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“Prediction of Bangladeshi Consumer's Online Purchasing Intentions During Pandemic and Post Pandemic Using Machine Learning Algorithms”

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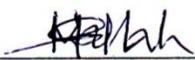
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APPROVAL

This thesis titled “**Prediction of Bangladeshi Consumer's Online Purchasing Intentions During Pandemic and Post Pandemic using machine learning algorithms**”, Submitted by Mahmuda Mahfuz Rimi, ID No: 182-16-331 to the Department of Computing & Information Systems, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computing & Information Systems and approved as to its style and contents. The presentation has been held on 21-11-2022.

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I hereby declare that; this project has been done by me under supervision of, **Mr. Md. Sarwar Hossain Mollah**, Associate Professor and Head, department of Computing and Information System (CIS) of Daffodil International University. I am also declaring that this project or any part of there has never been submitted anywhere else for the award of any educational degree like, B.Sc., M.Sc., Diploma or other qualifications.

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ABSTRACT

Corona virus has a great influence on global marketing along with customer behavior and attitudes. Besides this the corona virus has a major impact on the lifestyle, buying stuff, and patterns of consumption of Bangladeshi customers. Because people are so busy these days, online purchasing is essential in the twenty-first century. In this situation, online purchasing is the most suitable option for people. This paper relies on predicting online shopping intentions of consumers during and after the pandemic. In this case 1000 Bangladeshi people were surveyed using a structured questionnaire as well as a suitable sampling technique. Consumers shop online to save time and access a wider range of products and services, according to the thesis. When it comes to liking and disliking things, both men and women show the similar behavior pattern; People like home delivery & despise not being able to touch as well as feel the item. People gather online shopping news from various online sites, especially social media, and pay for delivery in cash for clothing, foods and accessories. The majority of consumers are concerned with the safety of the payment system, and their level of satisfaction with shopping online is mixed. Another outcome of the thesis is, price of the product, quality of the product, client service, delivery system security, & security of payment system all have a significant effect on consumer purchasing behavior both before and after the pandemic. The research will be helpful to online business owners who would like to better understand the perspectives of their clients in order to improve consumer engagement and stability in the coming marketplace. In the context of the corona virus outbreak in Bangladesh, this can help practitioners develop suitable marketing policy ideas for purchasing online. The purpose of this thesis is to look into attitudes and behaviors of Bangladeshi customers.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The Covid-19 outbreak has an important effect on the world's economy that has been negatively impacted by a number of variables. Bangladesh was hit by the corona virus after than some other regions, despite it was significantly drastic in terms both for financial & health consequences. However, as a result of globalization, developing economies such as Bangladesh, the pandemic has affected them, as well as the global population as a whole. The corona virus outbreak has significantly changed the world. Bangladesh has implemented a number of safety precautions in response to the pandemic, related to those employed by other nations around the globe, like separateness & limitations on movement or shutdowns. Moreover, the nation had been forced to shut down some organizations, especially those presumed "non-essential. "People in our country have been choosing to live a different way, buying separately, & converting their patterns of consumption in a wide range of ways during the corona virus situation. From March to July 2020,' shopping goods and services' business owners lost a significant amount of money in terms of marketing. Most industries' production lines are now being changed. Customers all over the world, including our country, are searching for goods and services from a wide range of viewpoints.

During the COVID-19 pandemic in Bangladesh, in-store consumer buying limitations affected respectively vital & semi brand suppliers, and also consumer buying attitudes. In response to the effects of corona virus on in-store items purchased & buying habits, Bangladeshi consumers have radically changed their lifestyle choices. Most of the Bangladeshi customers were confronted with fresh community & personal circumstances, along with alters in earnings & leisure time, each of which impacted customer behavior & attitudes. Customers are growing worried about their fitness, security, the atmosphere, as well as the cost of their items purchased. Customers are increasingly looking for locally accessible goods & stores in their communities. Following the global epidemic, the massive increase in internet purchases, especially in our country, is expected to persist. Many stores have closed

as a result of the lockdown scenario; customers also insisted home delivery, mobile payments, online counseling sessions, and also the accessible of important products in internet business owners' brands. It's a more recent trend that customers expect to continue.

The online store is among the quickest businesses in the present era, as everyone is currently facing a revolutionary change. In our country also the e-commerce industry is rapidly gaining traction, with online stores & sales increasing by up to 80 % in the corona virus time. The disease was discovered for the first time in China in December 2019, and the World Health Organization has declared Covid-19 a pandemic because of its rapid spread throughout the world. As a result, a no of shutdowns has now been implemented in major cities all over the globe. The 1st corona virus case was found in our country in March 2020, prompting the government to impose a lockdown and movement restrictions. This global epidemic had such a significant effect on customer buying behavior. Each global epidemic has caused massive changes in the economy, social behavior, global policies, and people's mentalities, and Covid-19 has had a major impact on society's citizens and their lifestyles. has caused massive changes in the economy, social behavior, global policies, and human thinking, & the corona virus had a major shock on the citizens of society & their ways of life. Internet purchases are a segment of electronic commerce in which customers can order and buy goods from any online vendor shop on the Internet. This is also known as an e-shop, online store, virtual store, internet shop, web store, and so on. During the covid-19 pandemic, all local shoppers decided to start their businesses online, and online business growth has increased by 70-80%. Online usage increased by 50% during the pandemic. The goal of this research is to know how customers' attitudes & habits changed in our country during the year 2019, in addition to their habits as they began to adopt purchasing habits. This research also attempted to determine the kinds of goods they bought internet & how much change occurred in these kinds of goods choices during the pandemic & post-pandemic online ordering. Finally, this research will attempt to determine the present issue of in-store buying in addition to the advantages of internet purchases during the Covid-19 time, which affected consumers to prefer internet purchases over in-store items purchased.

1.2 Objective

The objectives are as follows:

- To find out customer opinions and intentions regarding internet purchases in our country during the pandemic and post-pandemic on numerous variables in our country.
- To identify suitable products categories for males and females of different ages.
- To identify those variables that has a positive and negative impact on online purchasing.
- To evaluate online shopping satisfaction in our country during the pandemic and according to some parameters, predict consumers' post-pandemic internet purchasing intention.

1.3 Motivation

Consumers seem to be preoccupied & have hectic schedules, so internet purchases are hugely essential in the 21st century. Internet purchasing is the suitable option in this situation. Machine learning is a vast subject area & much of it has yet to be completed. We first learned a lot about online shopping before narrowing down some key topics. Then we read different studies on those subject matters. We looked into the papers' limitations & future scope and found that a few researchers did work on all of those subjects. We discovered that, though many people were trying to work on country-specific internet purchases studies, there had been a very few papers on internet purchases in Bangladesh. Researchers also found that many authors tried to focus on corona virus situation online purchases, there was a very few works on post-pandemic time. That's why; I decided to work on this specific subject.

1.4 Rationale of the study

Only very few earlier works is existing on internet purchases in Bangladesh. Most of the work has concentrated on different country-based internet purchases, with only a tiny quantity of focus on Bangladesh-based internet purchases. Particularly, there is a tiny no. of thesis which is based on machine learning. Researchers will discover consumer perceptions of internet purchases in the aftereffects of the epidemic. In addition, researchers used machine learning classification algorithms to predict whether people would favor the internet or physical shopping following the

pandemic. As a result, we were able to collect 1000 pieces of feedback from Bangladeshi customers.

1.5 Research Questions

Before we began this thesis, authors faced numerous challenges since collecting information from individuals is challenging as well as time-consuming. We also had issues likewise while constructing our framework. But, before starting the research, researchers chose several questions to concentrate on so as to overcome and finish this research.

- How could we find the research dataset?
- Can the accuracy of different algorithms be compared on the same dataset?
- Is it feasible to perfectly pre-process the source data?

1.6 Predicted Outcome

We've previously mentioned that we'll be using machine-learning technique & a variety of different classifiers. For this thesis, we generated one dataset.

- Depending on several variables, determine consumers' after-pandemic internet purchase decisions.
- Created a dataset of online shopping for Customers in Bangladesh
- During pandemic, it shall be capable of determining the factors those are both positively and negatively going to affect online purchases in our country.

1.7 Report Layout

In Chapter 1, Here, we will discuss the introduction, which will include the objective, research questions, research motivation, Rationale of the study & predicted outcomes.

In Chapter 2, In this portion, we will talk about the literature review part as well as an introduction & research challenges.

In Chapter 3, This section will discuss the proposed methodology with an introduction, questionnaire design, data gathering process, system hardware, and software requirements, various classification algorithms explanation & planning.

In Chapter 4, This section will discuss about coding and implementation of this research.

In Chapter 5, In this section we will describe data analysis and interpretation. Moreover, we will explain various pie charts, bar charts, tables and graphs here.

In chapter 6, This section will discuss recommendations, research findings, future work and conclusion.

CHAPTER 2

BACKGROUND STUDY

2.1 Introduction

In this portion, we will talk about the review of literature part as well as an introduction & research challenges.

2.2 Literature Review

The use of e-commerce to buy goods & services straight from the merchant via the Internet is known as online purchasing. More people than ever are turning to the net to purchase anything from residences to footwear to plane tickets. When purchasing items via the internet, humans today have a variety of choices for selecting products & services. Daily savor, interests, & preference transform as a variety of factors, including the Internet. Moreover, this advancement necessarily requires a greater understanding of customer behavior.

Two factors frequently influence consumer perceptions of online shopping: confidence & benefit finding. Consequence, confidence & benefit finding appear to be critical presupposition of online purchasing habits. Additionally, customer satisfaction, privacy or security, payment, consumer time sense & consumer support each have a large and powerful predictability for customer purchase comfort.

As per Shamima and Kasem (2014), Bangladesh has a large number of internet users increasing daily & various businesses have begun to operate online. People now have a variety of options choices for making a choice products & services when purchasing via the internet. (Atikur Rahman & Md. Mahofuzur Rahman, 2020)

Internet purchases have distinct features. According to Huseynov and Yildirim (2014) (Rahman et al., 2018), The most important obstacle to online purchasing is the absence of intercommunication, accompanied by the confidentiality of individual information as well as the privacy of financial transactions over net. Demangeot and Broderick (2010), (Rahman et al., 2018) also discovered that sense of ease of the use has no effect on behavior in this case, which is influenced by privacy and security concerns. Even if a customer spends hours surfing the Internet,

no relationship is formed between the consumer and the online store in the existence of perceived online risk.

Age, monthly income & sexual identity all play a role in online promotion shopping as they instigate customer behavior & perceptions. In China, consumers' internet purchases intentions are influenced by their age, education, income, relationship status, and, most importantly, their usefulness.

PetrovicDejan (2006) In his study on the analysis of consumer online activities, he described one of most appropriate behavioral performances of internet users & discovered the methods people discover, relate, as well as approximate the product's information. When survey results were compared to the current client satisfaction theory, several issues concerning a particular group of customers were recognized. The goal of this report is to translate the above findings into a collection of strategic & technological accomplishment tasks. Implementing the above suggestions will lead to greater consumer adjustments.

As according Shun and Yunjie (2006)'s research (Rahman et al., 2018), products other than books, electronics, software, and entertainment can be sold online. The motivation for such personal belongings is that when buying such items, no individual examination is required because product descriptions & explanations could be attracted for most, if not all, goods. This category includes the majority of the mobile phone family. According to recent customer behavior research, there are four unique client groups, each with their own set of goals and motivations. They also found a consistent and effective collection of videos. When it arrives to commodity internet searching, this cluster's high levels of technical assurance are an encouraging aspect.

In his study, Li, H., Kuo, C., and Russell, M. G. (1999) discovered that customers that one purchase from online store on a regular basis are more concerned with suitability and less worried after some practice. Because they are time-constrained and don't notice buying goods without responsiveness or trying to touch, these purchasers regard applicability as the most significant aspect in purchasing selections.

In recent years, UNCTAD (United Nation Center for Trade and Development) has emphasized the significance of electronic commerce, particularly internet purchases, for developing nations. UNCTAD provides one-of-a-kind programs to help emerging economies enter all areas of electronic commerce. In addition, UNCTAD has developed guidelines and policies for all types of international electronic commerce payouts. As a result, the private industry should be well ready to meet the challenges requirements & anticipations of its clients in addition trying to stand out in competing with domestic and international challenger.

The study's goal, according to Do, T. Nguyen, and C. Nguyen (2019), is to examine the major factors that influence consumers' intentions to buy online. They conducted their research using two methods: "secondary research method" and "quantitative method." Age, income, gender, and other demographic factors can all influence online purchase decision. As a consequence, research cannot represent the whole customers. Researchers should develop a customer, market strategies and improve the quality of product. The thesis can aid seller and companies in developing durable interactions with their clients.

2.3 Challenges

While conducting our research, we met a number of challenges. At first, researchers had trouble generating this dataset because it was difficult to collect data from the customers. Researchers attempted it and gathered 1000 customer data. Cleaning dataset became the most complex task. But we learned a lot and had a good time doing it.

CHAPTER 3

PROPOSED METHODOLOGY

3.1 Introduction

Researchers will discuss their suggested methodology, data collection method, design of a questionnaire, preparation sections, and requirements of the system in the section.

3.2 System methodology

Rather than simply having excellent products, the long-term viability of a sale is extremely reliant on customer habits as well as preferences. Under the current COVID-19 pandemic situation, every day, customer attitude changes. Predicting customer buying habits may thus be crucial for the future marketing plan. This research is quantitative research. To predict consumer behavior, two approaches are used in this paper: the first one is statistical approach and the second one is machine learning technique or approach. (Safara, 2022). The statistical approach computes & figures out the relationship among different features. In the machine learning technique, a predictive model is proposed to predict customer attitude when shopping online. The following describes the research method for this document.

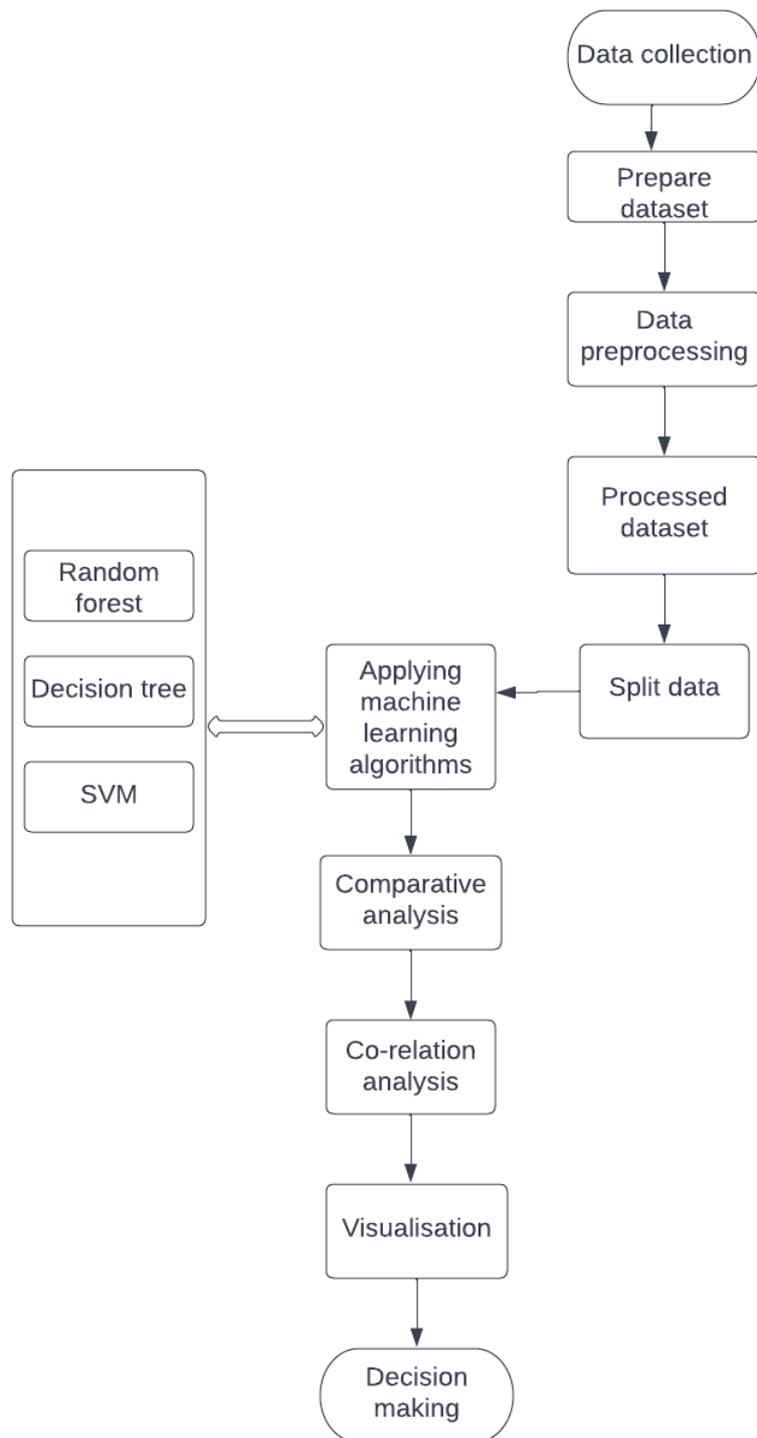


Fig 3.1: The steps of our proposed technique

Initially, the data was collected. We talked about how we were going to collect data. A Google form was used to collect data. The primary dataset was then prepared in Microsoft Excel. Several categorical value, missing values, text value, and numerical value were discovered after data collection. Then we made the decision to prepare

the data beforehand so that algorithms could use it. Processing of data is the capability of converting data into a usable format. To facilitate the outcome, the information is processed in a particular layout. Data should be preprocessed to reduce implementation time and improve results. For this purpose, we normalized the data so that the attributes are as follows..The general formula is as follows:

$$X_n = (X - X_{\text{minimum}}) / (X_{\text{maximum}} - X_{\text{minimum}})$$

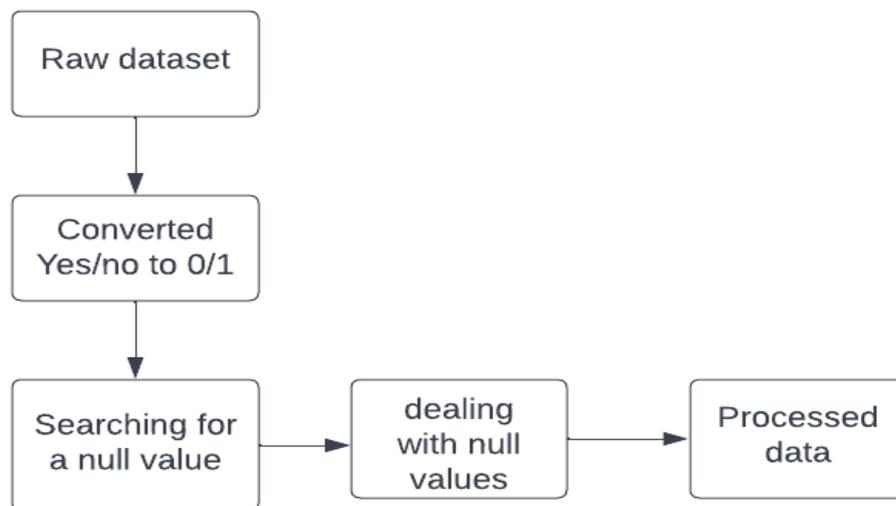


Fig 3.2: Procedure for preparing data

We gathered unripe datasets. Yes/no answers were therefore transformed to 0 and 1 respectively. Then we started to look for a value of 0. We dealt with it when we discovered a null value. Then we received processed data. The dataset was then divided into training and testing data, and algorithms of machine learning were used. We applied: Random Forest (RT), Support vector machine (SVM) and Decision Tree.

3.3 Correlation Analysis

After normalizing the data, we calculated the correlation between the features to find its feature that has the greatest significant relation with the impactful feature. There are two choices for the Impactful feature: yes or no. Here, yes means corona virus had an effect on the purchasing habits of customers. On the other hand, no means corona virus had no effect on the purchasing habits of customers.

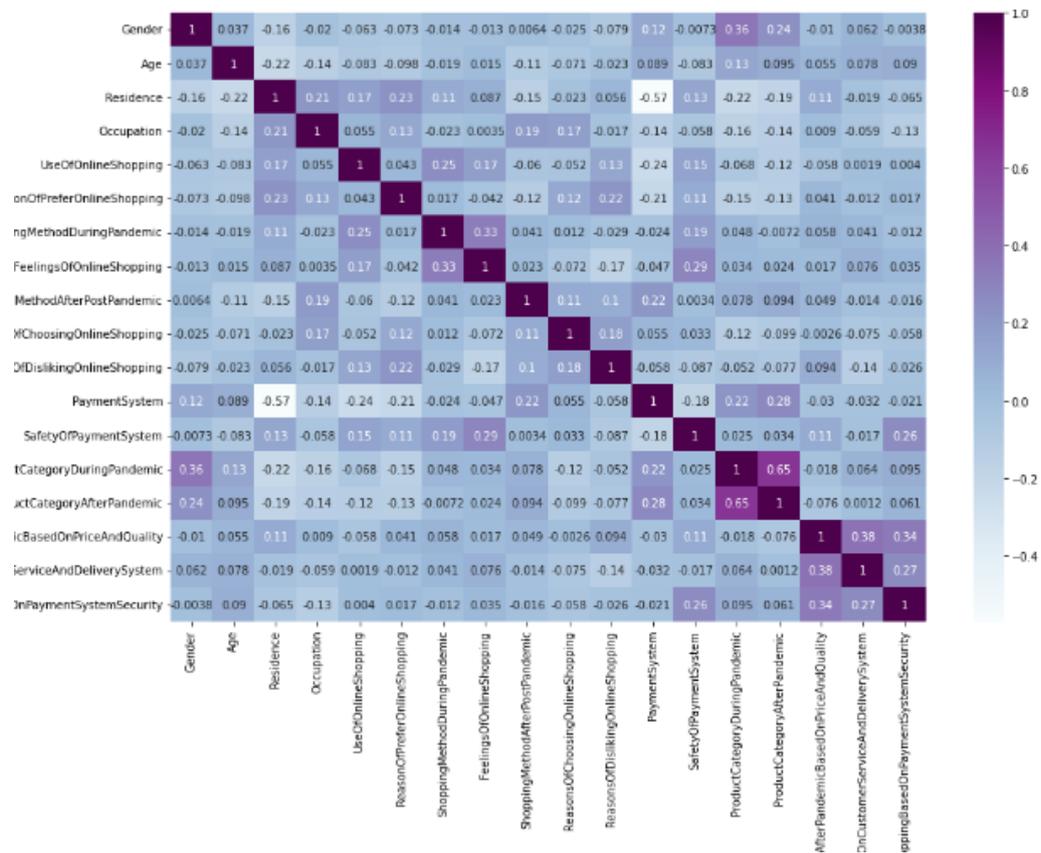


Fig 3.3: Heat map of the dataset

3.4 Random Forest (RF) classifier

Random forest is a famous classification algorithm and its nature is supervised. When compared to other classifiers, this classification algorithm has a low error rate. A random forest generates a large number of de-correlated trees for prediction. It reduces tree correlation by incorporating randomization into the tree-growing process. The randomization method is split-variable. In this algorithm, every tree divide has a minimum feature state space. This algorithm has the benefit of being applicable to both problems of regression and classification.

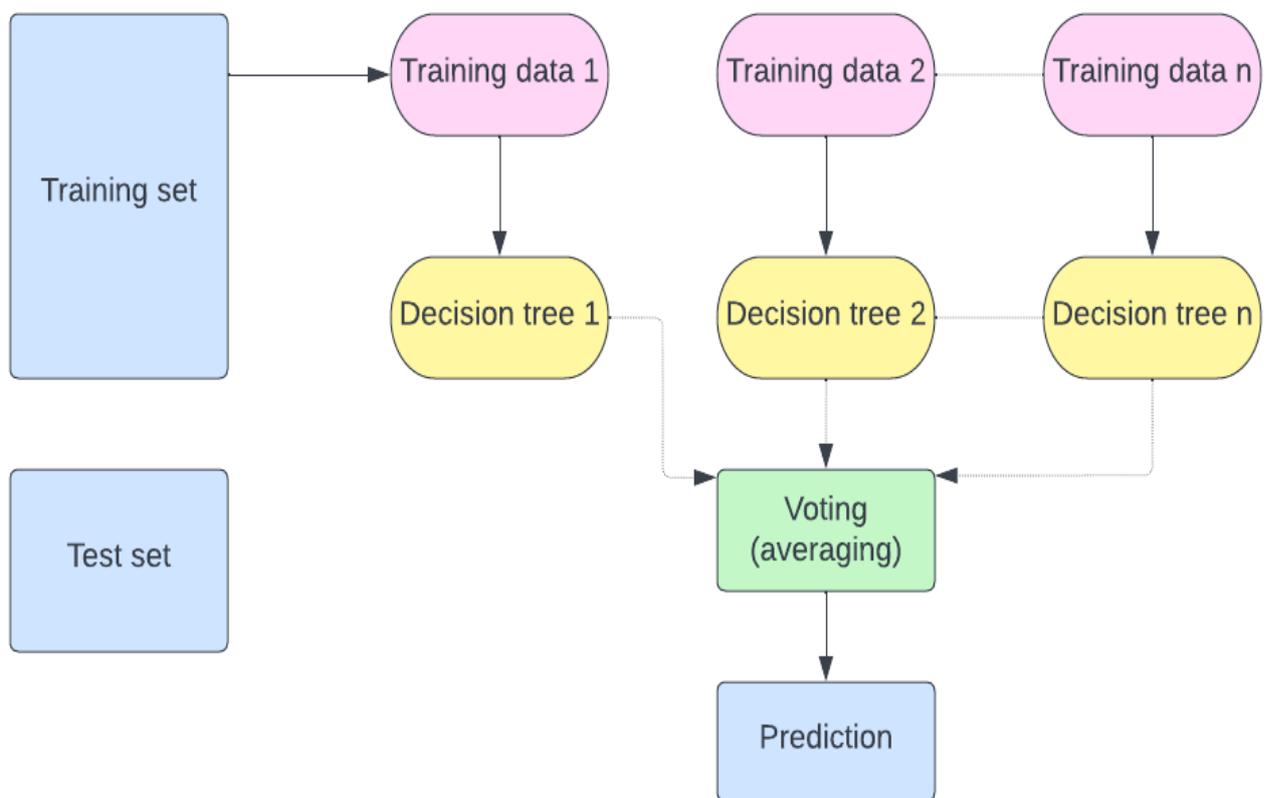


Fig 3.4: Random Forest (RF) Classifier

3.5 Decision tree (DT)

Decision tree is a classification algorithm and its nature is supervised. It is not only applicable for regression problems but also applicable for classification problems. The model is structured on trees. It divides the features into smaller portions with similar response values using splitting criteria. The tree diagram is built using the divide-and-conquer strategy. Decision trees require very little pre-processing. This model can control category features with no help.

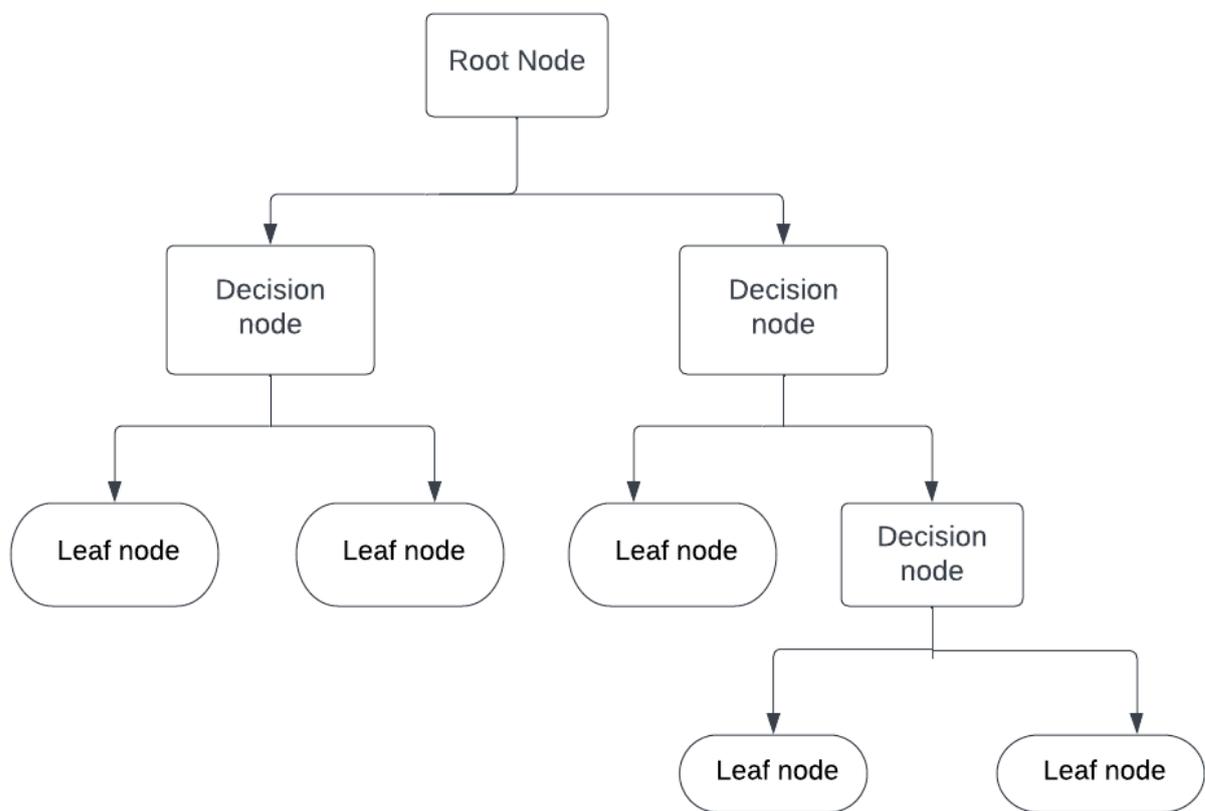


Fig 3.5: Decision Tree (DT) Classifier

3.6 Support vector machine (SVM)

Support vector machine is a supervised machine learning approach. This algorithm is used to resolve classification problems. The values of the features are presented in the specified coordinate after the data has been arranged in n-dimensional area. The word "hyper plane" refers to how it offers its most consistent points for each portion.

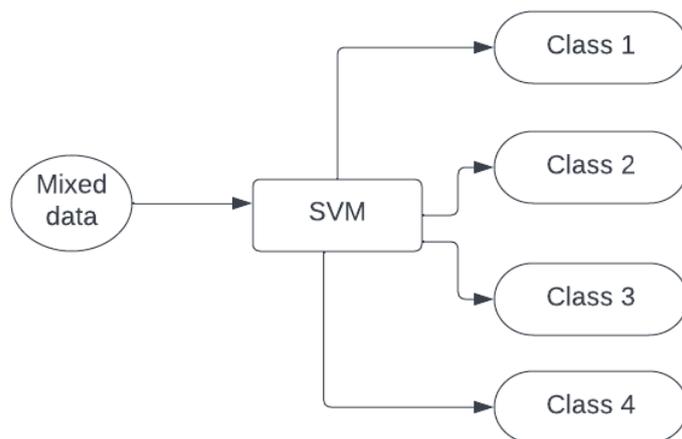


Fig 3.6: Support vector machine classifier

In this research, we used 3 classification algorithms: support vector machine, random forest & decision tree. Among the 3 classifiers, the decision tree had the maximum accuracy, while support vector machine had the minimum.

3.7 Questionnaire Design

The questionnaire was divided into two parts: first one is respondents' demographic details like gender, monthly income, profession & age. In 2nd part, a very few variables chose for testing the effect on customer's behaviors and attitudes toward internet purchases during pandemic time. Previous papers used similar data gathering technique. So, we did it. The items in a self-administered online questionnaire were graded on a five score Likert scale, with (one) 1 indicating low grade (Highly Dissatisfied) and (five) 5 indicating high grade (Highly Satisfied).

3.8 Data Collection Method

To look into customer motivations and attitudes toward internet shopping, researcher chose survey research. The investigation begins with the identification of various variables related to the formation of consumer attitudes. In this research primary data is used. The primary data for this study came from a survey conducted in Bangladesh with a sample size of 1000 people. Primary data was gathered using a questionnaire. After collecting and creating the dataset, we cleaned it using various techniques. To develop the model, divide the dataset into training and testing sections.

3.9 System Requirements

We conducted our research and analyzed the results using specialized software, tools, and hardware. So, the following are the important items we used during our thesis.

Hardware components:

- Ram (Minimum 8 GB)
- Hard Disk (Minimum 500GB)
- Operating System (Windows 10)

Tools Requirements:

- Google Colab
- Microsoft Excel for creating dataset
- Python Libraries: Numpy, seaborn, Pandas and Matplotlib
- Python programming language

CHAPTER 4

Coding and Implementation

4.1 Library Function of python

Python library functions like seaborn, pandas, and numPy were used in this research. I imported python library function and classifiers that I planned to use in this project. I used sklearn to import both the decision tree classifier and the random forest classifier.

```
import numpy as np
import matplotlib
import matplotlib.pyplot as plt
import seaborn as sns
import pandas as pd
%matplotlib inline
```

Fig 4.1: Python's Library Function

4.2 Reading Dataset from the CSV file

A CSV file was used to read the dataset.

```
ds = pd.read_csv('Solution331.csv')
```

```
ds.shape
```

```
(1000, 20)
```

```
ds.head()
```

Fig 4.2: CSV File reading from the dataset

4.3 Examining missing values

I examined the data to see if there were any null values or not.

```
✓ [43] ds.isnull().values.any()  
True
```

Fig 4.3: Checking for Missing or Null Values

We see that there were no missing or null values here. Our dataset is now ready to be preprocessed.

4.4 Maintaining null values

```
from pandas.core import missing  
if missing:  
    missing = ds.SafetyOfPaymentSystem.mean()  
    ds.SafetyOfPaymentSystem = ds.SafetyOfPaymentSystem.fillna(missing)
```

Fig 4.4: Maintaining null values

4.5 Modeling

We divided our dataset into two parts: train data set & test data set.

```
xtrain,xtest,ytrain,ytest = train_test_split(x,y,test_size = .20,random_state =1)
```

Fig 4.5: Dataset Splitting

3 distinct models have been used. Such as-(DT) Decision tree classifier, (RF) Random Forest classifier, and (SVM) support vector machine classifier. Later, we used three algorithms to forecast customer purchasing decisions during and after the pandemic, and we calculated their accurate results.

4.6 Using Classification Model

4.6.1 Implementation of Random Forest (RF) algorithm

```
from sklearn.ensemble import RandomForestClassifier

Rclf = RandomForestClassifier()

Rclf.fit(xtrain,ytrain)
```

Fig 4.6: Random Forest algorithm code

4.6.2 Implementation of Decision Tree (DT) algorithm

```
from sklearn.tree import DecisionTreeClassifier

Clf = DecisionTreeClassifier ()

Clf.fit(xtrain,ytrain)
```

Fig 4.7: Decision Tree algorithm code

4.7 Discussion and Performance

4.7.1 The Random Forest algorithm accuracy result

```
Rclf.fit(xtrain,ytrain)

RandomForestClassifier()

Rclf.score(xtest,ytest)

0.7682926829268293
```

Fig 4.8: The Random Forest algorithm accuracy result

4.7.2 The Decision tree algorithm accuracy result

```
from sklearn.tree import DecisionTreeClassifier

Clf = DecisionTreeClassifier ()

Clf.fit(xtrain,ytrain)

DecisionTreeClassifier()

Clf.score(xtrain,ytrain)

0.9969325153374233
```

Fig 4.9: The Decision tree algorithm accuracy result

4.7.3 The Support vector machine algorithm accuracy result

```
from sklearn.model_selection import train_test_split
from sklearn.svm import SVM

xtrain,xtest,ytrain,ytest = train_test_split(x,y,test_size = .20,random_state =1)

xtrain

model = SVM(gamma='auto')

model.fit(xtrain,ytrain)

model.score(xtest,ytest)

0.7317073170731707
```

Fig 4.10: The Support vector machine algorithm accuracy result

We obtained an accuracy of 0.99 for the decision tree algorithm. The accuracy score for the support vector machine is .73 and the random forest is 0.76.

However, the accuracy score is not a good indicator of performance. So, after calculating the accuracy score, we double-check the outcome using precision and recall. Precision and recall are defined as follows:

Precision: Precision is the ratio of positive data correctly predicted by the classifier to the total number of positive data predicted.

Precision is expressed mathematically as,

$$\text{Precision} = \text{True Positive} / \text{True Positive} + \text{False Positive}$$

Recall: The ratio of the total number of true positives to the actual number of positive data. The mathematical definition of recall is,

$$\text{Recall} = \text{True Positive} / \text{True Positive} + \text{False Negative}$$

4.8 Comparison of the Classifiers

| CLASSIFIER | ACCURACY | PRECISION | RECALL |
|------------------------|----------|-----------|--------|
| DECISION TREE | 0.99 | 0.99 | 1.00 |
| RANDOM FOREST | 0.76 | 0.75 | 0.77 |
| SUPPORT VECTOR MACHINE | 0.73 | 0.73 | 0.73 |

After implementing the classifier and comparing its performance, we can see that the DECISION TREE classifier outperformed the other classifier with an accuracy of 0.99, precision of 0.99, and recall of 1.00.

CHAPTER 5

5.1 Data Analysis and Interpretation

All actions, along with all organizational processes, have been relocated to the internet since people have been restricted to their homes. Different internet service provider firms in Bangladesh have only mainly provided millions of city & village humans in the past few days by supplying life-saving treatment & hygiene goods that have been needed badly. Most customers are pleased to receive online service solutions during this Covid-19 situation. Quantitative analysis of data are used to demonstrate the method for collecting data. Corona virus situation, the following are the stages of ideas of different types of individuals about internet purchases:

5.2 Demographic Profile of Respondents

5.2.1 Gender

| Gender | Frequency | Percentage |
|--------------|-----------|------------|
| Female | 458 | 45.8% |
| Male | 541 | 54.2% |
| Total gender | 999 | 100 % |

Table 5.1: Respondents Gender Wise Distribution

Here we can see that, most of the respondents are men, with the remainder being female, according to the segment of the population's sexual identity profile results.

5.2.2 Age

| Age | Frequency | Percentage |
|--------------------|-----------|------------|
| Below 20 years | 158 | 15.8 % |
| 20-25 years | 288 | 28.8% |
| 26-30 years | 229 | 22.9% |
| 31-35 years | 158 | 15.8% |
| 36 years and above | 166 | 16.6% |
| Total | 999 | 100% |

Table 5.2: Respondents' Age Wise Distribution

According to table 2, the majority of respondents were between the ages of 20 - 25. It was discovered that 15.8% of the total respondents were under the age of 20, 22.9% were between the ages of 26 and 30, 15.8% were between the ages of 31 and 35, and 16.6% were over the age of 36.

5.2.3 Residence

| Residence | Frequency | Percentage |
|-----------|-----------|------------|
| Urban | 677 | 67.8% |
| Rural | 322 | 32.2% |
| Total | 999 | 100% |

Table 5.3: Respondents' residence Wise Distribution

From the table we can see that, the majority of respondents (nearly 67.8% of the total respondents) live in urban areas, while 32.2% live in villages.

5.2.4 Occupation

| Occupation | Frequency | Percentage |
|-------------|-----------|------------|
| Student | 383 | 38.3% |
| Businessman | 243 | 24.3% |
| Housewife | 141 | 14.1% |
| Service | 232 | 23.2% |
| Total | 999 | 100% |

Table 5.4: Occupations Wise Distribution of respondents'

In terms of profession, 38.3% of respondents 'were students, 24.3% of respondents were businessmen, 14.1% respondents were housewives, and the rest were doing other services.

5.2.5 Monthly income

The chart shows the various earnings of respondents. These are segmented into 4 categories.

| Monthly Income | Frequency | Percentage |
|----------------|-----------|------------|
| 0-10000 | 456 | 45.6% |
| 10001-20000 | 217 | 21.7% |
| 20001-30000 | 171 | 17.1% |
| Above 30000 | 155 | 15.5% |
| Total | 999 | 100% |

Table 5.5: Respondent's income levels

Table 5 shows 45.6% of respondents per month income falls into 0–10000-taka category, 21.7% fall into the taka. 10001-20000 category, 17.1% fall into the 20001–30000-takacategory and 15.5% respondents per month income is above 30000

Onlineshopping participation

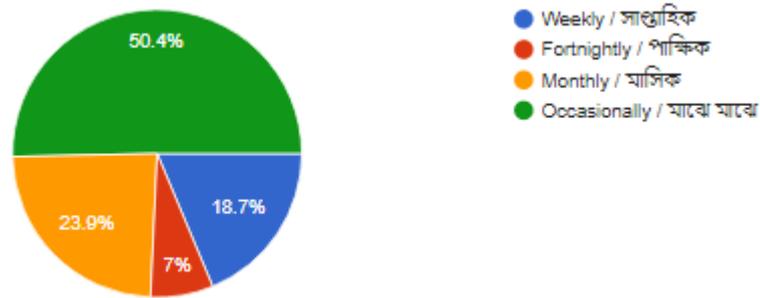


Fig 5.1: Online shopping participation

50.4% of respondents shop on the internet occasionally, 23.9% of respondents shop one time a month, 7% of respondents shop online fortnightly, and 18.7% of respondents' do shop online weekly.

5.2.6 Reasons why people prefer to shop online

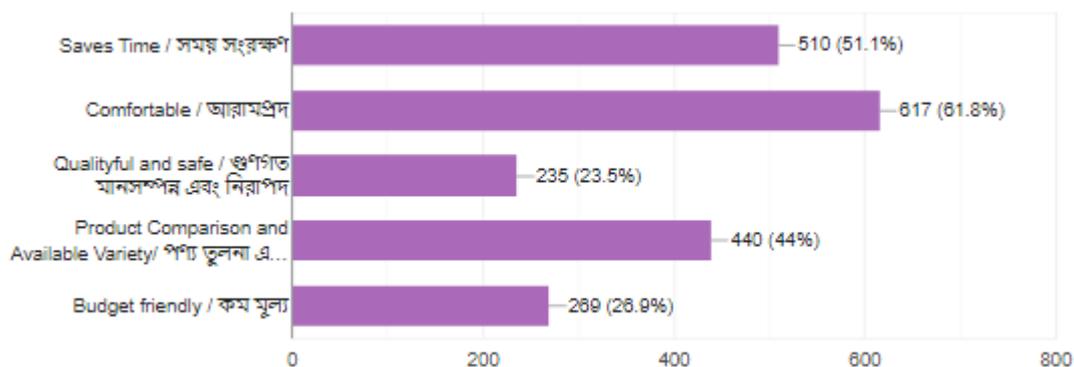


Fig 5.2: Reasons why people prefer to shop online

We found that 51.1% of respondents preferred internet shopping for time saving, 61.8% preferred online shopping for a comfortable, 23.5% respondents preferred online shopping for quality full products and safety purpose, 44% prefer for easy product comparison, and 26.9% respondents' preferred internet shopping for another reasons.

The main benefits of shopping online are less time-consuming, convenience, as well as the wide variety of goods available. Three of these reasons encourage internet shopping and online purchasing. Companies must develop strategies and products to attract and retain online customers.

5.2.7 During a pandemic, research participants' convenient shopping processes

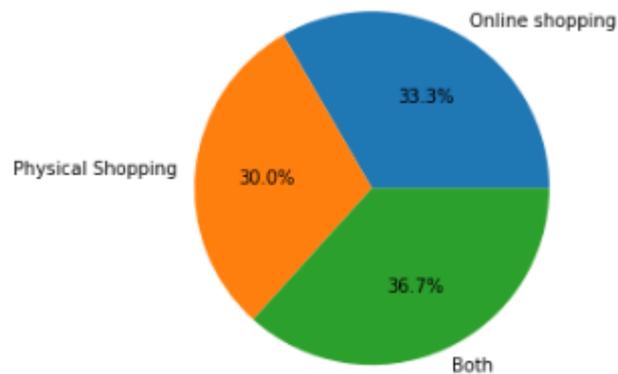


Fig 5.3: During a pandemic, research participants' convenient shopping processes

Researchers discovered that almost 33.3% of survey participants trust internet purchases, approximately 30.0% trust offline stores, as well as 36.7%, intend to do both.

5.2.8 Comfort with online purchases

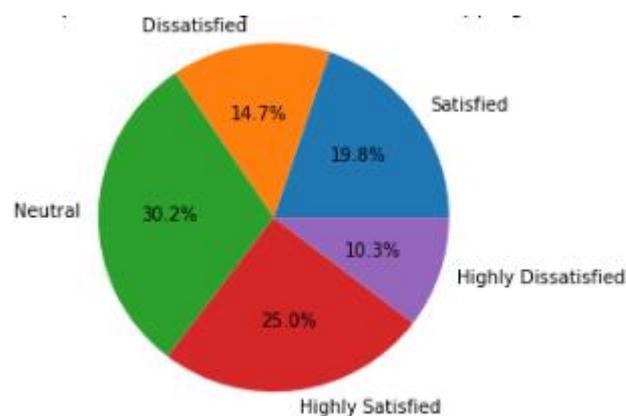


Fig 5.4: Comfort with online purchases

Figure 4 shows, 19.8% of shoppers are gratified, whereas 14.7% are disappointed. 30.2% of respondents are neither gratified nor disappointed. Buyers are completely happy in 25.0% of cases, while 10.3% seem to be extremely unhappy.

Customer happiness is essential in online shopping. Consumers who seem to be pleased with their shopping are much more likely to buy products again. According to the pie chart, the greater number of people who responded are satisfied with their on-line purchase's participation. Businesses should take action to transfer disappointed & unbiased shoppers into pleased as well as happy consumers, inspiring people to buy online on a regular basis. This can be achieved by improving information reliability, purchasing customer support, and after-sales support.

5.2.9 Customers liked shopping modes after the pandemic situation

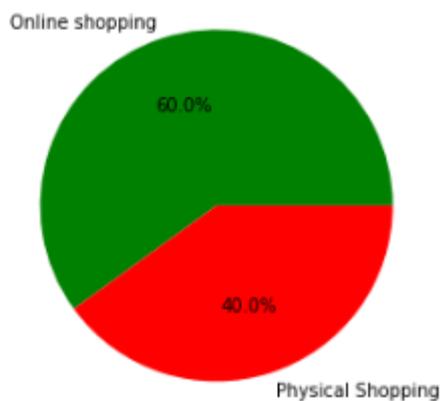


Fig 5.5: Customers liked shopping modes after the pandemic situation

From this chart, we see that approximately 60.0% of users will choose to shop online in post pandemic situation. In post-pandemic incidents, 40.0% of people will prefer to shop physically.

5.2.10 Reasons why people choose on-line purchases

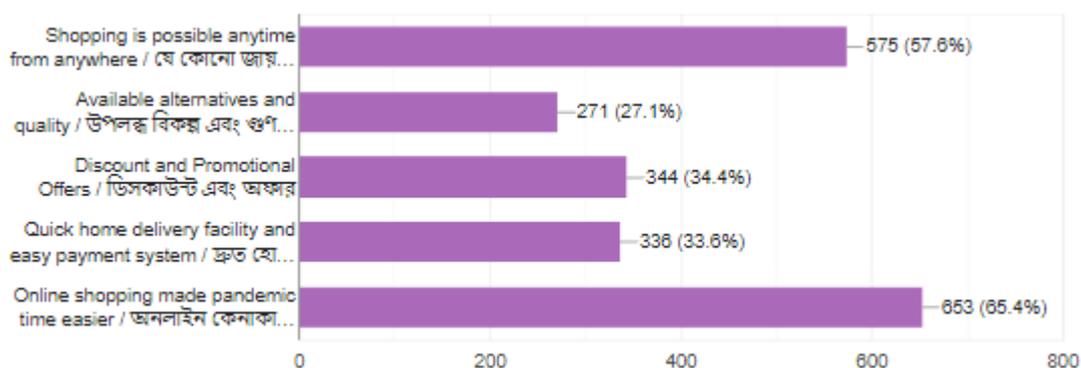


Fig 5.6: Reasons why people choose on-line purchases

According to the figure, 57.6% humans prefer on-line purchases because it allows them to shop whenever and from wherever they want, 27.1% or 271 people prefer on-line purchases as the available options & element of purchasing, 34.4% human prefer on-line purchases for discounts & promoting, and 33.6% human prefer on-line purchases as the super-fast dwelling delivery service as well as easy transaction system. Also, 65.4%, human, like on-line purchases to build Covid-19 time smooth.

5.2.11 Reasons why people dislike on-line purchases

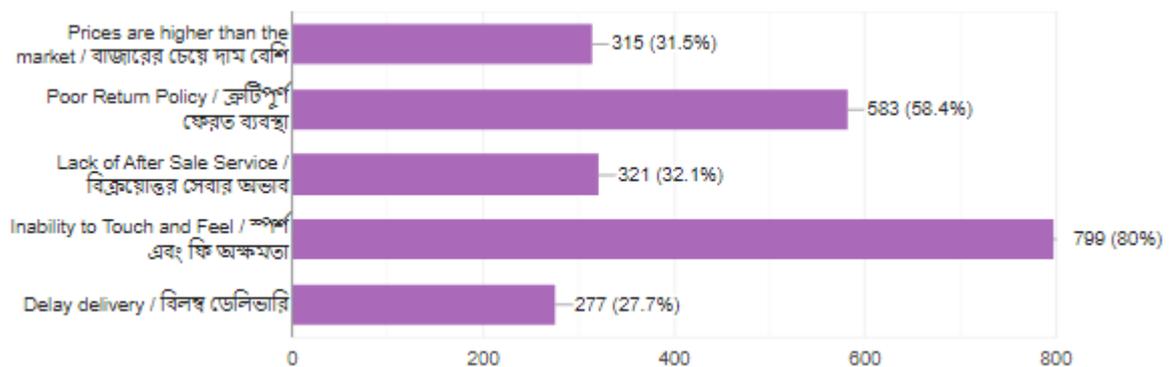


Fig 5.7: Reasons why people dislike on-line purchases

We asked participants what they disliked about online shopping. According to the graph, 31.5% (315 respondents) dislike online shopping because the prices are higher than in the market. The poor return policy is disliked by 58.4% of respondents (583). The lack of after-sales service is disliked by 32.1% of respondents (321). 80% of respondents (799) dissatisfaction not being able to personally experience or test the facts of on-line purchases. For delayed delivery, 27.7% human dislike on-line purchases.

The inability to touch and feel the product is the primary disliking factor about online shopping, or the primary barrier to online shopping, as confirmed by Chen and Barnes' study (Mohammad Anisur Rahman, 2018) Heijden et al (CH Park, 2003). The rising cost of the goods another major issue that consumers dislike. To encourage online shopping, internet shoppers might also develop more effective terms and condition, the fastest delivery system, and after-sale services, as well as charge a reasonable price.

5.2.12 Payment options for online shopping

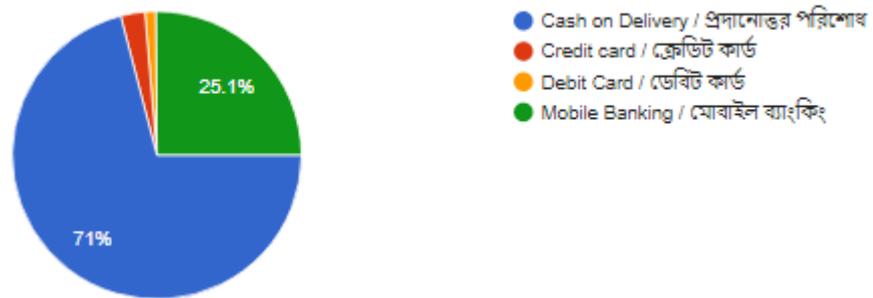


Fig 5.8: Payment options for online shopping

This pie chart shows that customers have a variety of payment options, which is an important consideration when making an online purchase. The majority of respondents (71%) do cash-on-delivery transactions, while 25.1% use mobile banking to pay their payments. In addition, 2.7% of respondents use a credit card facility. Debit cards are used by 1.2% of respondents to pay their payments. The maximum of consumers chooses to pay with cash on delivery. However, credit and debit cards become minor well-known in our country compared to other advanced countries.

5.2.13 Security of remuneration mode

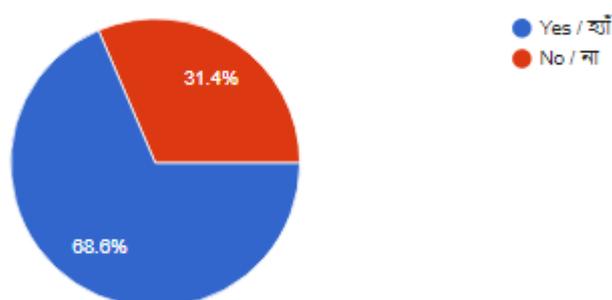


Fig 5.9: Security of remuneration mode

Based on the chart, 68.6% of people agree that Bangladesh's online payment system is secure, while 31.4% people are not agreed. And anyway, reliable payment seems to be a major concern in Bangladesh. A maximum number of customers think

that electronic payments are risky. Consumers are hesitant to do using debit & credit cards while purchasing from the internet. To increase consumer trust in the payment system, businesses should develop new and improved technology.

5.2.14 Online product categories during the corona virus situation

| Product category (during pandemic) | Frequency | Percentage |
|-------------------------------------|-----------|------------|
| Apparel and beautification products | 382 | 38.2% |
| Tickets | 618 | 61.9% |
| Accessories | 212 | 21.2% |
| Healthcare and fitness | 281 | 28.1% |

Table 5.6: Online goods categories during the corona virus situation

We see that during the corona virus time 38.2% of customers bought clothing & glamour goods online., 61.9% of customers bought tickets online, 21.2% of customers bought accessories, 28.1% of customers bought healthcare and fitness goods, 22.4% of customers bought books & 40.7% of customers bought grocery items and foods online.

5.2.15 Online goods categories after the corona virus situation

| Product category (after pandemic) | Frequency | Percentage |
|-------------------------------------|-----------|------------|
| Apparel and beautification products | 327 | 32.7% |
| Tickets | 712 | 71.3% |
| Accessories | 221 | 22.1% |
| Healthcare and fitness products | 284 | 28.4% |
| Books | 222 | 22.2% |
| Grocery items & restaurant food | 304 | 30.4% |

Table 5.7: Online goods categories after the corona virus situation

We can see from the table, In the post-pandemic situation, 32.7% of customers will purchase clothing & glamour products online, 71.3% of consumers will order tickets online, 22.1% of consumers will buy accessories, 28.4% of customers will buy medicine & fitness goods online, 22.2% of customers will buy books online, as well as 30.4% of consumers will buy groceries & food and beverage online.

Apparel and skincare products, internet ticket booking & groceries, and food and beverage are the 3 key categories driving internet purchase processes among internet shoppers. Internet purchases will become more popular since consumers desire to purchase more goods in the years ahead. Merchants should develop new strategies for increasing selling of various products.

5.2.16 After the Covid-19 pandemic I would prefer to buy a product from an online store if the price and quality were the same in stores and on the internet.

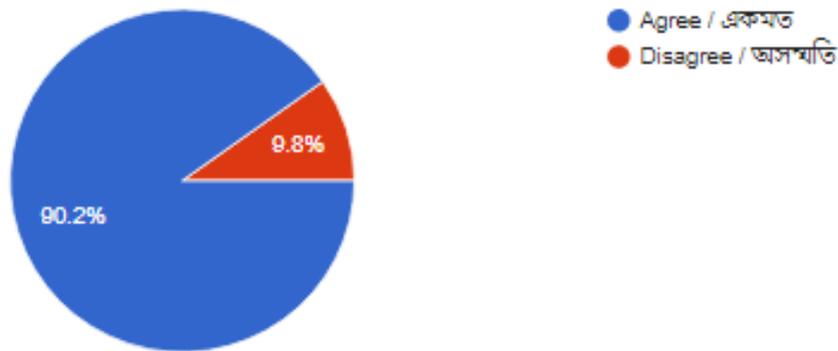


Fig 5.10: After the Covid-19 pandemic, I would prefer to buy a product from an online store if the price and quality were the same in stores and on the internet.

Post-pandemic time, 90.2% of consumers are willing to purchase internet for the exact quality and cost that they would in a real shop. However, even though the quality and cost are the same, 9.8% of persons would be reticent to purchase online.

5.2.17 I might prefer to purchase goods from a virtual store if the Service, support & Service Process stayed the same in post-pandemic time

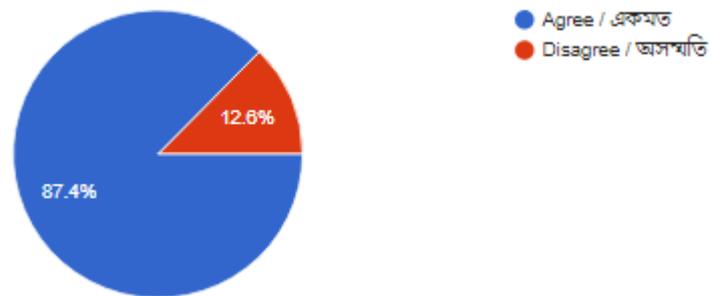


Fig 5.11: I might prefer to purchase goods from a virtual store if the Service, support & Service Process stayed the same in post-pandemic time

Customer service is essential for any business because it encourages repeat business; and marketing is carried out through existing customers. Internet purchases seem to be more essential than ever before in today's world, as the 3Ps formula for consumer service must be followed. Dealing with customers online requires the 3Ps: professionalism, patience, and a people-first attitude. 12.6% respondents are not willing to do shop in online if consumer service and product delivery system remained similar.

5.2.18 After the Covid-19 pandemic, I would rather purchase an item from an online retail store if the payment system is secure

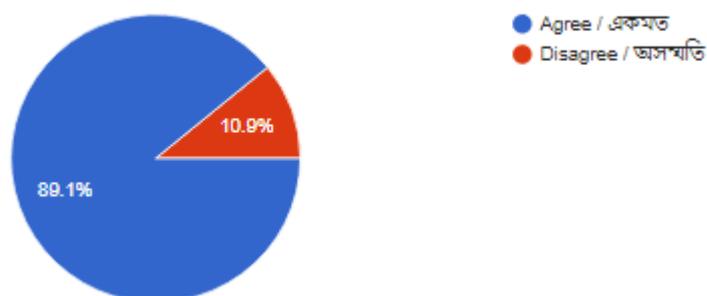


Fig 5.12: After the Covid-19 pandemic, I would rather purchase an item from an online retail store if the payment system is secure.

According to the graph, if the fee structure is safe, 89.1% of respondents will feel secure purchasing goods internet post pandemic time. However, 10.9% respondents are concerned about the security of online payment systems.

CHAPTER 6

FINDINGS, RECOMMENDATIONS, CONCLUSION AND FUTURE WORKS

6.1 FINDINGS

- Because it's more convenient, time-saving, and convenient, the new generation becomes more drawn to online purchasing. According to the research study, several factors influence a customer's decision to purchase online services and goods. The most commonly identified factors are time savings, relaxation, product comparison and alternatives, and the ability to shop from anywhere at any time.
- Most of the people are worried about the safety of the transaction system.
- The main barriers to online shopping are security concerns as well as the incapability to experience and touch
- Most of the people prefer internet buying because it eliminates the need for the consumer to move because goods are ordered as well as handed to the consumer's door.
- Rural residents face several difficulties when shopping online.
- Instead of making a final product choice and decision, customers contrast quality, cost and etc in internet & then feedback previous ratings & feedbacks about product. Consumers did the same thing during the covid-19 pandemic and they will do this in the future.
- We discovered the delivery method performed admirably during the covid-19 situation & customers anticipate improved home delivery, taking into account packaging, delivery person attitudes, and timeframe.
- Except for online business, every business sector was affected by the pandemic. Online businesses were beneficial have beneficial effect.

6.2 RECOMMENDATIONS, CONCLUSION AND FUTURE WORKS

Online purchases have become more popular every day. Requirements of consumers for online sales have now become difficult for merchants. This paper investigates the effect of corona virus on consumer habits and what customers' intentions will be after the pandemic time. The primary goal of this study is to understand customers' internet shopping intentions during the pandemic and to see

if these same actions will alter after normalizing corona virus situation. Various classification methods are used, where the Decision tree achieves the highest accuracy of 99.6%. Random Forest Algorithm accuracy is 76.8% and Support Vector algorithm accuracy is 73.1%. We discovered that Decision Tree generated the greatest results, implying that after a pandemic, consumers will choose internet shopping purchases (Liu et al., 2020). Correlation analysis is also applied to determine which features are most important in predicting the behavior of customers. Consumers' online purchasing intentions are significantly influenced by features such as residence and payment system security.

Different classifiers could be used for prediction in future research to improve accuracy. This study only looked at Bangladesh; future research should look at the entire world to see if there are any differences. More data could be collected in future studies, and deep learning could be used to improve accuracy. Future research could look into meta-heuristic algorithms to improve the better accuracy of customer behavior prediction. In addition, a dataset with more COVID-19-affected attributes could be used in the training of estimation models.

APPENDICES

Abbreviation

Support vector machines = SVMs

Random Forest = RF

Decision Tree = DT

Appendix: Reflections on the Research

We also had no prior experience with machine learning, python, graph analysis, and so on when we began the thesis. Our supervisor was very cooperative and provided us with relevant advice. During the course of our research, we learned new technologies or techniques, which algorithms are best for which situations, how to apply classification algorithms, and so on. Both Google colab and the Python programming language were unfamiliar to me. Everything was explained to us in great detail by our supervisor.

Finally, our studies gave us confidence and inspired us to do more in the future.

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