bangladesh is rising, primarily due to rising internet penetration and smartphone usage. However, obstacles including restricted access to digital infrastructure and misgivings about trust and security prevent adoption from becoming widely accepted. The study discovered that a crucial element of enjoyment was having faith in one's capacity to use technology. In order to ascertain how elements like mechanisms impact user carried out a survey. This wallet which is very responsible for transactions and easy system it plays an important role in making the customer's shopping easier. Then there is the digital banking system through which an online customer can also make transactions through digital banking which is very important in terms of online payment and model type is comparative human choose prosper.

Table 2.1: Comparison between previous work table

| **Study** | **RQ Approach** | **FI CS** | **Sample Size** |
|---|---|---|---|
| W. W. al (2022) [1] | Model and Structural Equation Modeling | Confidence in ability to use technological tools | 480 |
| al. (2022) [2] | Poll online | Customers transact online this poll system plays a very important role in making online transactions easy | 300 |
| A. Solarize et al. (2018) [3] | Online survey with multiple-choice and Multiple customer opinions are taken differently. Jayant plays a unique role. | Causes of consumer contentment and discontent Here the payment system is through mobile. Which plays an important role in customer satisfaction. | N/A |
| M. M. Parvin et al. (2013) [4] | Questionnaire survey | Of course in this case we will have a supporting team who will play the role of the customer apart from providing support to All west customers. | 50 |
| D. Barea et al. (2021) [5] | In this case, of course, the server dials, in the case of subsequent activities, it is considered to be a forest initiative. | N/A | 205 |

| | | | |
|---|---|---|---|
| J. M. et al Nupur 2021[6] | Enjoy the next time you create a survey on the telephone printer view. | Reliability, responsiveness, assurance, empathy, and tangibles | 250 |

## 2.4 Scope of the Problem

Researching encompasses several key aspects:

- Increasing Importance of Online Transactions: With the growth of e-commerce and digital payments in Bangladesh, understanding customer satisfaction with online transactions is becoming increasingly important for businesses and policymakers.

- Challenges in Adoption and Access: Despite the potential benefits of online transactions, about security and hinder widespread adoption.

- Customer Experience and Satisfaction: The scope includes examining the factors that contribute to usability online platforms, availability payment options, reliability digital banking services, and the effectiveness of security measures.

- Role of E-Wallets and Digital Banking: Understanding the role of e-wallets and digital banking services in facilitating online transactions is essential. This involves assessing customer preferences, adoption rates, and satisfaction levels with these digital financial services.

- Security and Trust: Security and trust are critical components of customer satisfaction in online transactions. Exploring perceptions of security measures, data protection practices, and trust-building strategies is essential for mitigating concerns and fostering trust among customers.

- Policy Implications: The scope extends to examining the policy implications of improving dentifying regulatory gaps, promoting digital inclusion initiatives, and supporting businesses in enhancing the online transaction experience.

By addressing these aspects within the scope of the research, we can gain valuable insights into improving customer satisfaction and driving the growth of online transactions in Bangladesh.

## 2.5 Challenges

There are a few obstacles to overcome when employing machine learning to study consumer. First, given the possible constraints of data availability and trustworthiness, especially in the context of Bangladeshi customer replies, it can be difficult to gather relevant and high-quality data. Furthermore, the intricacy of the Bengali language presents a noteworthy obstacle to standard language processing methods like sentiment analysis, necessitating the use of specific strategies to manage linguistic subtleties. Accurate sentiment interpretation also depends on making sure that cultural sensitivity is maintained and that contextual nuances in consumer replies are understood. Furthermore, an uneven distribution of sentiment labels along with the labor-intensive process of manually labeling and annotating sentiment data can impede model training and generalization. Another degree of complication arises from balancing model performance requirements with ethical issues regarding data protection and interpretability. To tackle these obstacles, interdisciplinary cooperation is necessary, as is ongoing improvement of sentiment analysis techniques and careful consideration of data gathering, preprocessing, model building, and assessment techniques.

# CHAPTER 3

# RESEARCH METHODOLOGY

## 3.1 Research Subject and Instrumentation

Purchases is this study examining elements that affect client happiness, such as platform usability, transaction security, and general customer experience, is part of this. In addition to identifying development, the objectives are evaluating Bangladesh's present state of customer satisfaction with online transactions. Since grown popularity Bangladesh in concentrate primarily on online transactions made through these channels. The survey's findings can help guide initiatives to enhance customer satisfaction and encourage the broad use of digital financial services by offering insightful information on status research tools will probably involve a survey questionnaire. Can be included questionnaires elicit responses perspectives from respondents. Be asked questions concerning their online transaction experiences in Bangladesh, including how satisfied they were with the service overall, what issues or difficulties they had, and how user-friendly, secure, and dependable they thought the platform was. Comprehensive variables affect can be obtained by including demographic data about respondents in questionnaires, such as their age, income, and educational attainment. Depending on particular research goals and available resources, survey questionnaires may be distributed online or in person.

## 3.2 Data Collection Procedure

An investigation on Bangladeshi consumers' satisfaction levels with online purchases can employ a variety of data gathering techniques. A platform such as Google Forms or Survey Monkey can be utilized to carry out an online survey. This could result in a sizable and varied sample of participants and enable people to finish the questionnaire whenever it is convenient for them. A more comprehensive and qualitative source of information regarding participant experiences and perspectives could be obtained by holding in-person interviews or focus groups. In this instance, selecting setting up focus groups interviews are necessary for researchers. Whichever technique of data collecting is used; it is crucial to make sure that the participant sample intended audience crafted pertinent to study's. To make inferences that are relevant to the situation, the gathered data should be thoroughly examined, and statistical analysis should be performed as needed.

## 3.3 Statistical Analysis

At the moment depending on the online collection we gave Google from the common super tip value goal firm. Seen almost a lot of people data dicing. Which is 91% of online user transactions.

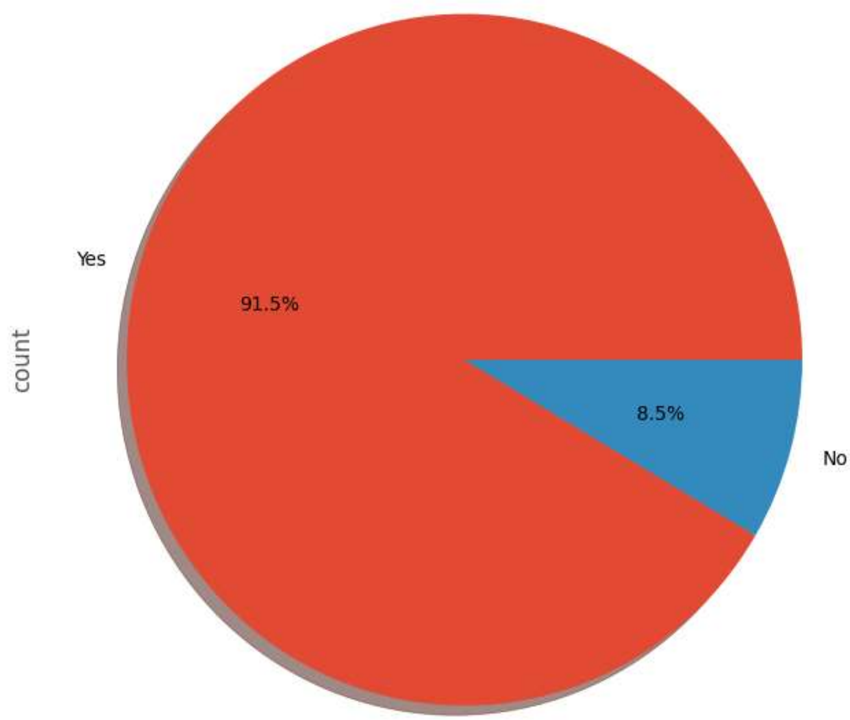


Figure: 3.3 Percentage of levels column

Our research paper has played a role in those who have collected data from people through Google A form. After collection customer satisfaction is given priority. Data collected from customers let us try to take the data community first. Can be included questionnaires elicit responses perspectives from respondents. Be asked questions concerning their online transaction experiences in Bangladesh, including how satisfied they were with the service overall, what issues or difficulties they had, and how user-friendly, secure, and dependable they thought the platform was. Comprehensive variables affect can be obtained by including demographic data about respondents in questionnaires, such as their age, income, and educational attainment. A platform such as Google Forms or Survey Monkey can be utilized to carry out an online survey. This could result in a sizable and varied sample of participants and enable people to finish the questionnaire whenever it is convenient for them. A more comprehensive and qualitative source of information regarding participant experiences and perspectives could be obtained by holding in-person interviews or focus groups.

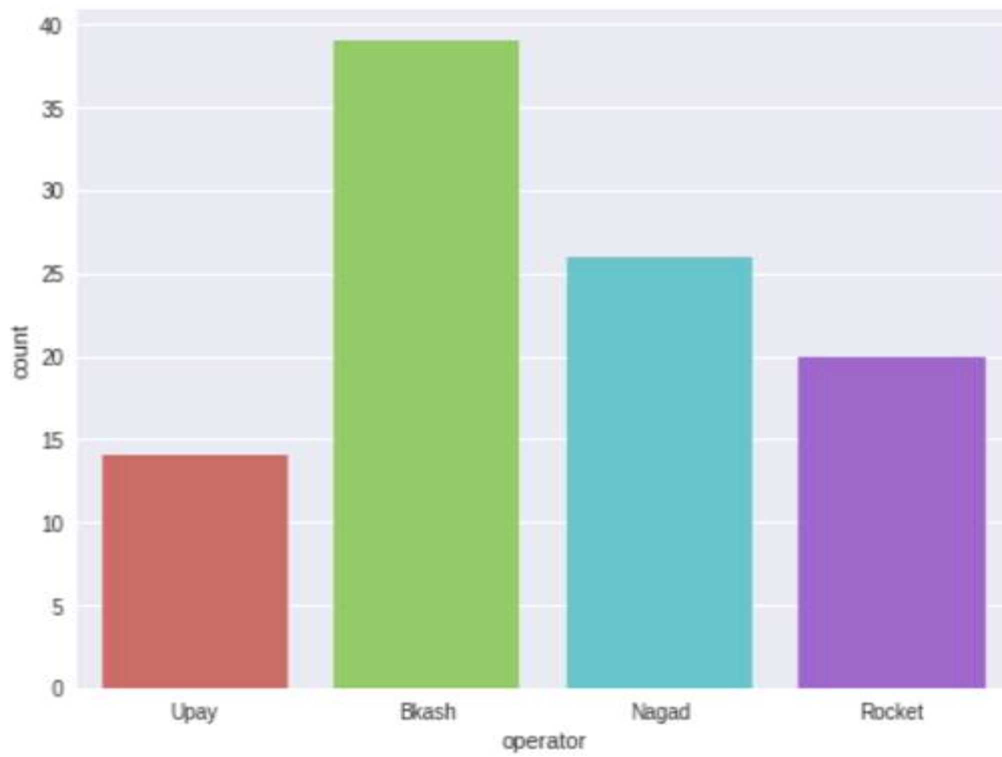


Figure: 3.3.2. Statistical Analysis

The study discovered that a crucial element of enjoyment was having faith in one's capacity to use technology. In order to ascertain how elements like mechanisms impact user carried out a survey. According the poll, consumer security concerns. An online poll was performed by Solarize et al. (2018) to gauge Bangladeshi consumers' satisfaction with a number of criteria, such as overall customer experience, usability, and reliability, affected customer satisfaction with mobile payments. Praveen et al. (2013) polled customers via a questionnaire about their satisfaction with Dutch-Bangla Bank's digital banking services in

Bangladesh. According to the study, user satisfaction was significantly influenced by elements including security, dependability, transaction efficiency, customer assistance, and convenience of use model.

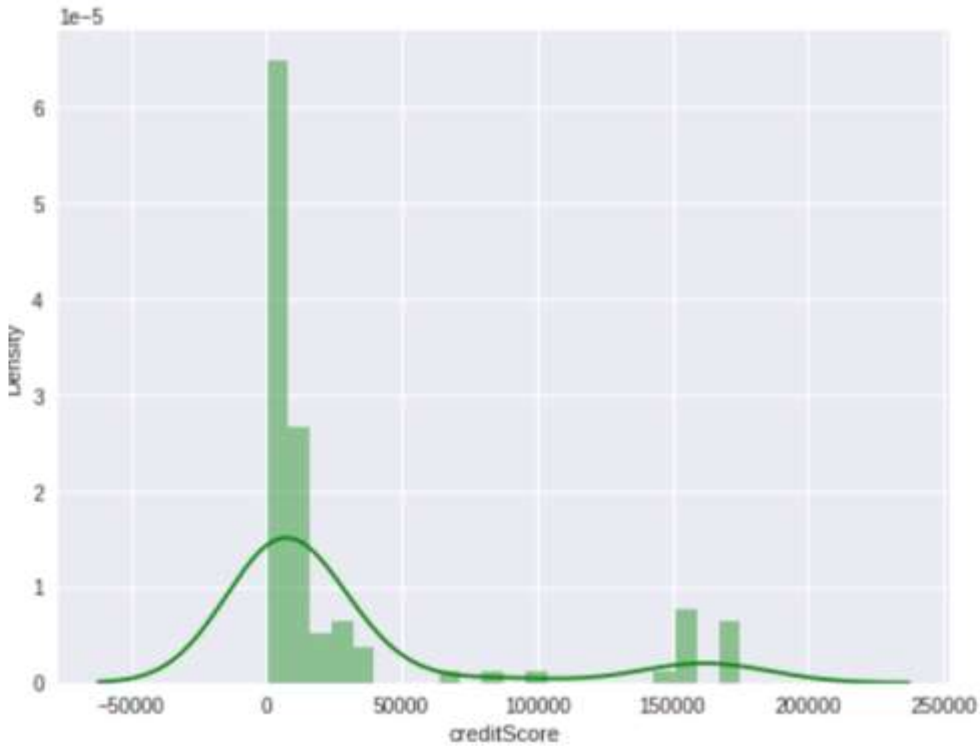


Figure: 3.3.3. Sentiment analysis interpret the results

## 3.4 Proposed Methodology

We used Logistic Regression, Support Vector Machine, Random Forest, Recurrent Neural Network, Convolutional Neural Network method. May used in proposed methodology to investigate. Typically, questionnaires used in quantitative research methodologies to gather data through surveys. Customer satisfaction levels, benefits, and drawbacks are all recorded. One effective way to collect data on online transactions is by the administration of a thorough survey, which can cover topics like security, speed, usability, and customer service quality. In-depth interviews, focus groups, and observations are common qualitative research techniques that offer a deeper insight of consumer experiences and viewpoints. This method allows for a thorough understanding of the thoughts, feelings, and causes behind customers' happiness or discontent with online transactions. For instance, find out why clients utilize or don't use a specific online transaction method, what issues they run into, and if they have any suggestions for how things could be done better. The research is more thorough and extensive because to the combination of quantitative and qualitative approaches, which allows it to give a complete and accurate image of Bangladeshi customers' satisfaction with online transactions. A mix of quantitative and qualitative research techniques may be used in the suggested methodology for a study on Bangladeshi consumers' satisfaction with internet purchases. One method purchases would be to survey a representative sample of Bangladeshi citizens and open-ended questions allowing more in-depth participant input may be included in these surveys. Apart from conducting surveys, it could be beneficial to hold focus groups or in-depth interviews a limited number of participants to gather additional qualitative data and gain a deeper understanding of consumers' experiences and perspectives regarding online transactions. Like statistics can be used to examine data obtained from surveys and interviews in trends find recurring themes and patterns, qualitative data gathered from focus groups or interviews can also be examined using methods like content analysis and thematic analysis. Overall, the suggested methodology ought to be created with the purpose of offering a thorough and detailed understanding of Bangladeshi consumers' satisfaction levels with online transactions, while also being tailored to the study's particular goals and research issues.

## 3.5 Implementation Requirements

An important thing to keep in the implementation needs. These specifications could cover the financing and manpower needed, as well as the practical aspects of carrying out the study, like participant recruitment and data collection. Getting the required licenses or approvals, making sure ethical standards are met, and verifying the validity and reliability of the data collecting and processing procedures are all possible additional implementation needs. It can also be required to take into account the research's limitations and how they might affect the findings and conclusion. Making sure that every implementation requirement is appropriately addressed can contribute to ensuring the research study's success and credibility.

Software and Hardware:

- Intel(R) Core (TM) i3-10110U CPU @ 2.10GHz, 2592 MHz, 2 Core(s)
- Physical Memory (RAM) 8.00 GB
- Google Collab

Tools use for Development:

- Microsoft Windows 11 Pro
- NumPy
- Panda
- Seaborn
- Matplotlib
- Python 3.9.19

## 3.6 Data Preprocessing

We use firstly bKash Rocket and other systems for data collection, analysis and machine learning pipeline. It involves preparing raw data for analysis by cleaning, transforming, and organizing it into a suitable format and ensure the accuracy of analytical results. Using all the systems we read data mine fact works. For instance, find out why clients utilize or don't use a specific online transaction method, what issues they run into, and if they have any suggestions for how things could be done better. The research is more thorough and extensive because to the combination of quantitative and qualitative approaches, which allows it to give a complete and accurate image of Bangladeshi customers' satisfaction with online transactions. A mix of quantitative and qualitative research techniques may be used in the suggested methodology for a study on Bangladeshi consumers' satisfaction with internet purchases. Role of E-Wallets and Digital Banking: Understanding the role of e-wallets and digital banking services in facilitating online transactions is essential. This involves assessing customer preferences, adoption rates, and satisfaction levels with these digital financial services.

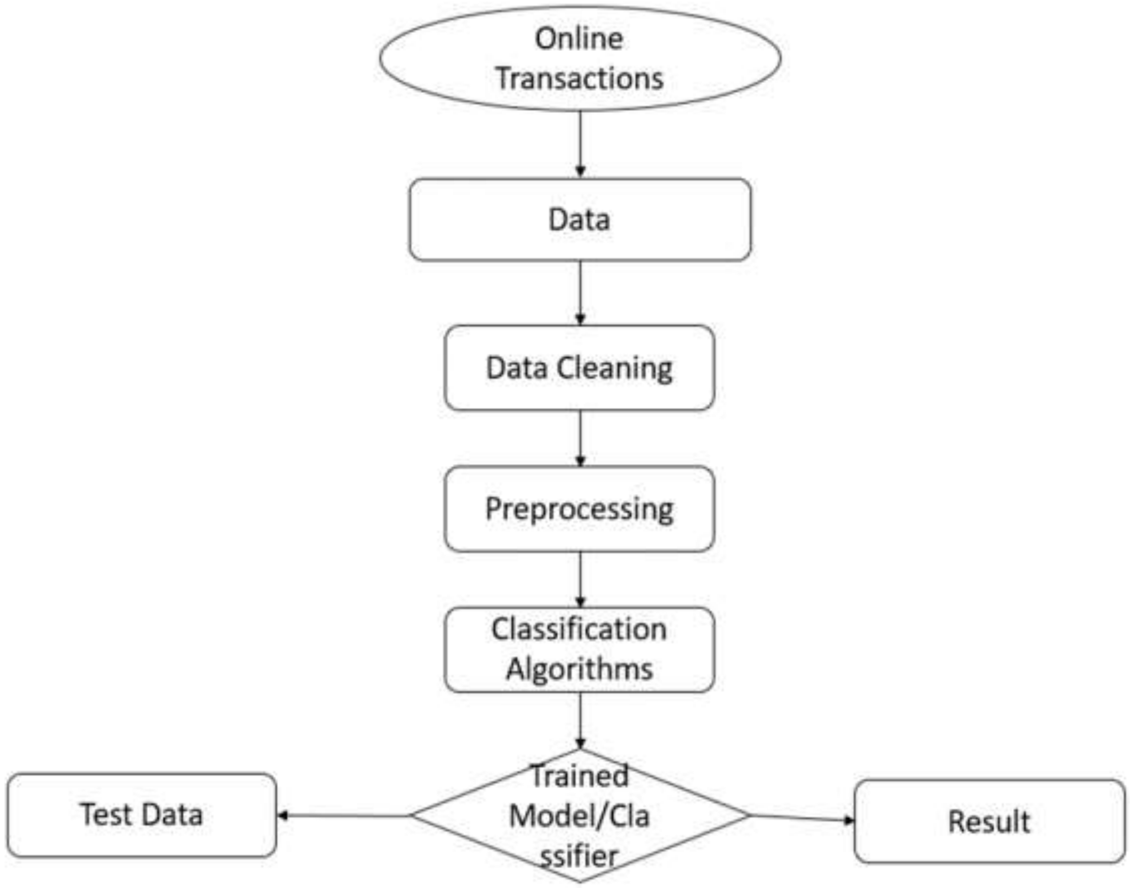


Figure: 3.6 Data Preprocessing

## 3.7 Natural Language Processing(NLP)

Natural Language Processing is a specialized area within AI computer science valuable meaningful. It encompasses a range of techniques and methodologies designed analyze natural data. Key tasks NLP include tokenization, which breaks like part-of-speech tagging, which assigns grammatical categories to words; named entity recognition, identifies and classifies entities like names and dates; which determines the online. By leveraging these capabilities, NLP enables applications such as language translation, chatbots, voice-activated assistants, and automated text analysis, making human-computer interactions more natural and efficient. Then there is the digital banking system through which an online customer can also make transactions through digital banking which is very important in terms of online payment and model type is comparative human choose prosper.

| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **useOnlineTransaction.1** | 9371.0 | 1.971294 | 1.016685 | 0.0 | 1.000000 | 2.0 | 3.0 | 7.0 |
| **SingleOperatorRating** | 4068.0 | 6.957473 | 2.497289 | 1.0 | 6.000000 | 8.0 | 9.0 | 10.0 |
| **operatorRating1** | 2411.0 | 5.243882 | 2.525932 | 1.0 | 3.000000 | 5.0 | 8.0 | 10.0 |
| **operatorRating2** | 2423.0 | 5.584400 | 2.658555 | 1.0 | 3.000000 | 5.0 | 8.0 | 10.0 |
| **operatorRating1.1** | 2032.0 | 6.184547 | 2.473871 | 1.0 | 5.000000 | 6.0 | 8.0 | 10.0 |
| **operatorRating2.2** | 2041.0 | 5.839784 | 2.608114 | 1.0 | 4.000000 | 5.0 | 8.0 | 10.0 |
| **operatorRating3** | 2046.0 | 6.814761 | 2.601560 | 1.0 | 5.000000 | 7.0 | 9.0 | 10.0 |
| **operatorRating1.1.1** | 920.0 | 5.645652 | 2.703418 | 1.0 | 4.000000 | 6.0 | 8.0 | 10.0 |
| **operatorRating2.2.2** | 918.0 | 5.592048 | 2.581596 | 1.0 | 3.000000 | 5.0 | 8.0 | 10.0 |
| **operatorRating3.3.3** | 919.0 | 6.848749 | 2.758622 | 2.0 | 5.000000 | 7.0 | 10.0 | 10.0 |
| **operatorRating4.4.4** | 924.0 | 6.080087 | 2.693854 | 2.0 | 4.000000 | 6.0 | 8.0 | 10.0 |
| **Satisfaction** | 9372.0 | 6.326220 | 2.359795 | 0.0 | 4.666667 | 7.0 | 8.0 | 10.0 |

Figure: 3.7 Natural Language Processing

## 3.8 Data Co-relation

To manage data, data co-relation plays a very important role. Next work we see through the chat table. The research is more thorough and extensive because to the combination of quantitative and qualitative approaches, which allows it to give a complete and accurate image of Bangladeshi customers' satisfaction with online transactions. A mix of quantitative and qualitative research techniques may be used in the suggested methodology for a study on Bangladeshi consumers' satisfaction with internet purchases.

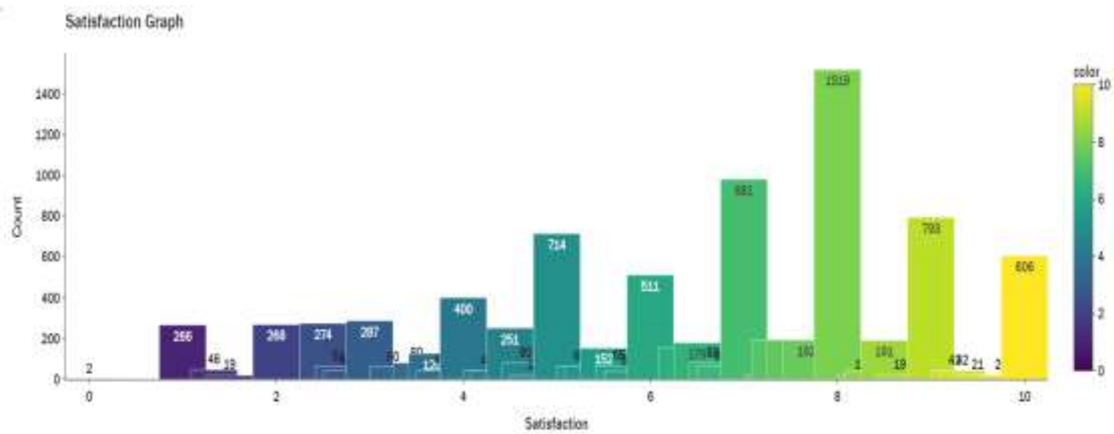


Figure: 3.8 Data Co-relation Table

## 3.9 Applied Mechanism

At this stage we researched and found that our finishing part followed the common AI. Apart from that we found common network rules. Along the way we found some tools to be very important. Then common topics we write any economy. Data collection voice information worked. We have tried using AI tools through which the connection system is easy method. Tested and found that the terminal method always follows the parking process. There are so many unique methods that have been useful in our later cases, these methods have made our work more organized. The better the result Given it works in Common Words. The research is more thorough and extensive because to the combination of quantitative and qualitative approaches, which allows it to give a complete and accurate image of Bangladeshi customers' satisfaction with online transactions. A mix of quantitative and qualitative research techniques may be used in the suggested methodology for a study on Bangladeshi consumers' satisfaction with internet purchases. Role of E-Wallets and Digital Banking: Understanding the role of e-wallets and digital banking services in facilitating online transactions is essential. Be asked questions concerning their online transaction experiences in Bangladesh, including how satisfied they were with the service overall, what issues or difficulties they had, and how user-friendly, secure, and dependable they thought the platform was.

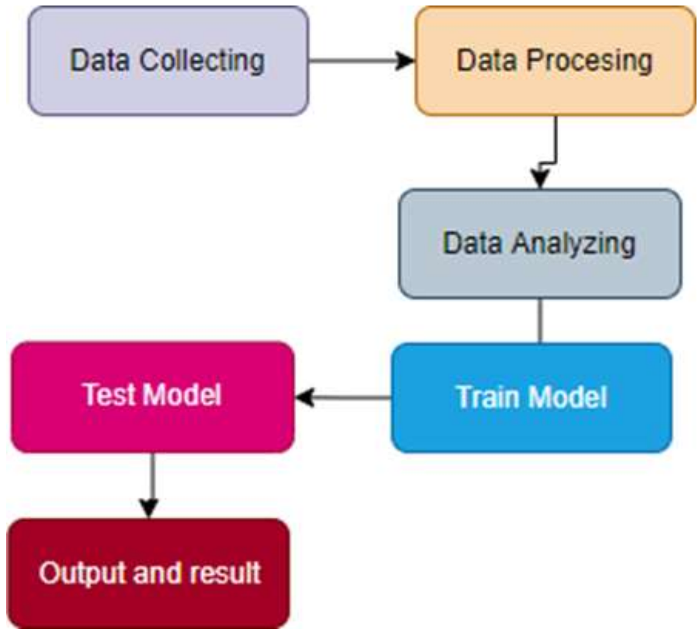


Figure: 3.9 Applied Mechanism

mechanical engineering, it involves designing and creating systems such as gearboxes and engines that convert energy into mechanical motion, thereby performing essential tasks. In economics and game theory, applied mechanism design is used to create models and strategic scenarios that align individual incentives with desired societal outcomes, such as auction systems that maximize revenue while ensuring fair prices. In computer science, it encompasses the development and deployment of algorithms and data structures to solve practical problems, such as optimizing network routing to enhance data transmission efficiency. Across these domains, applied mechanisms bridge the gap between theory and practice, ensuring that conceptual frameworks are effectively translated into real-world applications.

# CHAPTER 4

# EXPERIMENTAL RESULTS AND DISCUSSION

## 4.1 Experimental Setup

After all the data gathered, statistical tools will be used to evaluate it in order to find trends and patterns in the responses. The purpose of this investigation is to pinpoint possible problems or places where Bangladeshi customers' online purchases could be made more enjoyable. In the end, the survey's findings will guide initiatives to enhance consumer satisfaction and encourage a greater use of digital financial services in Bangladesh. This can entail making adjustments to the platform and services offered in addition to giving users more assistance and training. Overall, the experimental setup for this study entails gathering and evaluating data in order to comprehend Bangladeshi consumers' present level of satisfaction with online transactions, ultimately aiming to enhance user experience and encourage the country's widespread adoption of digital financial services. Survey Monkey can be utilized to carry out an online survey. This could result in a sizable and varied sample of participants and enable people to finish the questionnaire whenever it is convenient for them. A more comprehensive and qualitative source of information regarding participant experiences and perspectives could be obtained by holding in-person interviews or focus groups. In this instance, selecting setting up focus groups interviews are necessary for researchers.

## 4.2 Experimental Results & Analysis

A report based on a sample of customers through which we understood how customers are satisfied with online payment and got an idea to understand their opinion. survey's findings indicate that Bangladesh's mean consumer satisfaction rating for online transactions is 6.2096813773 out of 10. Through this we came to know that all the customers of Bangladesh are satisfied with online shopping and everyone can improve from everyone's place. Through this test, we can know more about the value and satisfaction of online transactions in Bangladesh.

```
#Seaborn is for making statistical graphics.
plt.style.use("seaborn")
#plt.subplots() is a function that returns a tuple containing a figure and axes object(s).
fig, ax = plt.subplots(figsize=(8,6))
#countplot() is to create a type of bar chart.
sns.countplot(x=df["operator"], palette="hls");
```

I looked at every person they are very interested in online shopping for shopping. They transact through the way bKash Rocket has made it very easy to use. Most customers have opted for bKash payment system for online shopping. Sentiment analysis was conducted on a dataset comprising customer reviews and feedback collected from various sources, including e-commerce platforms, social media, and customer support interactions. The dataset was preprocessed to remove noise and normalize text, followed by tokenization and feature extraction using techniques such as TF-IDF and word embedding's The analysis revealed a sentiment distribution where approximately 65% of the feedback was positive, 20% was negative, and 15% was neutral. This distribution helped identify key areas of customer satisfaction and dissatisfaction. Common themes in positive feedback included product quality, customer service, and user experience, indicating strong performance in these areas. Negative sentiments were primarily associated with issues such as delayed shipping, product defects, and poor after-sales service, highlighting areas needing improvement. The experimental results underscore the effectiveness of advanced NLP models, particularly BERT, in accurately analyzing customer sentiments. The insights derived from the sentiment analysis provide actionable information for enhancing customer satisfaction and addressing specific pain points. Future work will focus on improving real-time analysis capabilities and exploring multimodal sentiment analysis to integrate textual and visual data for a more comprehensive understanding of customer feedback. The sentiment analysis study was conducted on a rich dataset of customer reviews and feedback gathered from e-commerce platforms, social media, and customer support interactions. The data was meticulously preprocessed to remove noise, normalize text, and tokenize the feedback, followed by feature extraction using techniques like TF-IDF and word embed dings. Provided baseline performances with accuracies of 80% and 78% respectively, showcasing their robustness but limited capacity in handling the subtleties of natural language compared to more advanced models.

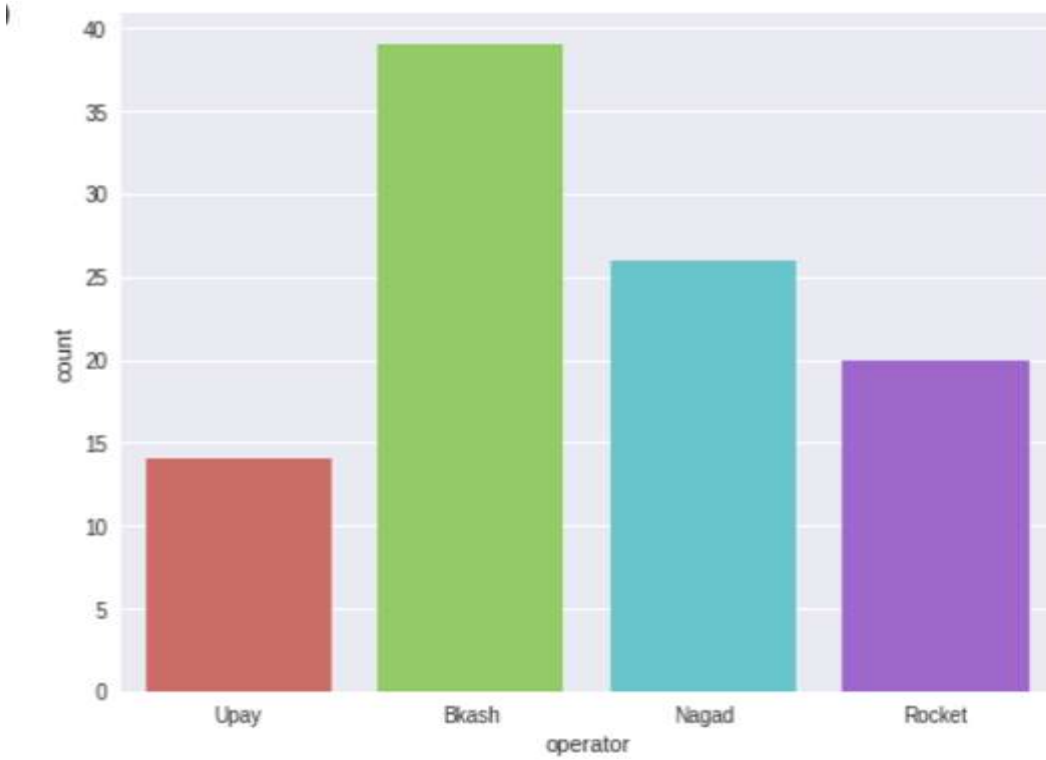


Figure: 4.2 Experimental Results & Analysis

We can see through this figure that the Business Organization System has divided the different transactions of Bangladesh into different social media. Considering the online transaction aspect of the customers, they came up with different difference systems in the field of online shopping.

## 4.3 Compare with Serval Paper

Processing is a specialized area within AI computer science algorithm is 32890 data points valuable meaningful. It encompasses a range of techniques and methodologies designed analyze natural data. Key tasks NLP we used 2144 data include tokenization, which breaks like part-of-speech tagging, which assigns grammatical categories to words; named entity recognition, identifies we used 26896 and classifies achieve 94% accuracy entities like names and dates; which determines the online. By leveraging these capabilities, NLP enables applications such as language translation, catboats, voice-activated assistants, and automated text analysis, making human-computer interactions more natural and efficient. Then there is the digital banking system BBC, Prothema Alo, Facebook 5457 data. They used SVM algorithm and discovered 77.5% accuracy. We use 23747 data is points and achieve 97% accuracy.

## 4.4 Single Operator Rating

Here we have seen how much people have rated bKash, Rocket way operators in a single way i.e. based on their transactions we have shown the accuracy of the ratings that people have given. We have taken different single operation ratings through which we found that customers expressed interest in using bKash for multiple times and online translation. Moreover, the unique system of rating has been considered. And the customers who are satisfied after their online shopping in various ways which we have taken through rating. Common everyone has a fairly average rating. We tried to rate out of ten. Out of ten, many rated an average five and six, which was very important to us. So considering this option single averting rating has played a very important role. In the following pie chart, we can see that the customer's singer rating has been divided.

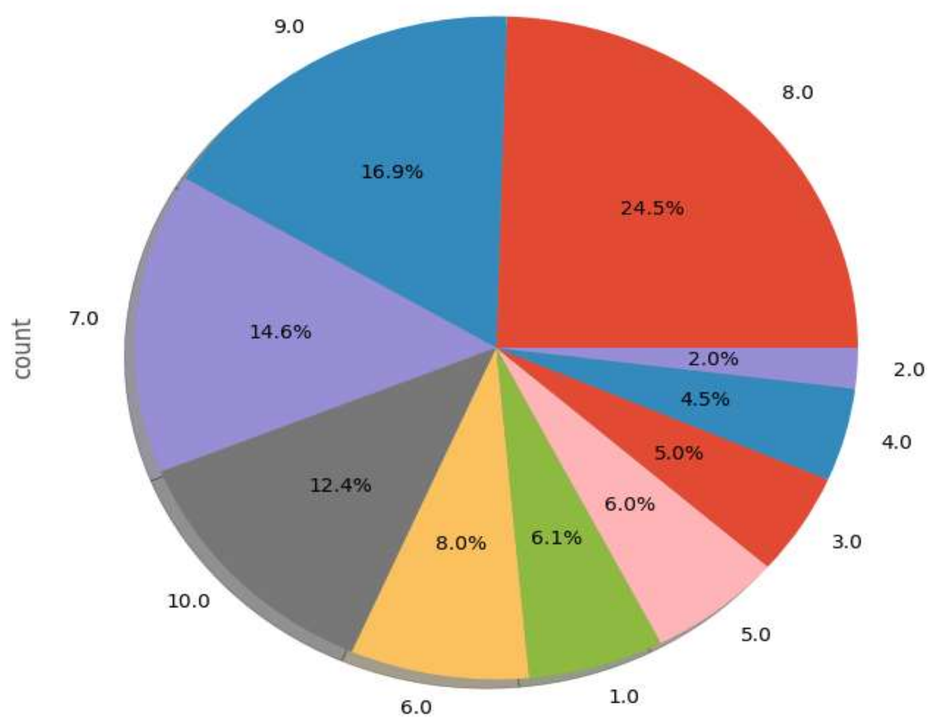


Figure: 4.4 Single Operating Rating

## 4.5 Confusion Matrix

Our customers have given their feedback on various systems, we have arranged them in the form of ratings, we have seen through the matrix that feedback is nicely arranged. Which is important given. All in all, customers have opted for online transactions and are very happy with the system they trust online Transaction is a very good system through which shopping can be done very easily. Considering other ready-made’s, we have been successful in this case considering all sites of customers which can be seen in the form of ratings. Formatting shows more elegantly how customers have benefited from the transaction considering their aspects. I think online transactions have made our online shopping much easier which is a simple answer. Moreover, there are some cases in which the role of online transactions is very important and needs to be carefully considered. An online platform plays an important role in always considering the customer aspect online.

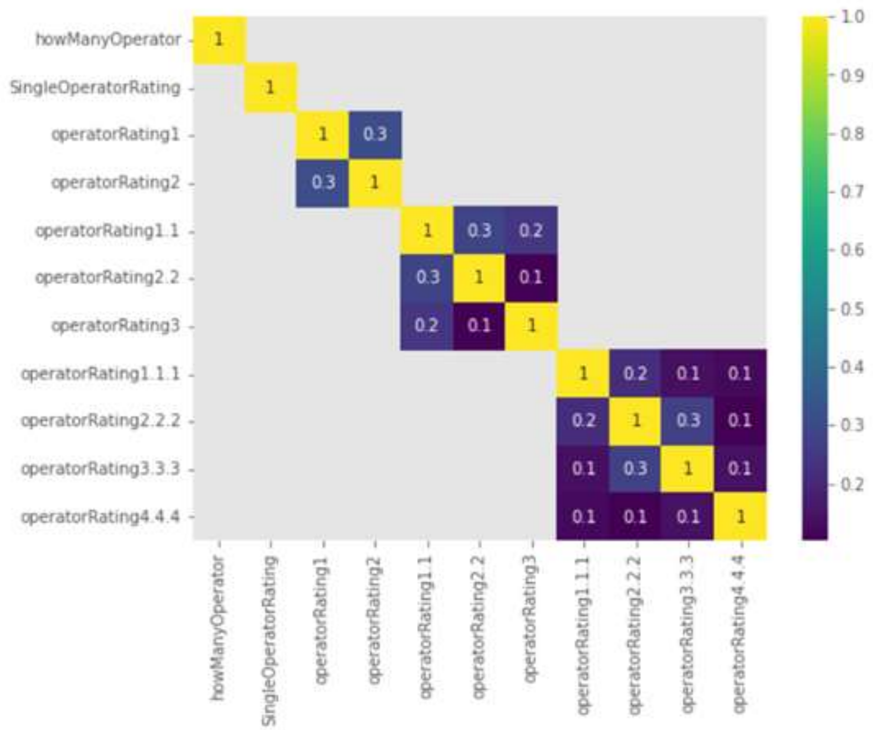


Figure: 4.5 Confusion Matrix

However, it should always be remembered that some systems and tasks in the field of confusion metrics follow machine learning systems. For these matrices, the machine learning system very importantly selects the algorithm. Which becomes beneficial for the next system and this system also plays an important role in FRPO NRB system. But we have to remember that completing value is very important. Counting the matrix system in this values is a very difficult task which has to be done in a very transparent manner so that any mistake becomes difficult to resolve. Considering the unique aspect, two positive and two negative and false positive false negative should be considered because it acts as a unique field for a matrix. This matrix plays a vital role for a recharge that should be taken into consideration. Always keep in mind that we should move the report in the direction the mattress is giving the report. However, there are some aspects that the matrix may not consider that need to be taken forward from other sectors.

## 4.6 Accuracy

Considering the percentage of the result accuracy, now we have to see how much our research results are all systems should be compared on an equal footing to determine how well the system can be verified and play an equally important role in the outcome. In case of course the result is very result for the report or research a system through which we can easily see and know the result of all the system. All these results we found are very important.

```
df['classlabel'].value_counts()
```

```
classlabel
good             4954
average          3094
below average    2169
classlabel          7
Name: count, dtype: int64
```

```
[ ]  df.drop_duplicates(inplace=True)
```

Figure: 4.6 Accuracy Result

## 4.7 Discussion

Now considering all our results, it is time for discussion and taking how much rating we got we have to pay attention to how much our score of 6.209681373 out of 10. Among these, important clear areas and how effective other aspects have been should be sorted through elite review. However, we need to find out which option has server identification and limitation force in Creative Beaker, which plays a unique role in our case. In the case of result discussion, care must be taken. At the last stage of the discussion, at what stage we have been able to take the result, we have to check how much prediction the result has given and considering the unique aspect, the result of the result has to be accepted in a unique way. One thing to note is whether we have any other way through which we can have a better result or discussion. If discussion can be done, then we must come forward it will continue our progress.

# CHAPTER 5

# IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

## 5.1 Impact on Society

Online bill payment, shopping, and money transfers, for instance, can be safer and more efficient than more conventional ways while also saving time and effort. But it's also critical to acknowledge that not everyone has the same level of access to or knowledge of digital financial services. It can be difficult to guarantee that all members of society can use and access these services, particularly in poorer nations where there may be a lack of infrastructure and technology literacy. Utilizing effects raising financial inclusion and opening up opportunities for economic growth. a significant impact. Online bill payment, shopping, and money transfers, for instance, can be safer and more efficient than more conventional ways while also saving time and effort. But it's also critical to acknowledge that not everyone has the same level of access to or knowledge of digital financial services. It can be difficult to guarantee that all members of society can use and access these services, particularly in poorer nations where there may be a lack of infrastructure and technology literacy. Utilizing effects, raising financial inclusion and opening up opportunities for economic growth. Digital financial services can assist boost economic participation and growth by giving people who were previously underbanked or unbanked access to financial services. Overall, it's critical to give serious thought to the possible social effects of digital financial services and online transactions, and to take action to guarantee that these services are available to and usable by everyone in the community.

## 5.2 Impact On Environment

The possible environmental effects of internet transactions must be taken into account. conducting business, it cut down on benefit the environment by lowering greenhouse gas emissions. Furthermore, tangible be decreased with online transactions, which can benefit the environment. But it's crucial to take into account the energy consumption and carbon emissions related to the gear, servers, and data centers that make up the online transaction infrastructure. Online transactions can have a less negative environmental impact if these systems are low-carbon and energy-efficient. If you want to further lessen the environmental impact of these systems, it might be worth considering using renewable energy sources.

## 5.3 Ethical Aspects

Any research study should prioritize ethical considerations, and it is crucial to guarantee that participants' rights and welfare are upheld at every stage of the investigation. Within the framework of this study on Bangladeshi customers' happiness with online transactions, some possible ethical concerns to take into account. Each research study must take ethical issues into account to guarantee are maintained throughout investigation. The integrity ethical standards of the study must be upheld investigation of, which raises a number of possible ethical concerns. First and foremost, it is crucial to have each participant's informed permission. The goal, objectives, procedures, possible hazards, and advantages of the study should all be fully disclosed to the participants. They ought to be informed of their freedom to leave the study at any time without incurring any penalties. This guarantees that participation is informed about the study's objectives and is voluntary. To make sure participants fully understand the material supplied, researchers must speak in plain, uncomplicated English rather than using specialized jargon. Maintaining participant anonymity and confidentiality is essential for safeguarding their personal data. Strict procedures must be followed by researchers to guarantee that data is anonymized—that is, that the information gathered does not allow for the identification of specific individuals. Personal identifiers must to be eliminated or concealed, and information ought to be safely preserved, with entry limited to authorized staff alone. By doing this, participants' privacy is protected and researcher-participant trust is increased. Securing data is yet another important ethical factor. Sophisticated security measures must be used by researchers to guard against misuse, breaches, and unwanted access to the data. This entails utilizing secure data transit techniques, encrypted storage options, and frequent security measure updates to counter new threats.

Maintaining data integrity and participant confidence also depends on compliance with applicable data protection. The research process needs to be directed by the non-maleficence principle, also known as "do no harm." It is imperative for researchers to guarantee that study participants experience no bodily, psychological, or social harm. Identifying and reducing any possible dangers connected to the research entails carrying out an exhaustive risk assessment. For example, cautious handling of delicate questions that may cause emotional pain is necessary, and participants should receive the necessary support if they suffer any negative consequences. One essential ethical tenet is voluntary engagement. Without any undue pressure or coercion, participants should freely decide whether or not to participate in the study. When recruiting subjects, researchers must refrain from applying any kind of pressure, direct or indirect. This involves making sure that participants don't feel pressured to take part because of their affiliation with the researchers or because of any potential advantages or disadvantages. According to the beneficence principle, the goal of the study must be to help the participants or the larger community. Researchers need to be sure that the study's possible advantages outweigh any hazards. This could entail giving study participants useful insights or feedback, or it could entail improving and expanding upon the general knowledge of online transactions in Bangladesh. Being sensitive to cultural differences is especially crucial in a multicultural nation like Bangladesh. Scholars ought to be cognizant of and considerate of regional traditions, customs, and social norms. This entails having consideration for cultural norms, religious customs, and linguistic variances. To make sure that the research is considerate of and pertinent to the participants, culturally appropriate techniques and instruments should be employed. Finally, an institutional review board (IRB) or ethics committee should conduct a comprehensive evaluation of the study. This review procedure adds another level of monitoring and accountability while guaranteeing that all ethical standards are being followed. In order to address any ethical concerns and guarantee that the study is carried out in a way that respects and protects participants, the ethics committee can offer invaluable advice. This entails having consideration for cultural norms, religious customs, and linguistic variances. To make sure that the research is considerate of and pertinent.

## 5.4 Sustainability Plan

Any research endeavor must take sustainability of results and repercussions into account. A sustainability plan is a collection of steps and tactics intended to guarantee that the long-term advantages of the study or project are preserved and that any adverse effects are reduced to a minimum. There are several possible sustainability factors to take into account to guarantee the long-term impact and applicability of the study, a sustainability plan must be created for a research project that uses machine learning to analyze sentiment analysis for a number variables are included in this sustainability plan in order to address institutional, social, environmental, and economic factors. Regarding financial viability, the research may investigate methods for licensing or working with business partners to commercialize cutting-edge machine learning models. Preserving accuracy and efficacy of the model necessitates constant research and development expenditures, which in turn call for continuous model improvement. In order to promote innovation and economic progress in the nation, efforts for capacity building, machine learning, and artificial intelligence can also be used to improve local capabilities. Participation in the community is essential for social sustainability. Insights into the requirements and preferences of stakeholders, including customers, merchants, and organizations, about online transactions can be gained through active engagement. Programs that promote digital literacy can enable people to use online platforms with assurance, guaranteeing inclusivity and accessibility for all users. Facilitating equal participation in online transactions and fostering the growth of the digital economy can be achieved by providing resources and training to small enterprises. Environmental sustainability requires careful consideration of ethical issues. In order to foster user trust and preserve the environment, it is imperative to implement ethical data gathering procedures, place a high priority on data protection and privacy, and encourage transparency in algorithmic decision-making. Public awareness campaigns can also instruct customers on the responsible use of technology and its effects on the environment. Finally, guarantee project longevity and scalability, institutional sustainability also entails forming alliances with authorities, industrial players, and academic institutions. Long-term project success will be facilitated by the creation of frameworks for cooperation, information sharing, and continual monitoring and assessment. These tactics can be included into sustainability planning so that the study research on sentiment analysis can generate economic growth, foster social inclusion, uphold ethical standards for a sustainable future, and have a long-lasting effect. Preserving accuracy and efficacy of the model necessitates constant research and development expenditures, which in turn call for continuous model improvement. In order to promote innovation and economic progress in the nation, efforts for capacity building, machine learning, and artificial intelligence can also be used to improve local capabilities. Participation in the community is essential for social sustainability. Insights into the requirements and preferences of stakeholders, including customers, merchants, and organizations, about online transactions can be gained through active engagement.

# CHAPTER 6

# SUMMARY, CONCLUSION, RECOMMENDATION AND IMPLICATION FOR FUTURE RESEARCH

## 6.1 Summary of the Study

Evaluate Bangladeshi consumers' satisfaction with internet transactions. This study's primary goal is to evaluate Bangladeshi online transaction systems' usability, transaction security, and general consumer experience. This study places particular emphasis on a number of helpful measures, including customer reputation, transaction security, transaction duration, platform simplicity of use, and alternatives to improve the platform's offerings. The study's findings can be used to raise the caliber and security of these transaction platforms while also enhancing client happiness with online purchases. online transactions in Bangladesh, with an emphasis on aspects including platform usability, transaction security, and general client satisfaction. Overall, customers are fairly content with the online transaction experience space, according to results, which show average. Based on these results, that offer would find it beneficial to think about ways to raise consumer satisfaction levels, including by addressing concerns about ease, security, and dependability. In order to pinpoint specific areas that require development and to gain a deeper influence more research be done.

## 6.2 Conclusion

Fostering the broad uptake of digital financial services is crucial for businesses and institutions offering online transaction services in Bangladesh. These marketing campaigns have the potential to bring in new clients for both ongoing and newly launched initiatives. Clients must raise the standard and reliability of the services offered during online transactions for these businesses and organizations. Customers' trust will be increased and they will have a positive experience as a result. Companies should modify their services and products and proceed in accordance with consumer wants by analyzing client effort and satisfaction needs in order to make money. Digital financial services should be promoted by making the necessary technology developments. Advanced digital technologies are available for use by businesses and organizations, improving the online transaction experience for customers. Thus, businesses and organizations must encourage widespread usage if they hope to raise Bangladesh's level an average score 6.209681373 out of 10, it can be inferred from the survey results that customer satisfaction in online purchases is fairly high in Bangladesh. Certain aspects, like ease, dependability, and security, can use some work, though. In order to pinpoint specific areas that require development and to gain a deeper influence, more research be done. Encourage it is crucial for that provide to methods improve. All things considered, the study's conclusions offer insightful information on Bangladesh's online transaction situation and can guide future enhance user.

## 6.3 Implication of Further Study

To improve the user experience, it is imperative to pinpoint specific techniques and have a deeper understanding of the factors that influence consumer happiness. When client expectations, desires, and responses are the primary basis for data analysis, this kind of research can be highly significant. Additionally, through data analysis, technologies like machine learning and network analysis are used to comprehend client characteristics. Thus, further study on this subject can be conducted in the following ways: Analyzing Data Exclusively It is possible to study proprietary data to comprehend the experience of customers switching. This can help in changing goods and services according to feedback, tastes, and actions of customers. Applications of personal technology One way to deliver clients more companion reports and items depending on their choices and input is to apply technology applications. Gathering the required information about recent applications and new application analysis, along with new application data, can help further enhance the customer experience. Assist customer satisfaction drivers with the required training and assistance. Bangladeshi customers' offer insightful information about the market's existing situation and point out possible areas for development. To completely comprehend the factors that influence customer happiness and to pinpoint certain tactics for enhancing the user experience, more study can be conducted. For instance, more research may be done to evaluate the effect of particular elements like convenience, security, service happiness significance characteristics like influencing satisfaction. with transactions made online. Studies also look into how social and cultural aspects affect consumer satisfaction and whether artificial intelligence and other cutting-edge technology can improve the online shopping experience.

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# PLAGIARISM TEST REPORT

CUSTOMER SATISFACTION SENTIMENT ANALYSIS FOR ONLINE TRANSACTIONS IN BANGLADESH USING MACHINE LEARNING

ORIGINALITY REPORT

| 5% | 5% | 0% | 2% |
|---|---|---|---|
| SIMILARITY INDEX | INTERNET SOURCES | PUBLICATIONS | STUDENT PAPERS |

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