PRODUCT PURCHASING SENTIMENTS ANALYSIS FOR MONITORING COSMETIC BRANDS AND BEAUTY PRODUCTS BASED ON USER FEEDBACK IN BANGLADESH

BY

JANNATUL MAWA
ID: 192-15-1063

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

Shah Md. Tanvir Siddiquee
Assistant Professor
Department of CSE
Daffodil International University
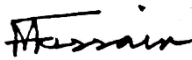

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APPROVAL

This Project titled "Product Purchasing Sentiments Analysis For Monitoring Cosmetic Brand And Beauty Products Reviews On User Feedback", submitted by Jannatul Mawa, ID:192-15-1063 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 B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on January 2024.

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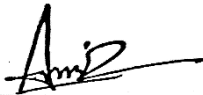Engineering
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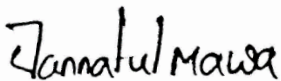Shahjalal University of Science and Technology

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Shah Md. Tanvir Siddiquee, Assistant Professor, Department of CSE** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

Supervised by:

(signature)
_____

Shah Md. Tanvir Siddiquee
Assistant Professor
Department of CSE
Daffodil International University

Submitted by:

(signature)
_____

Jannatul Mawa
ID: -192-15-1063
Department of CSE
Daffodil International University

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ABSTRACT

My research delves into the dynamic realm of consumer preferences in cosmetics, employing a data-driven approach to unravel patterns and insights in this multifaceted industry in Bangladesh. The study centers on the comprehensive analysis of user responses, gathered through a meticulously designed survey instrument, to discern prevailing trends and preferences in moisturizers, serums, and oils. The dataset, comprising responses from 511 participants, provides a rich source of information on brand perceptions, country-of-origin preferences, and consumer ratings. By employing Python programming and data visualization libraries, I conducted an in-depth exploration of consumer habits, shedding light on the popularity of specific brands and the countries associated with favored cosmetic products. The analysis revealed Cerave as a dominant player in the moisturizer segment, with a significant preference for products originating from Korea. Furthermore, the study examined consumer choices in serums, uncovering a prevalence of positive ratings, particularly in the "Good" category. The diversity in brand usage showcased a wide array of choices, with Cerave, The Ordinary, and Set Wet emerging as popular selections. The country-of-origin analysis demonstrated a pronounced affinity for Korean serums, accounting for a substantial share of the market. Shifting focus to oils, the research highlighted a predilection for organic oil, with Parachute and Bajaj n Drops standing out as preferred brands. Bangladesh emerged as a dominant source country for cosmetic oils, capturing over half of the market share. This research contributes to the understanding of consumer behavior in the cosmetics industry, offering valuable insights for both industry practitioners and researchers. The data-driven approach employed in this study serves as a robust methodology for comprehensively exploring and interpreting consumer preferences in diverse product categories.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In the realm of Cosmetic Science, the analysis of consumer sentiments and preferences holds a pivotal role in shaping industry strategies and product development. My research embarks on an exploration of this intricate relationship, specifically within the context of the Bangladeshi cosmetic market. Additionally Embarking on a nuanced exploration of consumer sentiments within the vibrant landscape of the Bangladeshi cosmetic market, my research represents a meticulously orchestrated journey spanning from the conceptualization of research objectives to the intricate details of code implementation. The overarching goal is to unravel the multifaceted factors that intricately shape consumer preferences, providing a comprehensive understanding of the dynamics inherent in the realm of cosmetic consumption.

In crafting a robust research methodology, Google Forms [7] emerges as the cornerstone for data collection, strategically employed to cast a wide net across diverse sources. The resultant dataset, a testament to the meticulous approach, comprises responses from a diverse demographic, encapsulating the essence of consumer behavior with remarkable granularity. With a sizable 511 participants, the dataset not only boasts quantitative robustness but also facilitates an insightful exploration of the interplay between gender dynamics and cosmetic preferences, differentiating between male and female participants where Female 375 Male 136. The subsequent phase of the research unfolds within the dynamic and collaborative environment of Google Colab [6], where Python scripts come to life [9]. As the code delves into the intricacies of the dataset, a trove of noteworthy findings surfaces. The analysis reveals a rich tapestry of cosmetic product preferences, identifying cleansers, moisturizers, serums, and oils as distinct types of products based on age, budget, gender, brand, and country preferences. This granularity extends to the identification of specific product names, laying the groundwork for an in-depth exploration of consumer choices.

Within this expansive dataset, the code discerns intriguing patterns of cross-border preferences, shedding light on the popularity of certain cosmetic products across diverse regions of Bangladesh. These revelations not only underscore the richness of the collected data but also set the stage for a profound exploration of consumer behavior and preferences within the ever-evolving cosmetic landscape.

1.2 Motivation

Standing at the intersection of a dynamic market and crucial consumer sentiments, my research sets out on an exciting trek to uncover what exactly constitutes that complex creature Bangladeshi cosmetic buyer. The reason comes from an understanding that the industry is sensitive to changes in consumer trends: sentiments provide a compass for shaping market forces and product-development strategies. The complex interplay between consumer tastes and industry innovation reveals the need to analyze in detail all factors affecting cosmetic preferences.

So in such a land of varied cultural shades and local color, understanding what makes women and men their cosmetic choices becomes critical. It is sparked by a curiosity to understand and reveal the workings of these sorts of motives, especially concerning how culture, society and economy affect consumer consciousness. In addition, the research hopes to provide industry players with useful information that will enable them to adjust their strategies in line with varying consumer preferences among Bangladeshi consumers.

This is more than mere curiosity: it represents an ardent determination to create a mutually beneficial relationship between consumers and cosmetics manufacturers. Exploring the depths of consumer emotions With its findings, my research work hopes to offer practical suggestions for industry operations that can improve products and ultimately better customers 'experience of cosmetics.

1.3 Objective

My research has precisely defined objectives to tease out the intricate threads of consumer thoughts and wishes from within the Bangladeshi cosmetic market. Precise and deep, the objectives aim to steer researchers in grasping all those factors on which cosmetic choices

depend. These general principles are carefully laid out, in order to guide through the multifaceted world of cosmetic consumption in Bangladesh.

The primary objectives include:

Comprehensive Sentiment Analysis: With advanced sentiment analysis techniques using data analysis, identify and classify consumer sentiments about cosmetic products. User comments, reviews, and preferences are gathered from various sources using google Forms [7] to be decoded to determine the emotional tone.

Exploration of Demographic Dynamics: Analyze the impact of demographic factors, including age, budget, brand, country, and gender on cosmetic choices. Through dissecting the dataset according to demographic data, this research aim is to bring light on different forces behind consumer decisions.

Product Preference Patterns: Examine the dataset to find patterns in preferences among products. This requires a detailed examination of specific categories of cosmetic products, such as cleansers, moisturizers, serums, and oils. Each category has slightly different factors influencing consumer choice those are Good, Bad, Average, and Excellent.

Regional Variations in Preferences: Discover different tastes in cosmetics within Bangladesh. The research is based on the analysis of data from various age groups and in particular students at universities in the city of Dhaka. It attempts to discover differences between consumer attitudes and brand selection across different surfaces.

Impact on Industry Practices: Translate research findings into strategic automatic recommendations that are useful to industry stakeholders. This is an attempt to improve the quality of industry practice, creating a market environment that is more open and consumer oriented.

Thus, my study composes an agenda that can serve as a complete direction for the research to achieve in-depth knowledge about consumer behavior sentiments and trends of cosmetics use in Bangladesh.

1.4 Research Outcome

The culmination of extensive data analysis within the realm of cosmetic consumption in Bangladesh has yielded profound insights into consumer preferences across various dimensions. Through meticulous examination of a diverse dataset comprising responses from 513 individuals, including 136 young males and 375 females, the research has delved into the nuanced dynamics of cosmetic choices among university students and other young demographics.

Key Findings:

➢ **Cosmetic Categories and Consumer Preferences:**

- **Oils:** The analysis uncovered distinct brand preferences for oils, revealing insights into the preferred brands based on budget, skin type, and age group.
- **Cleansers:** Similarly, the dataset unveiled patterns in cleanser preferences, highlighting the preferred brands, their origin countries, and associated ratings based on consumer feedback.
- **Moisturizers:** The research explored consumer choices in moisturizers, shedding light on the most favored brands, their countries of origin, and the corresponding ratings in alignment with budget, skin type, and age group.
- **Serums:** The examination extended to serums, unraveling consumer inclinations towards specific brands, their countries of origin, and the discerned ratings within this cosmetic category.

➢ **Demographic Differentiation:**

- **Gender Dynamics:** The analysis distinguished between male and female participants, elucidating variations in cosmetic preferences based on gender.
- **Age Groups:** Insights were extracted by categorizing participants into different age groups, uncovering the evolving patterns of cosmetic choices across varying life stages.

➢ **Brand Origin and Rating Analysis:**

- The research provides an in-depth exploration of the origin countries of preferred cosmetic brands, offering a comprehensive understanding of the global cosmetic landscape's influence.
- Ratings assigned to each brand within the categories of oils, cleansers, moisturizers, and serums were meticulously examined, providing a qualitative dimension to consumer feedback as good, bad, average, and excellent.

These preliminary findings set the stage for more detailed exploration in the subsequent Results and Discussion chapter, where the intricacies of consumer preferences, regional variations, and the impact on industry practices will be expounded upon.

1.5 Report Layout

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CHAPTER 2: BACKGROUND

CHAPTER 3: RESEARCH METHODOLOGY

CHAPTER 4: EXPERIMENTAL RESULTS AND DISCUSSION

CHAPTER 5: IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

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IMPLICATION FOR FUTURE RESEARCH

CHAPTER 2
BACKGROUND

2.1 Preliminaries

Inside this section, the first elements of the study project are shown. This offers a essential elements and key features incorporated into this basic foundation for the research. The introductory segment focuses on the study background, mentioning researching the cognitive effects of Cosmetics brand and their influence on the cognitive abilities of customers in different age groups. It also explains why the study is being carried out. presents the objectives and anticipated results, as well as the structure of all documents.

2.2 Literature Review

Embarking on a journey through the rich tapestry of existing research, I navigate the landscape of consumer behavior in the Bangladeshi cosmetic industry. This review synthesizes insights from seminal works, aligning them with the objectives and focus of the current study.

> ➢ The exploration begins with Hossain and Hossain's insightful expedition [1], a comparative study published in 2022. With an eagerness to unravel regional nuances, they set out to understand consumer sentiment towards cosmetic brands in Bangladesh, meticulously analyzing social media data from Dhaka and Chittagong. This work not only sets the stage for regional variations but also emphasizes the significance of understanding diverse consumer perceptions.

> ➢ In the realm of marketing dynamics, I turn to Islam and Jahan's expedition [2] from 2021. Motivated by a quest to decode the influence of marketing influencers on cosmetic purchase decisions in Bangladesh, their study employs surveys and interviews. Through a lens focused on Dhaka, this work unveils the effectiveness of influencer recommendations, especially among the younger demographic, providing valuable insights into the changing landscape of consumer influence.

➢ Text mining becomes the next compass in my exploration, guided by the work of Islam and Islam [3] in 2020. With a meticulous approach to deciphering online cosmetic reviews in Bangladesh, they employ text mining techniques to dissect customer satisfaction factors. The findings reveal a tapestry of sentiment, where positive mentions intertwine with concerns about product effectiveness and packaging issues, offering a textual perspective to complement the quantitative sentiment analysis pursued in my research.

➢ As I traverse the literature landscape, I encounter Akhter and Al Mamun's qualitative venture [4] from 2019. Rooted in a desire to fathom the unique factors shaping cosmetic purchase decisions in an emerging market, their study engages with consumers through focus groups and in-depth interviews. Cultural values, social media influence, and brand trust emerge as pivotal factors, laying a foundation for understanding the multifaceted nature of consumer choices.

➢ In the cross-cultural expanse, Sharma and Islam's comparative study [5] beckons from 2018. This work, delving into sentiment analysis of online beauty product reviews in developing countries, stands as a bridge between India and Bangladesh. Their findings illuminate the positive sentiment towards international brands in both countries, yet unveil the Bangladeshi consumer's openness to local products, providing a cross-cultural backdrop for understanding consumer preferences.

As the chapters unfold, these narratives will intertwine with the unique contours of the Bangladeshi cosmetic market, guiding the trajectory of my research through the wealth of insights drawn from these diverse expeditions.

2.3 Research Scope

Navigating the uncharted terrain of data analysis and data science within the realm of cosmetics, my research carves a unique niche in an unexplored domain. As the first explorer in this latest technological frontier, I embark on a journey to reshape the landscape of the cosmetics industry through the lens of Python-based data analytics.

The infusion of data science techniques breathes a new life into the study of consumer behavior, providing an innovative touch hitherto unexplored.

One significant dimension that distinguishes my research from its predecessors lies in the breadth and variety of the consumer demographic captured. While treading the well-worn paths of existing literature, I observed a conspicuous absence of diverse consumer groups in prior studies. My research fills this void by encompassing a wide spectrum of consumers, including students and other demographics. This expansive approach not only enriches the dataset but also contributes to a more comprehensive understanding of the intricate dynamics governing cosmetic preferences.

In the ever-evolving landscape of research methodologies, my work takes center stage as a pioneer in employing the latest datasets. A critical examination of existing literature revealed a noticeable gap in recent studies utilizing the most up-to-date datasets. In response to this void, my research stands poised to be at the forefront of the cosmetics field, utilizing cutting-edge data to unravel the contemporary nuances of consumer behavior.

Furthermore, the strategic considerations embedded in my research—such as the analysis of skin type, budget constraints, brand ratings, and preferences based on the country of origin—inject a level of granularity hitherto absent in previous explorations. This deliberate focus on nuanced factors extends the scope of inquiry, allowing for a deeper understanding of the multifaceted decision-making processes that govern cosmetic choices.

In essence, my research not only pioneers the integration of data science in the cosmetics industry but also broadens the horizons of inquiry, encompassing a diverse consumer base and leveraging the latest datasets. The unique dimensions explored in my research set the stage for a nuanced and comprehensive exploration of the intricacies shaping the contemporary cosmetic landscape.

2.4 Challenges

Embarking on the journey of investigation, the path was riddled with challenges, each presenting an opportunity for creative problem-solving. A formidable hurdle surfaced in the initial stages—the arduous task of data collection. Unveiling the intricacies of individuals' cosmetic preferences proved to be a daunting challenge, as many hesitated to divulge personal choices for academic scrutiny. Negotiating this reluctance required finesse, prompting the utilization of anonymous questionnaires and the meticulous crafting of questions to elicit candid responses on cosmetic brands and experiences. Another intricate challenge materialized in the realm of sentiment analysis. Capturing the nuanced tapestry of users' sentiments towards cosmetic brands demanded a methodological finesse. The labyrinth of mind mapping posed its own set of challenges, compelling a meticulous exploration of unidentified questionnaires and a continuous refinement of queries to unearth the subtle shades of consumer preferences.

However, the journey did not merely traverse the landscape of user sentiments. I found myself contending with the tangible limitations of power and internet accessibility. Navigating through these hurdles added a layer of complexity to the research, impacting the reliability of data gathering and analysis processes. The hurdles underscored the need for adaptive strategies, ensuring precision and value in the findings despite the constraints. Moreover, as the dataset unfolded, handling and presenting the acquired data set presented additional challenges. Managing missing values within the dataset and orchestrating the intricacies of coding in Google Colab with Python demanded a delicate touch. These technical challenges prompted the exploration of innovative approaches to secure accurate and meaningful findings, fostering a dynamic interplay between problem-solving and the pursuit of research excellence.

In essence, the challenges encountered in this research journey served not as roadblocks but as catalysts for ingenuity. Navigating the complex landscape of data collection, sentiment analysis, and technical intricacies demanded creative solutions, shaping the research into a dynamic and adaptive exploration of consumer behavior in the cosmetics industry.

CHAPTER 3

METHODOLOGY

3.1 Overview

Embarking on a comprehensive research journey within the dynamic realm of cosmetic consumption in Bangladesh necessitated a meticulous and well-defined research methodology. This section provides an insightful overview of the methodological framework employed to explore consumer sentiments and preferences. The strategic approach was designed to navigate the intricacies of the Bangladeshi cosmetic market, capturing a diverse array of factors influencing consumer choices.

From the conceptualization of research objectives to the execution of data collection and the subsequent analysis, the methodology stands as a robust guide. Google Forms [7] emerged as a foundational tool, facilitating the collection of a rich dataset from various sources, ensuring a comprehensive representation of consumer behavior. With 511 participants contributing to the dataset, the research achieved both depth and breadth in understanding cosmetic preferences.
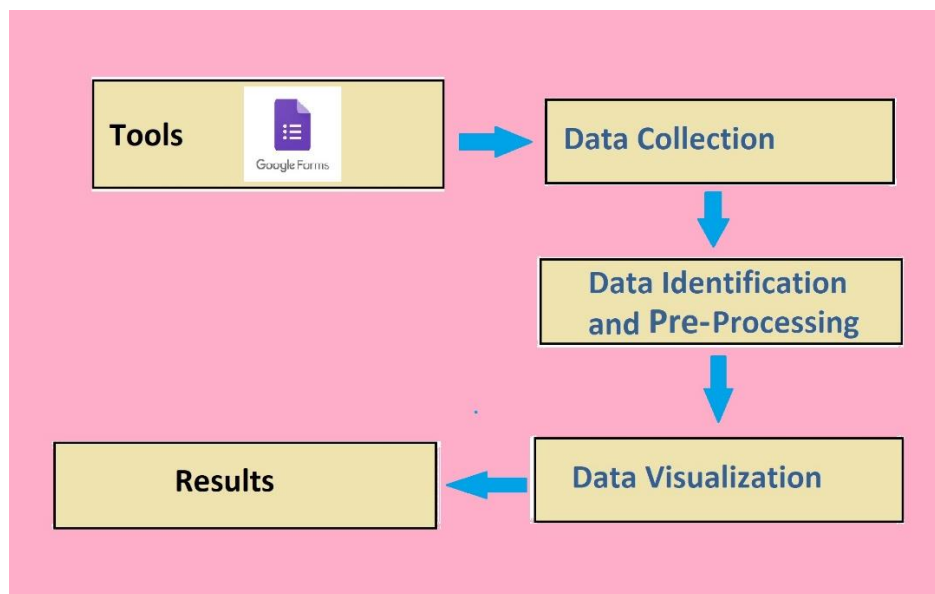

Figure 3.1: Methodology

The utilization of Google Colab, coupled with Python scripts [6] [9], marked the transition to the analytical phase. This phase unearthed noteworthy findings, illuminating patterns

and variations in consumer choices across different demographic segments. The analysis further identified specific product preferences, unveiling the diverse landscape of cosmetic consumption. In summary, this section outlines the meticulous planning and execution of the research methodology, setting the stage for a profound exploration of consumer sentiments and preferences within the Bangladeshi cosmetic market.

3.2 Research Subject and Instrumentation

The choice of the various instrumental parts of this research was attended to carefully so as enable an effective and thorough exploring into consumer feelings in the Bangladeshi cosmetic market. This investigative undertaking required a powerful computing system with a stable broadband connection, an Intel Core i7 sixth-generation processor, 16GB RAM and SSD of 500 GB. This configuration served as the technological backbone, enabling the swift and effective execution of data analysis tasks.

The main tool used for data collection was Google Forms, a flexible platform that allowed responses from all sorts of sources. Making full use of the flexibility and user-friendly interface offered by Google Forms, we broadened our net to capture opinions from a diversity of people across age groups and geographic locations throughout Bangladesh.

The analytical phase unfolded within the dynamic environment of Google Colab, a collaborative platform synergized with Python scripts [6] [9]. This combination empowered the research to delve into the intricacies of the collected dataset, unraveling patterns and nuances in consumer preferences.

Notably, the research subjects were the cosmetic products themselves, although the study did not involve the physical use or examination of the actual products. Instead, the focus was on the names and categories of the cosmetic items. The primary subjects, however, were the individuals contributing to the dataset, representing diverse age groups and hailing from different locations across the nation and get their sentiments toward cosmetics products. This inclusive approach ensured a comprehensive exploration of consumer sentiments, laying the foundation for a nuanced analysis of cosmetic preferences.

3.3 Data Collection and Preprocessing

After successfully gathering responses from 511 participants through Google Forms, the dataset underwent meticulous scrutiny and preprocessing to ensure its readiness for analysis. The initial step involved printing all attributes present in the dataset, providing an overview of the information to be explored. The dataset comprises 16 attributes, including demographic information, budget, cosmetics brand preferences, and associated ratings which you can find in figure 3.3A.

Upon printing the first five rows and columns of the dataset, a glimpse into the diversity of responses was revealed. The attributes encompassed a range of information, from age, gender, and skin type to budget, preferred cosmetics brands, country of origin for the brands, and brand ratings.

This rich and varied dataset formed the basis for an in-depth exploration of consumer sentiments and preferences in the Bangladeshi cosmetic market. The subsequent analysis involved a thorough examination of the data types, non-null counts, and missing values for each attribute which you will find in Figure 3.3A.

```
 #   Column                                                                      Non-Null Count   Dtype
---  ------                                                                      --------------   -----
 0   What is your age?                                                           508 non-null     float64
 1   What is your gender?                                                        509 non-null     object
 2   What type of skin do you have ?                                             509 non-null     object
 3   What is your budget for cosmetics per month?                                511 non-null     object
 4   What cosmetics brands do you currently use for cleansers?( facewash,shampoo,bodywash)  509 non-null     object
 5   Which country is this cleanser brand from?                                  510 non-null     object
 6   What rating would you give this brand of cleanser ?                         509 non-null     object
 7   What cosmetics brands do you currently use for moisturizers?(Lotion,Cream,Conditioner)  510 non-null     object
 8   Which country is this moisturizers brand from?                              509 non-null     object
 9   What rating would you give this brand of moisturizer ?                      508 non-null     object
 10  What cosmetics brands do you currently use for serum (gel,essence,toner)?   498 non-null     object
 11  Which country is this serum brand from?                                     488 non-null     object
 12  What rating would you give this brand of serum?                             487 non-null     object
 13  What cosmetics brands do you currently use for oils?(Hair oil,body oil,face oil)  507 non-null     object
 14  Which country is this oil brand from?                                       502 non-null     object
 15  What rating would you give this brand of oil ?                              504 non-null     object
dtypes: float64(1), object(15)
```

Figure 3.3.A: Attributes Data-Type And Non-Null Values

Missing values were identified and quantified, prompting the implementation of strategic measures for handling them. A missing value matrix and a correlation matrix of missing values were visualized, providing insights into the patterns and relationships among the missing values in different columns here in Figure 3.3 B. You can see the number of

missing values for each column its helped me to understand the correlation and the heatmap of the dataset's missing values.

```
Missing values in the dataset:
What is your age?                                                               3
What is your gender?                                                            2
What type of skin do you have ?                                                 2
What is your budget for cosmetics per month?                                    0
What cosmetics brands do you currently use for cleansers?( facewash,shampoo,bodywash)   2
Which country is this cleanser brand from?                                      1
What rating would you give this brand of cleanser ?                             2
What cosmetics brands do you currently use for moisturizers?(Lotion,Cream,Conditioner)   1
Which country is this moisturizers brand from?                                  2
What rating would you give this brand of moisturizer ?                          3
What cosmetics brands do you currently use for serum (gel,essence,toner)?       13
Which country is this serum brand from?                                         23
What rating would you give this brand of serum?                                 24
What cosmetics brands do you currently use for oils?(Hair oil,body oil,face oil)   4
Which country is this oil brand from?                                           9
What rating would you give this brand of oil ?                                  7
```

Figure 3.3.B: Missing values in Columns

The missing values Matrix I talked about is presented and visualized for a better understanding of where exactly my missing values are in Figure 3.3.C.
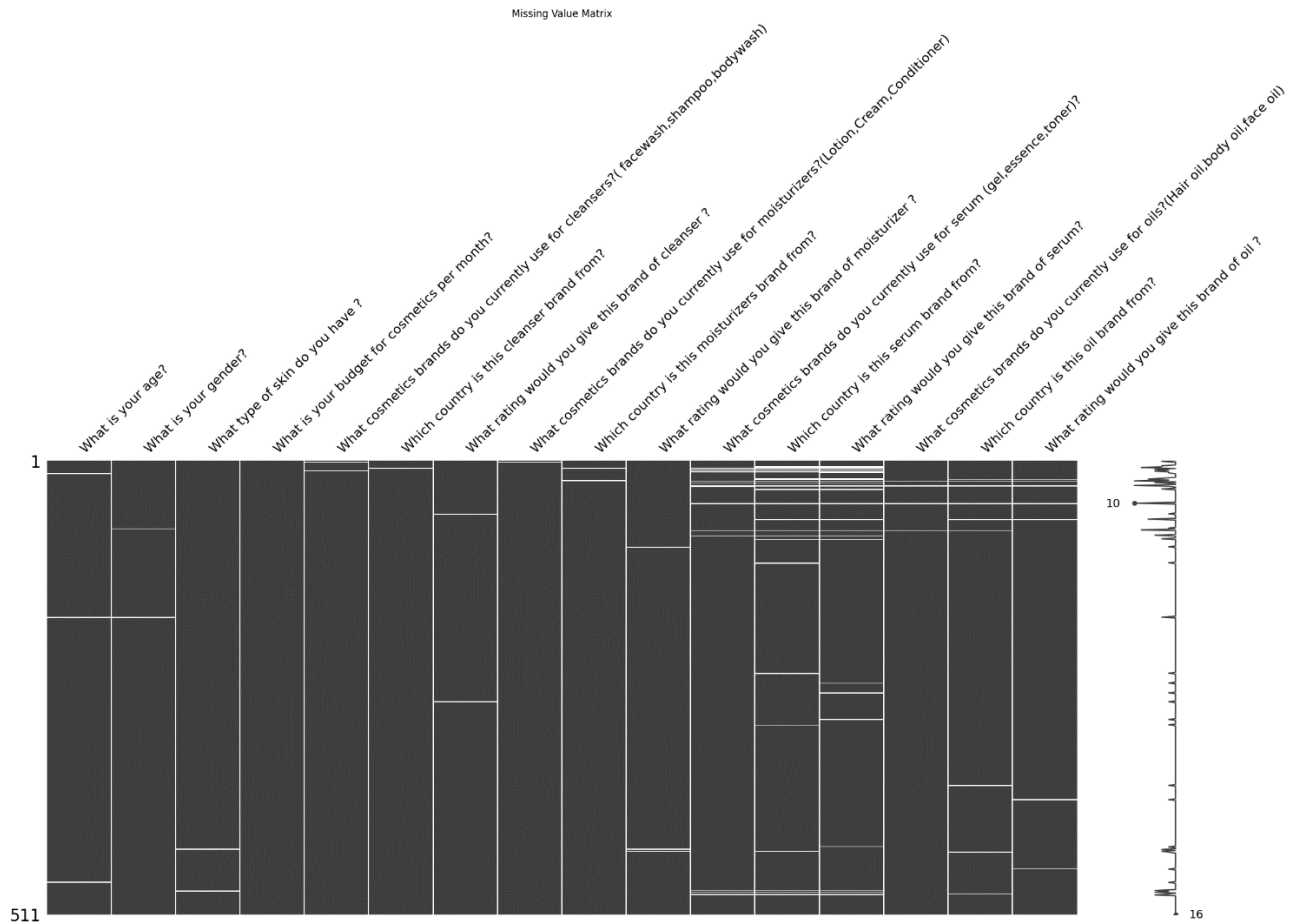

Figure 3.3.C: Missing value Matrix

Additionally, I have visualized the part co-relation of the missing values in the analysis part and it's presented in figure 3.3.D.
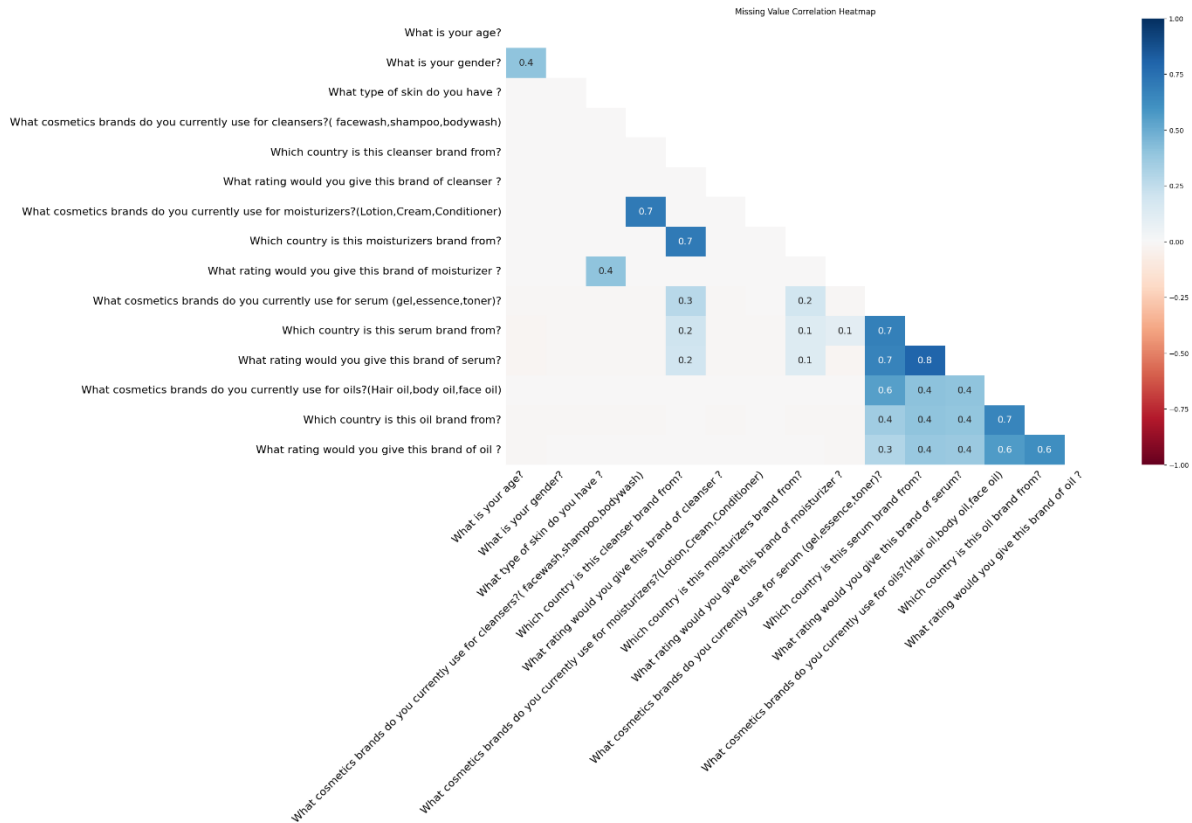

Figure 3.3.D: Co-Relation of Missing Values

To ensure the integrity of the dataset, missing values were addressed through a combination of removal and imputation. Missing values were dropped for certain columns, while others were imputed with appropriate measures such as mean for numerical columns and mode for categorical columns. The effectiveness of this preprocessing was confirmed by comparing the number of non-null values before and after handling missing values which is before handling the Number of non-null values before handling was 8078 and the Number of missing values before handling was 98 and after the imputation process the number of non-null values after handling is 8176.

The process was not without its challenges, notably in terms of data gathering. Some participants were hesitant to disclose their cosmetic product preferences, underscoring the sensitivity of the topic. Additionally, determining the ideal questions to elicit nuanced

sentiments and preferences posed a methodological challenge, resolved through iterative improvements in the questionnaire.

Despite these challenges, the dataset was refined, and missing values were strategically managed, laying the groundwork for a robust and insightful analysis. The data collection, coupled with meticulous preprocessing, forms the cornerstone for unraveling the intricate dynamics of consumer behavior within the dynamic landscape of the Bangladeshi cosmetic market.

3.4 Implementation Requirements

The implementation of this research venture hinged upon a well-orchestrated blend of technological tools and methodological approaches. Each component was carefully selected to ensure the seamless execution of data analysis and exploration of consumer sentiments within the Bangladeshi cosmetic market.

3.4.1 Hardware Specifications

A robust computing infrastructure was fundamental to the execution of data analysis tasks. The primary hardware utilized included a high-performance computer equipped with a Core i7 sixth-generation processor, 16 GB RAM, and a 500 GB SSD. This configuration provided the computational power necessary for efficient and swift processing of extensive datasets.

3.4.2 Software Tools

- **Google Form:** The data collection process was facilitated by Google Form. Leveraging this tool allowed for the creation of structured and comprehensive questionnaires, which were disseminated among diverse demographic groups through social media and university networks.

- **Google Colab:** Google Colab emerged as a dynamic and collaborative platform for implementing Python scripts. The Python programming language, coupled with Google Colab's interactive environment, played a pivotal role in the execution of data analysis tasks.

- **Python Libraries:** Various Python libraries, such as Pandas, NumPy, and Matplotlib, were employed for data manipulation, analysis, and [8] visualization. These libraries provided a versatile and powerful toolkit for extracting meaningful insights from the collected dataset.

3.4.3 Research Subjects

The central focus of this research was on cosmetic products, with a nuanced exploration of consumer sentiments. It's crucial to note that the research did not involve the physical testing of cosmetic products; instead, it centered around users' preferences, experiences, and sentiments related to different cosmetic categories. The subjects encompassed individuals from various age groups, including university students and other young participants, ensuring a diverse and representative dataset.

3.4.4 Data Science Methodology

The implementation of data analysis involved a structured approach, leveraging principles of data science. Techniques such as sentiment analysis, exploratory data analysis (EDA), and statistical analysis were applied to unveil patterns, preferences, and trends within the dataset. The methodology aimed to provide a comprehensive understanding of the factors influencing cosmetic choices.

3.4.5 Ethical Considerations

Throughout the implementation, ethical considerations were paramount. Participant privacy and confidentiality were rigorously upheld, and the research adhered to ethical standards in data collection and analysis. Informed consent was obtained from all participants, emphasizing transparency and respect for individual choices.

In summary, the successful implementation of this research necessitated a harmonious integration of cutting-edge hardware, software tools, methodological approaches, and ethical considerations. The judicious selection of each element contributed to the research's efficacy in exploring the intricate landscape of consumer sentiments in the Bangladeshi cosmetic market.

3.5 Statistical Analysis

The core of this research lies in the intricate statistical analysis conducted to derive meaningful insights into consumer behavior within the Bangladeshi cosmetic market. This section describes the steps taken, challenges faced, and key findings obtained through the data analysis process.

The journey towards statistical analysis commenced with the collection of diverse data from various sources using Google Forms [7]. Leveraging Python in Google Colab, the collected data underwent meticulous preprocessing. Several challenges were encountered, including the identification and handling of missing values. The iterative process of refining the dataset was crucial in ensuring the reliability of subsequent analyses.

The initial focus of the statistical analysis was on understanding the demographic composition of the research participants. This involved exploring the distribution of age groups, gender representation, and budget ranges for cosmetics. The dataset, comprising 511 individuals, was dissected to reveal insightful patterns.

An in-depth examination of participants' preferences for four key cosmetic products— cleansers, oils, moisturizers, and serums—unfolded. The analysis delved into the brand preferences within each product category, identifying the origin countries of these brands. Furthermore, the sentiment analysis of user feedback, categorized as good, bad, average, and excellent, provided a nuanced understanding of consumer satisfaction.

Graphical representations played a pivotal role in conveying complex information. The analysis included visualizing the distribution of different skin types among participants and distinguishing between oily, normal, and dry skin. These visualizations added a layer of clarity to the exploration of consumer characteristics.

The statistical analysis yielded a comprehensive set of numeric results, detailing the counts and percentages of participants falling into distinct categories. These findings were complemented by graphical representations, enhancing the interpretability of the results. Throughout the statistical analysis, obstacles such as missing values, diverse data formats, and the need for imputations were encountered. Addressing these challenges required a

combination of data science methodologies and creative problem-solving. Imputations were carefully applied to ensure the robustness of the dataset, paving the way for accurate analysis.

In conclusion, the statistical analysis section is the cornerstone of this research, unraveling the intricacies of consumer behavior in the Bangladeshi cosmetic market. The combination of numerical results and visualizations [8] paints a comprehensive picture, providing valuable insights that will be expounded upon in detail in the subsequent results section (Chapter 4).

CHAPTER 4

EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Overview

Chapter 4 serves as the pivotal hub where the culmination of extensive research efforts unfolds. This chapter encapsulates the comprehensive findings, analyses, and discussions derived from the meticulous exploration of consumer sentiments in the Bangladeshi cosmetic market. In the subsequent sections, I will delve into the experimental setup (4.2), elucidate the intriguing results and analyses (4.3), and engage in a comprehensive discussion (4.4) that sheds light on the nuances and implications of the research. This chapter stands as the cornerstone of the entire study, presenting a detailed narrative of the research journey, its intricacies, and, most importantly, the valuable insights gained through data analysis and interpretation. The amalgamation of numerical values, visual [8] representations, and discussions in this chapter collectively contribute to a robust understanding of consumer behavior and preferences in the dynamic landscape of cosmetic consumption in Bangladesh.

4.2 Experimental Setup

The success of any research endeavor rests on a robust and well-defined experimental setup. In this study, the choice of instruments and tools was meticulously calibrated to ensure precision and efficiency. The primary instrument utilized was a high-performance computer system equipped with a Core i7 sixth-generation processor, 16 GB RAM, and a 500 GB SSD. This powerhouse of computational capability served as the cornerstone for the subsequent stages of the research. The data collection process, a pivotal phase in the study, was executed through the seamless integration of Google Forms [7]. This versatile tool facilitated the acquisition of diverse and comprehensive responses from a varied demographic.

The heart of the analytical journey unfolded within the collaborative ecosystem of Google Colab [6], a cloud-based platform that seamlessly integrates Python scripts [9]. The choice of Python as the programming language was motivated by its versatility and extensive libraries for data analysis. This robust experimental setup, coupled with a stable internet

connection and a consistent power supply, formed the bedrock for the execution of intricate code analysis. The synergy between these instruments paved the way for a meticulous exploration of consumer sentiments and preferences in the Bangladeshi cosmetic market.

4.3 Experimental Results & Analysis

The results of the data analysis done using Python are presented here. presented and analyzed. the data was gathered from consumers of cosmetics in Bangladesh using a structured questionnaire designed on Google Forms, which was able to yield some insight into alluring. like sentiments' psychological effects, or brand preferences for cosmetics.

Age Group

The analysis of the 'What is your age?' attribute revealed the following findings:

The age distribution is diverse, ranging from 16 to 40 years. The average age is approximately 23.98 years, with a mean age of 23.0 Median age is 23.0 Max age: 40.0.

The age group 23 has the highest count, making up 16.44% of the total responses. The age group 24 follows with 9.98%, and the age group 22 with 9.78%.
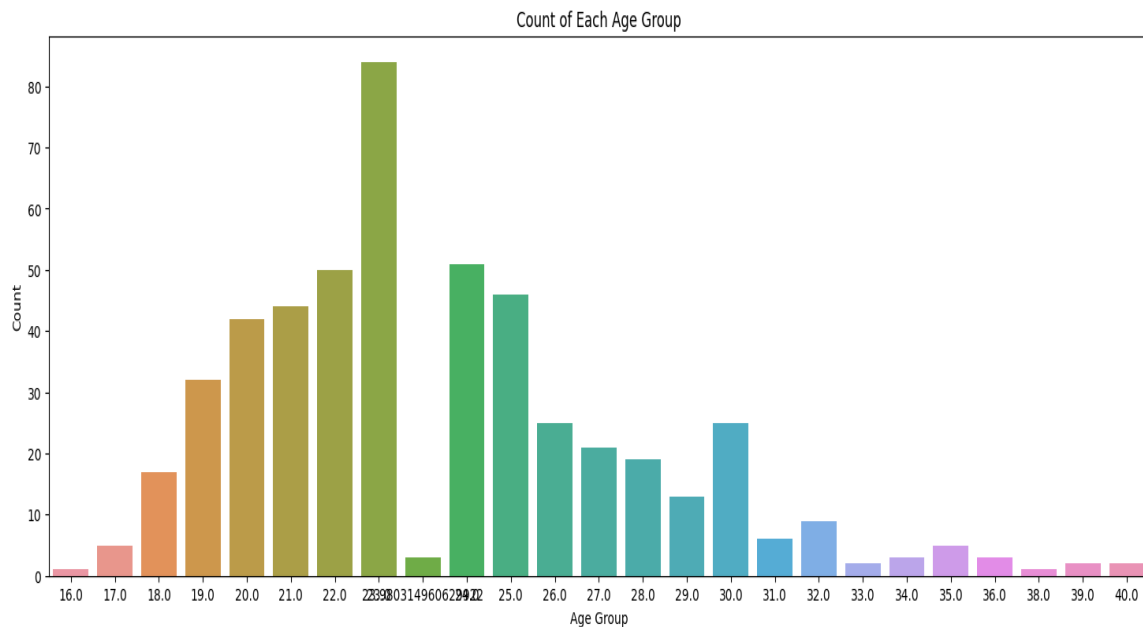
Figure 4.3.A: Age Distribution

The column-by-column findings are the Count of each age group: Age Group Count

0   23.000000   84, 1   24.000000   51, 2   22.000000   50, 3   25.000000   46, 4 21.000000   44, 5 20.000000   42, 6 19.000000   32 , 7 26.000000   25, 8 30.000000 25, 9 27.000000   21, 10 28.000000   19, 11 18.000000   17, 12 29.000000   13, 13 32.000000   9, 14 31.000000   6, 15 35.000000   5, 16 17.000000   5, 17 23.980315 3, 18 34.000000   3, 19 36.000000   3, 20 39.000000   2, 21 33.000000   2, 22 40.000000   2, 23 38.000000   1, 24 16.000000   1

The age distribution shows a relatively even spread, with variations across different age groups.

Gender

The 'What is your gender?' attribute indicates a gender distribution with 73.39% female and 26.61% male respondents were Female 375, Male 136.
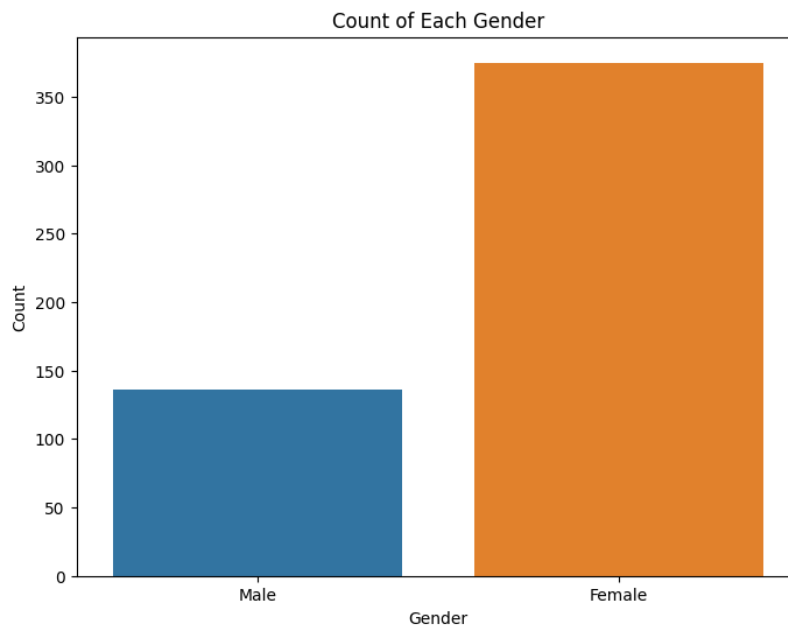
Figure 4.3.B: Age Distribution

Female respondents have an average age of 23.68, with a standard deviation of 4.07.

Male respondents have an average age of 24.82, with a standard deviation of 3.97.

Skin Type

The 'What type of skin do you have?' attribute shows that the majority of respondents have combination skin (33.07%), followed by normal (29.94%), dry (19.57%), and oily (17.42%) skin types.
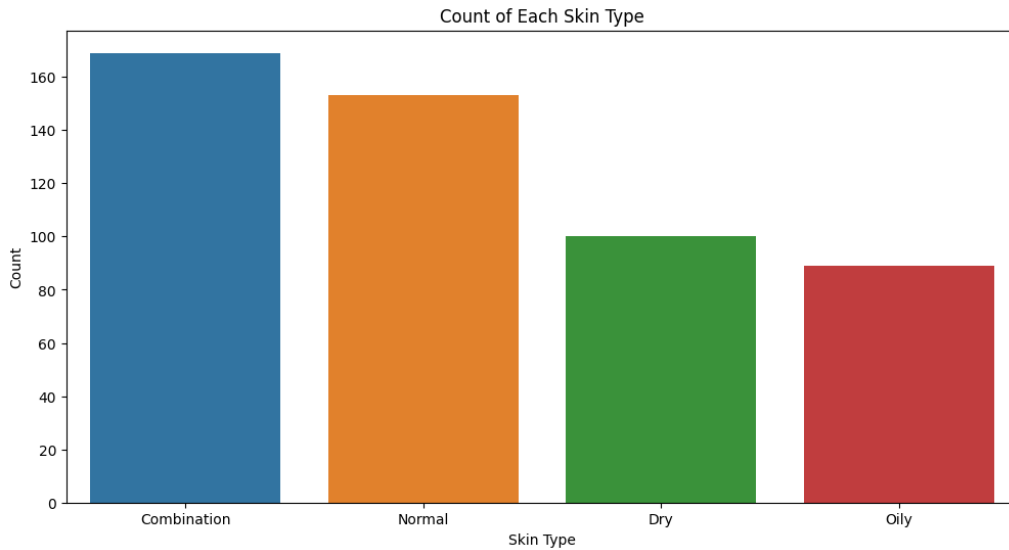

Figure 4.3.C: Skin Type Distribution

In particular Combination 169, Normal 153, Dry 100, Oily 89.

Budget for Cosmetics: Regarding the 'What is your budget for cosmetics per month?' attribute The most common budget category is '1000-5000,' with a frequency of 261.
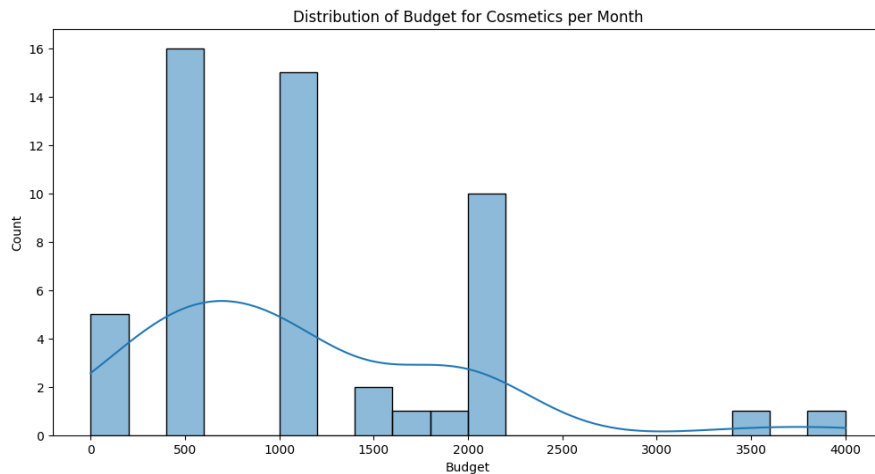

Figure 4.3.D: Budget Distribution per month

And particularly this is the one which have multiple people with exact number other are basically less than 1, Budget Category Count 0 1000-5000 261, 1 100-1000 150, 2 5000-10000 29, 3 1000 15, 4 500 15, 5 2000 10, 6 5000-1000 4, 7 100 3, 8 1500 2

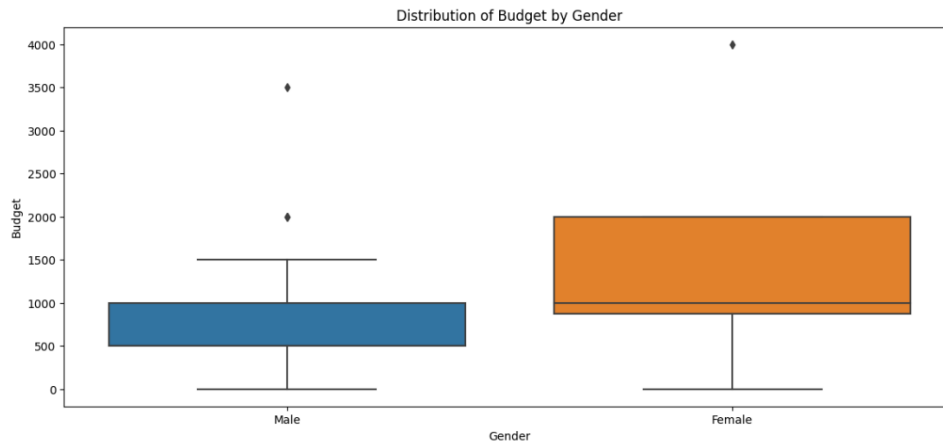The average budget is 1100, and the median budget is 1000.

Figure 4.3.E: Budget For Each gender

Additionally, the budget for males is from 500 to 1000 taka and the females start from roughly 800 to 2000 taka.

Cleansers Brands: The analysis of 'What cosmetics brands do you currently use for cleansers?' attribute yielded diverse results: Count of each value in the cleansers brand:

Nivea: 47, Dove: 44, Simple: 40, Lux: 35, Head n shoulder: 27, Himalaya: 23, Cerave: 23, Cetaphil: 23, Cosrx: 23, Garneier: 22, Neutrogena: 19, Pantene: 16, Ponds: 15, Biodarma: 14, The body shop: 13, Sunslik: 10, panteen: 7, Others organic shop: 6, Clear: 5, Skin life: 4, Purito: 4, Iunik: 4, Some by mi: 4, Bioree: 3, Boots: 3, Neutrogena: 3, Fair n lovely: 3, La rochy posay: 3, Parachute: 2, Others organic brand: 2, Hada labo: 2, Himalayan: 2, JNH: 2, Garnier: 2, Hadalabo: 2, kose softymo: 2, Facewash: 2, Bioderma facewash: 1, Sunsilk, bioderma: 1, Garnea: 1, the face shop: 1, La Roche posay: 1, Senka: 1, Boiree: 1, Face shop: 1, Daiso: 1, Different types of brands. Shampoo - Tresemme: 1, Avene: 1, innisfree: 1,Innisfree: 1, Dove, Lux, Ponds: 1, Cerave cleanser dove shampoo,, lux body wash: 1, cetaphil: 1, Unilever: 1, Tresemme, Lux, YC: 1, Ponds facewash, Pantene shampoo, Dettol:

1, Lotas,Nivea: 1, None,sunsilk, Lus: 1, Ponds,keratin: 1, Nevia, Vaseline, Pantene: 1, nivea men: 1, Aarong: 1, Everyouth: 1, Meril: 1, ST Ives: 1, Simple micellar water: 1, Garnier, Clean & Clear: 1, Japan Sakura cleanser: 1, OS, Cinthol: 1, Face wash : ponds, 2 other depends: 1, Face wash: 1, skin cafe: 1, cosrx: 1, lux: 1, cosrx, rovectin, skin1004,lux,sunsilk,axisy,soon jung,beauty of joseon: 1 Cerave SA smoothing, Simple Miceller gel wash,Simple hydrating light moisturizer, Simple miceller water: 1 Avene cleananse gel, organic shampoo, dove body soap: 1 nivea: 1 garnier: 1 Face wash, Shampoo.: 1 Nutregena: 1 Facewash, shampoo, bodywash, lotion etc: 1 Himaliya facewash: 1 Palmolive: 1 YC facewash. Head and shoulders, lux bodywash: 1 clean & clear   ,   Dove: 1   Pharma   act: 1
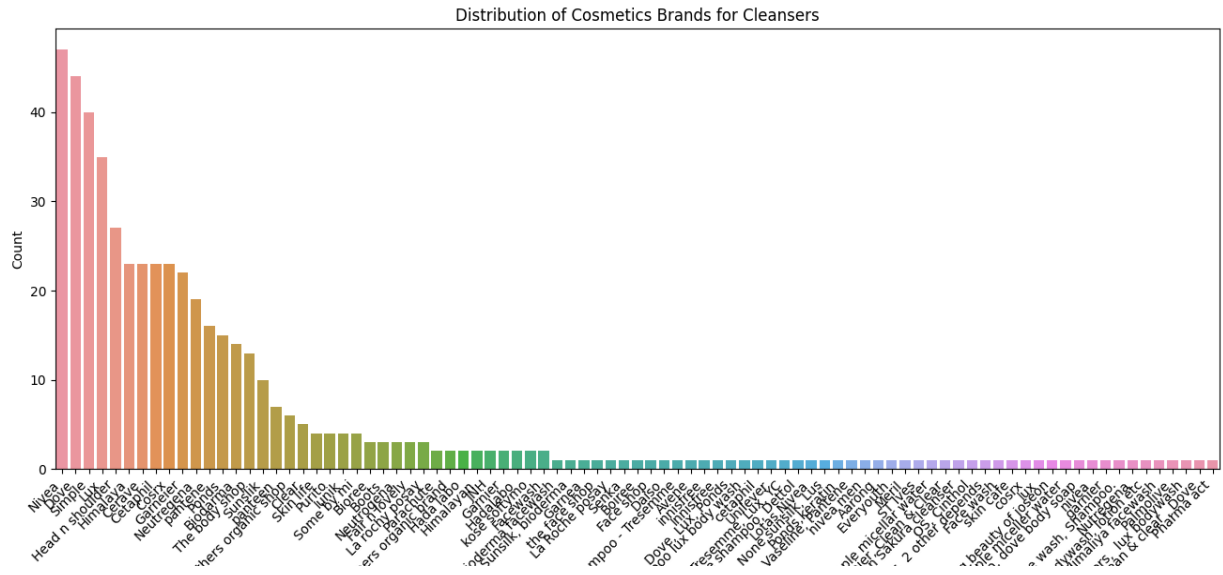

Figure 4.3.F: Cleanser Brand Distribution

Nivea is the most used brand, with a count of 47, followed by Dove (44), Simple (40), and Lux (35).

The cleansers come from various countries, with the USA being the most common (26.22%).

Country Count 0   12.USA   134 1   2.India   102 2   5.Korea   63 3   1.Bangladesh 60 4   8.France   46 5   9.Germany   39 6   13.Japan   18 7   11.England   16 8 3.Thailand   13 9   10.Italy   7 10   7.Spain   4 11 14.Australia   3 12   4.China 2 13   Uk   2 14   6.Pakistan   1 15   UK   1
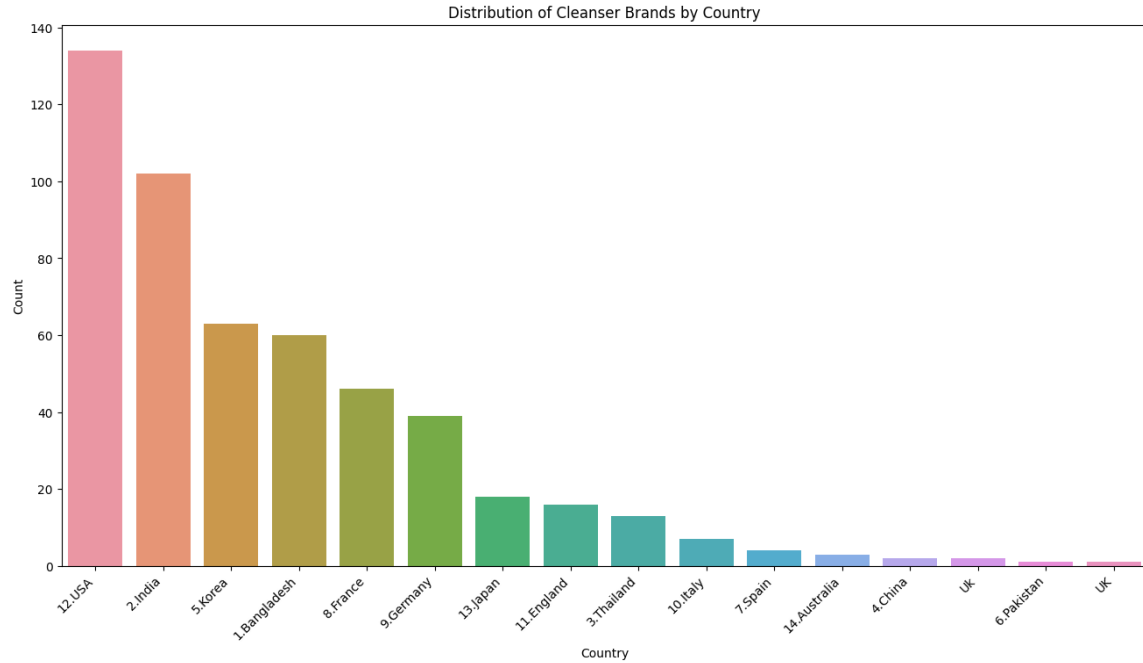
Figure 4.3.G: Cleanser Brand Country Distribution

Respondents provided ratings for the cleanser brands, with 'Good' being the most common rating (72.04%).
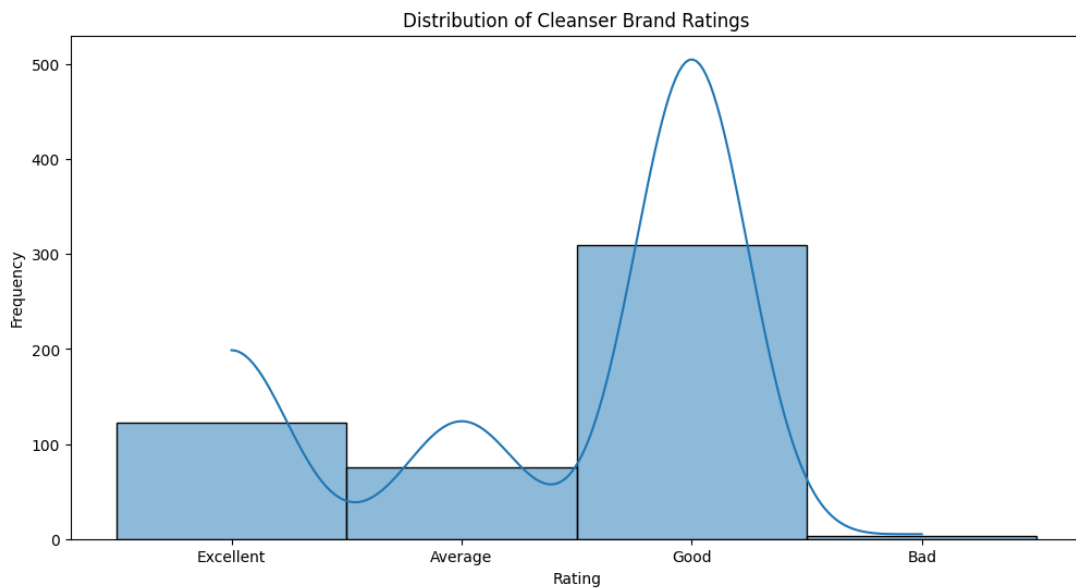

Figure 4.3.H: Cleanser Brand Rating Distribution

Moisturizers Brands: For 'What cosmetics brands do you currently use for moisturizers?' attribute:
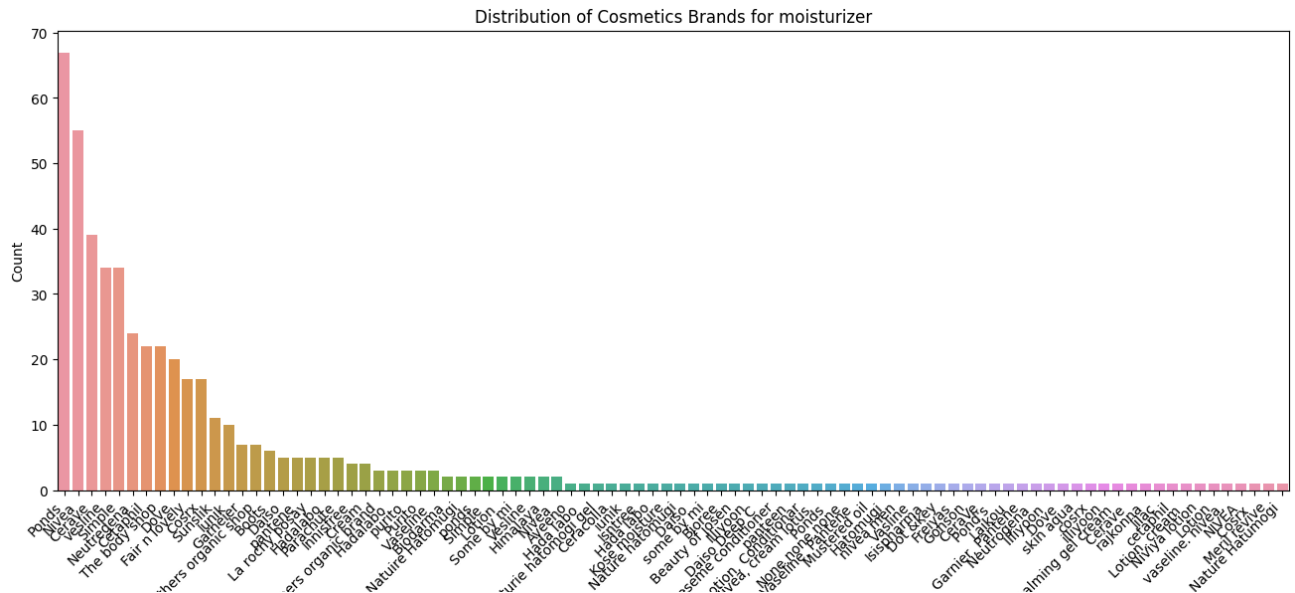

Figure 4.3.I: Moisturizers Brand Distribution

Ponds is the most used brand, with a count of 67, followed by Nivea (55) and Cerave (39). From Count of each value in the moisturizers brand attribute: Ponds: 67 Nivea: 55 Cerave: 39 vesline: 34 Simple: 34 Neutregena: 24 Cetaphil: 22 The body shop: 22 Dove: 20 Fair n lovely: 17 Cosrx: 17 Sunslik: 11 Iunik: 10 Garneier: 7 Others organic shop: 7 Boots: 6 Daiso: 5 pantene: 5 La rochy posay: 5 Hadalabo: 5 Parachute: 5 Innisfree: 4 Cream: 4 Others organic brand: 3 Hadalabo : 3 purito: 3 Purito: 3 Vaseline : 3 Biodarma: 2 Natuire Hatomugi: 2 ponds: 2 Simple : 2 Lotion : 2 Some by mi: 2 Vesline: 2 Himalaya: 2 Nivea : 2 Aveeno: 1 Hada labo : 1 Naturie hatomogi gel: 1 Ceracolla: 1 iunik: 1 Isntree: 1 Hada labo: 1 Kose moisture: 1 Nature hatomugi: 1 Daiso : 1 some by mi: 1 Bioree: 1 Beauty of josen: 1 Illiyoon: 1 Daiso Deep C : 1 Nivea lotion. Cosrx mosturizer. Treseme conditioner: 1 panteen: 1 Lotion, Conditionar: 1 Lotion Nivea, cream lotus : 1 Ponds : 1 None,none,none: 1 Vaseline, Pantene : 1 Mustered oil: 1 Hatomugi: 1 nivea men: 1 Vasline: 1 Isispharma: 1 Dot &key: 1 Freiyas: 1 Gonson: 1 CeraVe: 1 Pond's : 1 Laikou: 1 Dove, Garnier, Pantene: 1 Neutrogena : 1 Illiyoon : 1 Dove : 1 skin aqua: 1 cosrx: 1 illiyoon: 1 Iunik centella calming gel cream : 1 Cerave : 1 rajkonna: 1 lilac: 1 cetaphil: 1

Lotion, cream : 1 Niviya lotion: 1 Lotion: 1 vaseline. nivea,: 1 NIVEA: 1 Cosrx : 1 Meril revive: 1 Nature Hatumogi: 1

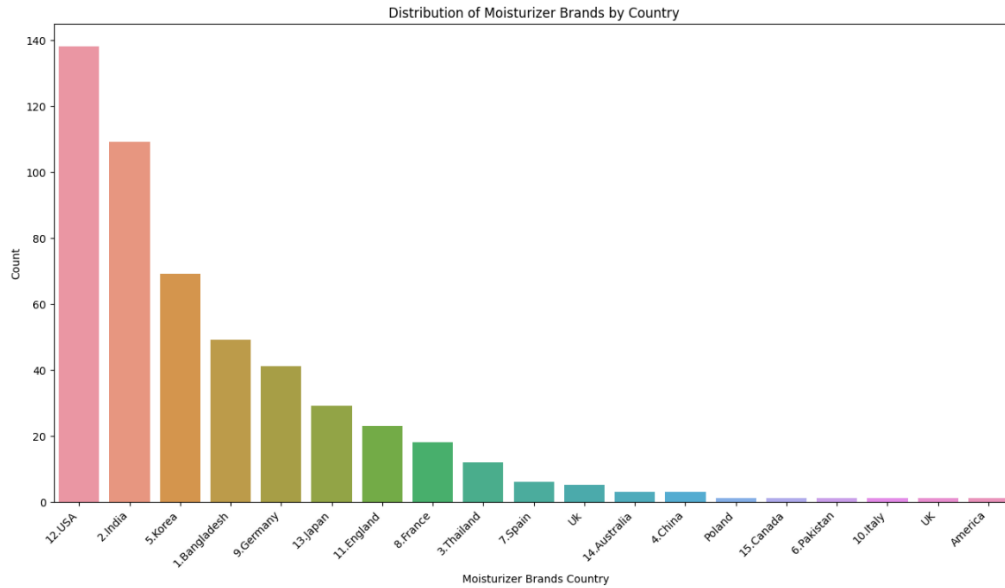The most common country of origin for moisturizer brands is the USA (27.01%).

Figure 4.3.J: Moisturizers Brand Country Distribution

And in details results is : Country Count 0   12.USA   138 1   2.India   109 2 5.Korea   69 3   1.Bangladesh   49 4   9.Germany   41 5   13.Japan   29 6 11.England   23 7   8.France   18 8   3.Thailand   12 9   7.Spain   6 10   Uk 5 11 14.Australia   3 12   4.China   3 13   Poland   1 14   15.Canada   1 15 6.Pakistan   1 16   10.Italy   1 17   UK   1 18   America   1.
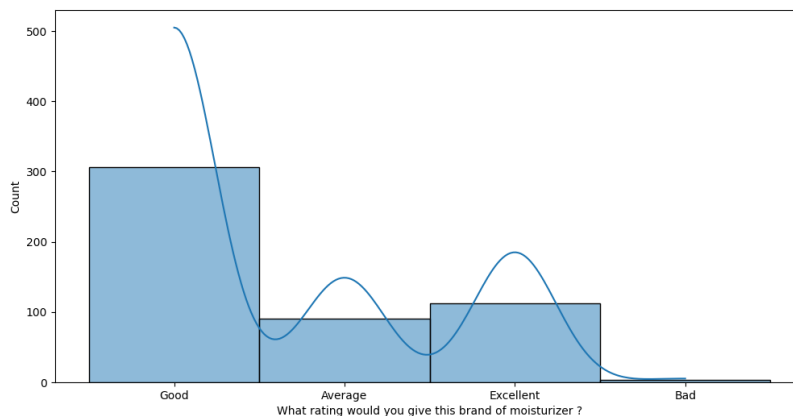

Figure 4.3.K Moisturizers Brand Rating Distribution

And the brand preferences to their uses is Good 59% Excellent 21% Average 17% Bad 0.58%

Serum Brands: Analysis of 'What cosmetics brands do you currently use for serum (gel, essence, toner)?' attribute shows:
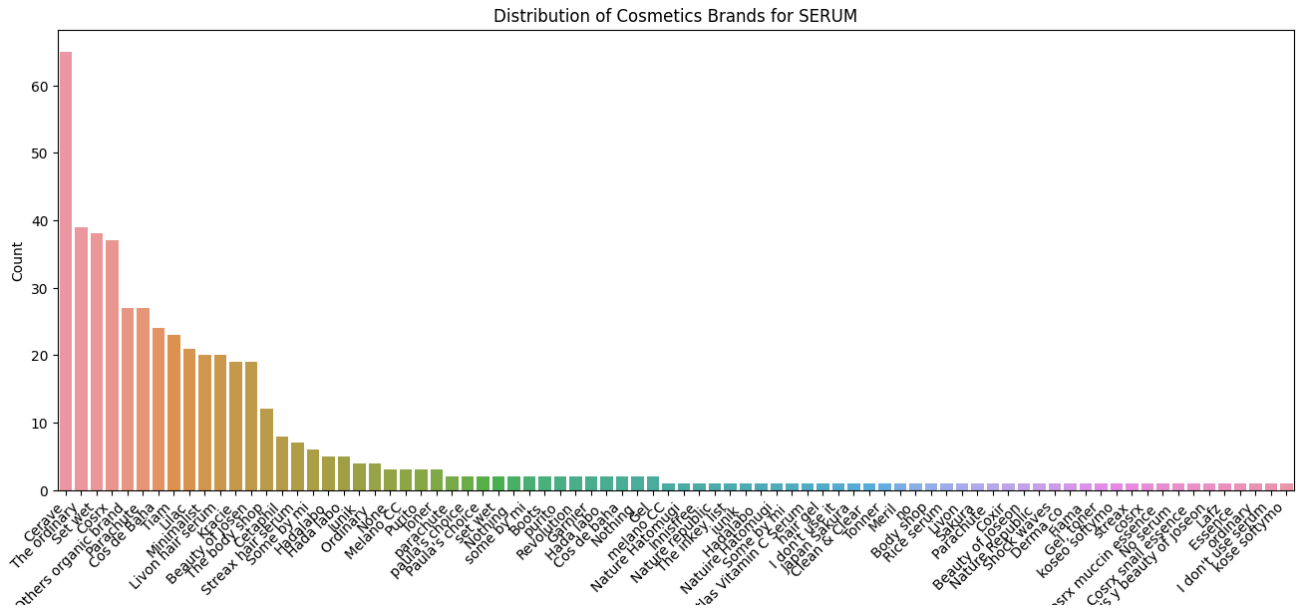

Figure 4.3.L: Serum Brand Distribution

Cerave is the most used serum brand, with a count of 65, followed by The Ordinary (39) and Set Wet (38). In details : Count of each value in the Serum Brand attribute: Cerave: 65 The ordinary: 39 Set wet: 38 Cosrx: 37 Others organic brand: 27 Parachute: 27 Cos de Baha: 24 Tiam: 23 Lilac: 21 Minimalist: 20 Livon hair serum: 20 Kracie: 19 Beauty of josen: 19 The body shop: 12 Cetaphil: 8 Streax hair serum: 7 Some by mi: 6 Hadalabo: 5 Hada labo: 5 Iunik: 4 Ordinary : 4 None: 3 Melano CC: 3 Purito: 3 Toner: 3 parachute: 2 paula's choice: 2 Paula's choice: 2 set wet: 2 Nothing : 2 some by mi: 2 Boots: 2 purito: 2 Revolution: 2 Garnier: 2 Hada labo : 2 Cos de baha: 2 Nothing: 2 Gel: 2 melano CC: 1 Nature Hatomugi: 1 Innisfree: 1 Nature republic: 1 The inkey list: 1 iunik : 1 Hadalabo : 1 Natuire Hatomugi: 1 Some by mi : 1 Blu Atlas Vitamin C Serum: 1 hair gel: 1 I don't use it: 1 Japan Sakura: 1 Clean & Clear : 1 Tonner: 1 Meril: 1 no: 1 Body shop: 1 Rice serum: 1 Livon: 1 Sakura: 1 Parachute : 1 Coxir: 1 Beauty of joseon: 1 Nature Republic : 1 Shock waves: 1 Derma co : 1 Fiama: 1 Gel, toner: 1 koseo softymo: 1 streax: 1 cosrx: 1 The

ordinary Niacinamide glycolic acid, cosrx muccin essence : 1 No serum : 1 Cosrx snail essence : 1 cosrx skin1004 axis y beauty of joseon: 1 Lafz: 1 Essence : 1 ordinary: 1 I don't use serum: 1 kose softymo: 1
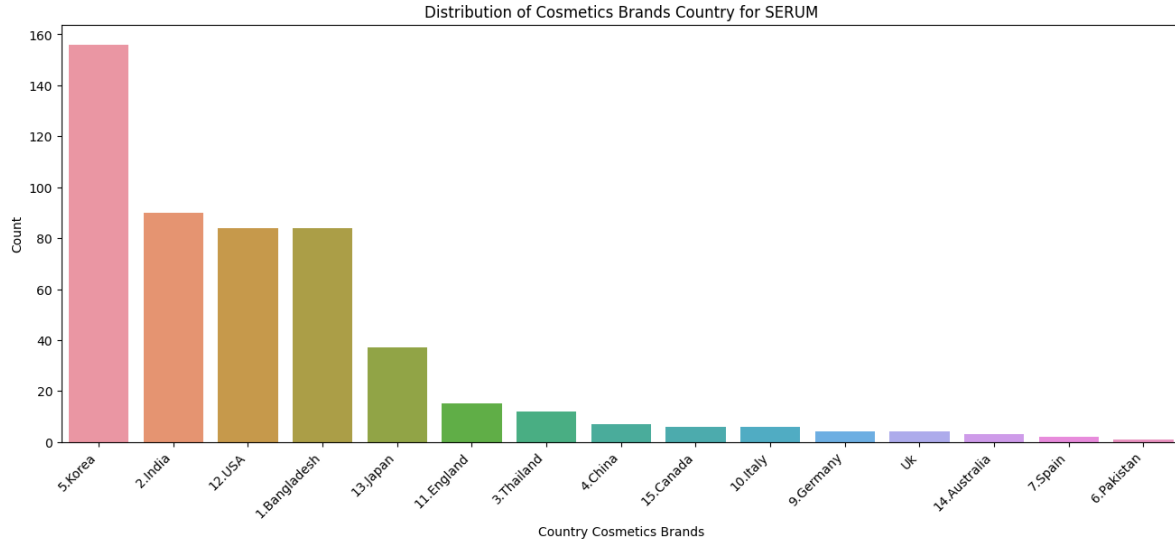

Figure 4.3.M: Serum Brand Country Distribution

The majority of serum brands are from Korea (30.53%). And accurate number is Count of each value in the   Serum country attribute: 5.Korea: 156 2.India: 90 12.USA: 84 1.Bangladesh: 84 13.Japan: 37 11.England: 15 3.Thailand: 12 4.China: 7 15.Canada: 6 10.Italy: 6 9.Germany: 4 Uk: 4 14.Australia: 3 7.Spain: 2 6.Pakistan: 1
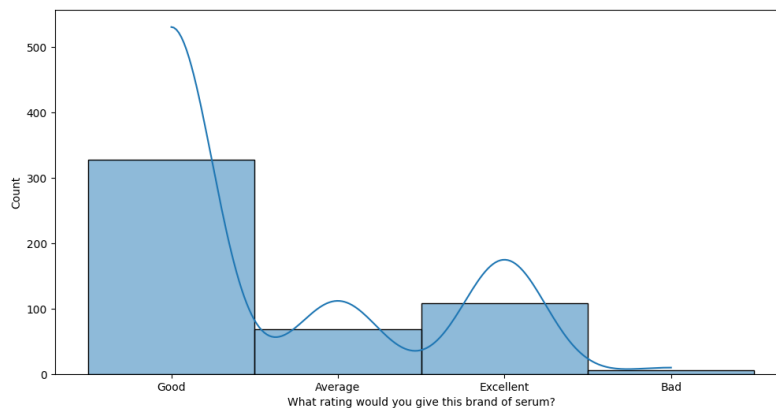

Figure 4.3.N: Serum Brand Rating Distribution

Respondents generally rate serum brands as 'Good' (64.19%) and others are Excellent 21.13% Average 13.50% Bad 1.17%.

Oils Brands: For 'What cosmetics brands do you currently use for oils?' attribute:
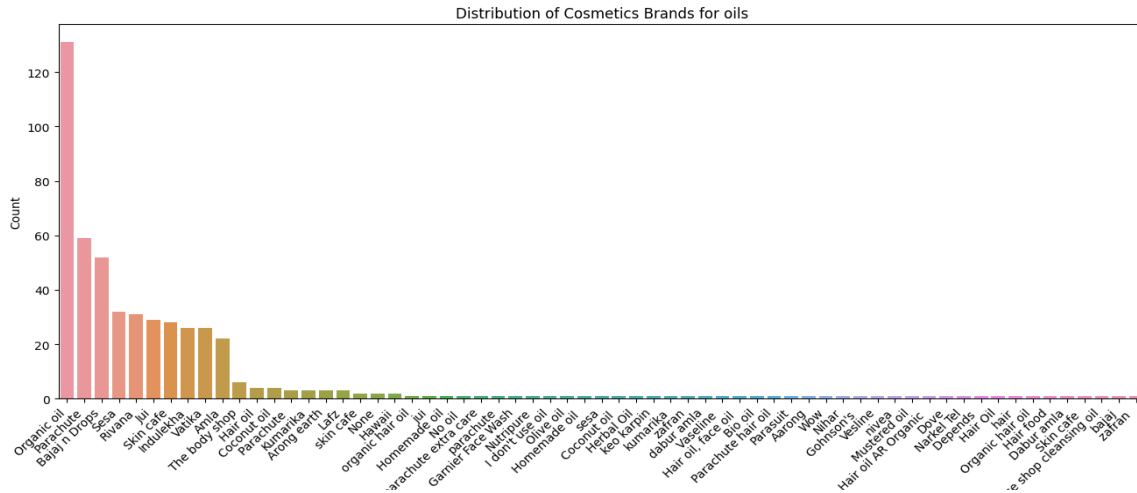

Figure 4.3.O: Oils Brand Distribution

Organic oil is the most commonly used, with a count of 131, followed by Parachute (59) and Bajaj n Drops (52). And for all others brands Count of each value in the oils brand attribute: Organic oil: 131 Parachute: 59 Bajaj n Drops: 52 Sesa: 32 Rivana: 31 Jui: 29 Skin cafe: 28 Indulekha: 26 Vatika: 26 Amla: 22 The body shop: 6 Hair oil: 4 Coconut oil: 4 Parachute : 3 Kumarika: 3 Arong earth: 3 Lafz: 3 skin cafe: 2 None: 2 Hawaii: 2 organic hair oil: 1 jui: 1 Homemade oil: 1 No oil : 1 Home made hair oil or parachute extra care: 1 parachute: 1 Garnier Face Wash: 1 Nutripure: 1 I don't use oil: 1 Olive oil: 1 Homemade oil : 1 sesa: 1 Coconut oil : 1 Herbal Oil: 1 keo karpin: 1 kumarika: 1 zafran: 1 dabur amla: 1 Vaseline : 1 Hair oil, face oil : 1 Bio oil: 1 Parachute hair oil: 1 Parasuit: 1 Aarong: 1 Wow: 1 Nihar: 1 Gohnson's : 1 Vesline: 1 nivea: 1 Mustered oil: 1 Hair oil AR Organic : 1 Dove: 1 Narkel Tel: 1 Depends : 1 Hair Oil: 1 hair: 1 Organic hair oil: 1 Hair food: 1 Dabur amla: 1 Skin cafe : 1 Face shop cleansing oil: 1 bajaj: 1 zafran : 1

The majority of oil brands are from Bangladesh (57.34%). And the accurate percentages for all countries are: Percentage Distribution of Each oil Brands by countries: 1. Bangladesh 57.338552 2.India 30.136986 3.Thailand 4.892368 5.Korea 2.935421 6.Pakistan 0.978474 7.Spain 0.782779 11.England 0.782779 15.Canada 0.587084 13.Japan 0.391389 8.France 0.195695 12.USA 0.195695 14.Australia 0.195695 10.Italy 0.195695 4.China 0.195695 9. Germany 0.195695 And the exact number of countries is
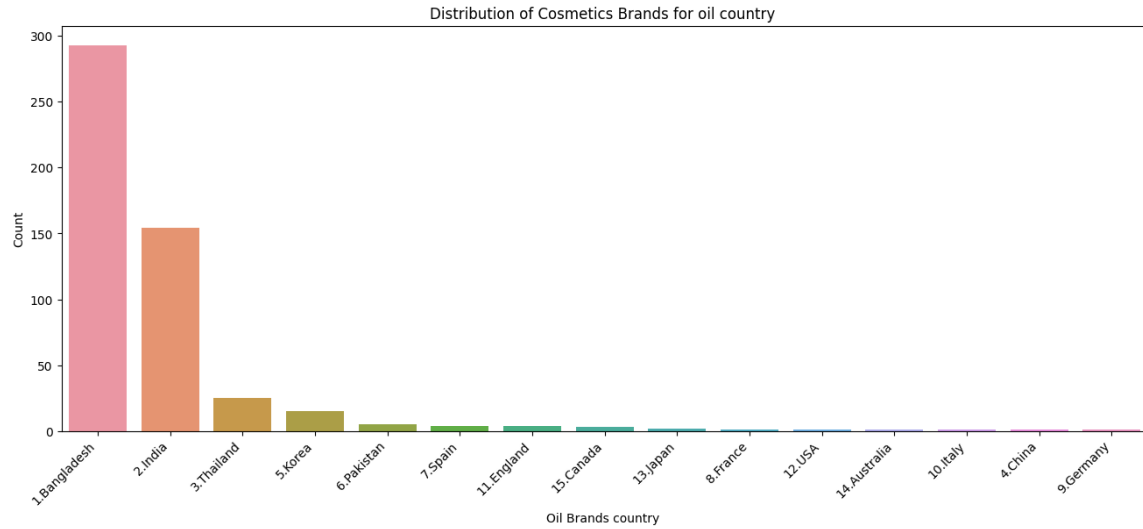
Figure 4.3.P Oils Brand Country Distribution

Count of each value in the country of oil attribute: 1.Bangladesh: 293 2.India: 154 3.Thailand: 25 5.Korea: 15 6.Pakistan: 5 7.Spain: 4 11.England: 4 15.Canada: 3 13.Japan: 2 8.France: 1 12.USA: 1 14.Australia: 1 10.Italy: 1 4.China: 1 9.Germany: 1
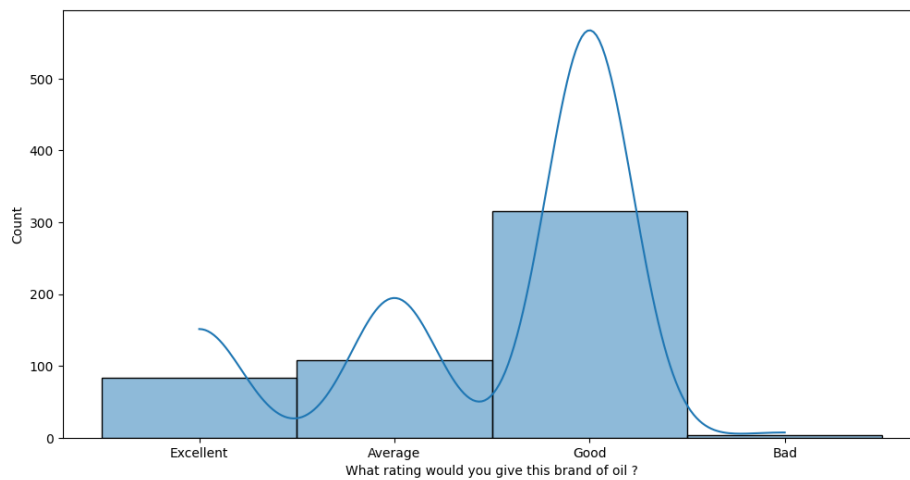

Figure 4.3.Q Oils Brand Rating Distribution

Ratings for oil brands indicate that most respondents find them 'Good' (43.83%). And in particular, others are Average 21.13% Excellent 16.43% Bad 0.78%.

These findings provide a comprehensive understanding of the respondents' preferences and habits regarding cosmetics, including age, gender, skin type, budget, and brand usage.

4.4 Discussion

Let's delve into the narrative woven by the survey data, unraveling the intricacies of cosmetic preferences among my respondents. From age nuances to gender inclinations, skin idiosyncrasies, budgetary considerations, and brand allegiances, each thread contributes to a vibrant tapestry of consumer choices in cleansers, moisturizers, serums, and oils.

Age Group: The respondents predominantly inhabit the realm of 20 to 25 years, with 23 being the epicenter of this cosmetic odyssey. This landscape is one of youthfulness, where preferences are shaped by the exuberance of emerging adulthood. For brands, this means sculpting offerings attuned to the desires of this youthful cohort.

Gender: In this narrative, a distinctive gender dynamic emerges, with the feminine force claiming approximately 73% of the protagonist's roles. The plot thickens, underscoring the need for cosmetic brands to weave narratives that embrace diverse gender perspectives. In this tale, inclusivity becomes a pivotal theme for both formulation and marketing strategies.

Skin Type: The characters in our narrative boast an array of skin types, with combination skin taking the lead, closely followed by normal, dry, and oily counterparts. This diversity paints a vivid picture of the varied canvas cosmetic formulations must cater to. Brands are challenged to create products that harmonize with the individualistic needs of each skin type.

Budget Preferences: The survey unfolds a chapter on budgetary allocations, revealing that many respondents earmark between 1000 to 5000 Taka (BDT) currency units monthly for cosmetic adventures. This financial subplot is critical for brands aiming to script tales of accessibility, prompting the creation of products that resonate across different economic strata.

Cleanser Brand Preferences: Nivea, Dove, and Simple emerge as protagonists in the cleanser saga, having captured the hearts of our respondents. These brands stand as beacons, guiding the way for others to navigate the competitive cosmetic landscape. Their popularity hints at the significance of brand reputation in this narrative.

Moisturizer Brand Preferences: Ponds, Nivea, and Cerave step into the limelight as the protagonists of the moisturizer chronicle. Their popularity suggests that in this tale, consumers seek solace in the arms of well-established brands, emphasizing the importance of trust and reliability.

Serum Brand Preferences: Cerave, The Ordinary, and Set Wet take center stage in the serum narrative. A diverse cast of characters unfolds, reflecting the eclectic preferences of our respondents. Here, the tale is one of innovation and uniqueness, as consumers seek formulations and ingredients that resonate with their skincare aspirations.

Oil Brand Preferences: Organic oil, Parachute, and Bajaj N Drops play pivotal roles in the oil saga, adorning the narrative with natural and organic hues. The rising trend of eco-conscious choices weaves through this subplot, urging brands to consider sustainable practices and ingredients in their formulations.

Country of Origin Preferences: A geographical chapter unfurls, where Bangladesh claims a significant role, followed by India and Korea. This subplot in our narrative guides both local and international brands in understanding the geographical nuances that color consumer preferences. For brands, tailoring narratives to resonate with specific locales becomes paramount.

Product Ratings: The final act of our narrative is one of satisfaction, as the majority of characters express contentment with the cleansers, moisturizers, serums, and oils they've chosen. This denouement signals a chorus of approval, reminding brands that the melody of success is composed of product quality, attentive listening to customer feedback, and an unyielding commitment to improvement.

Limitations and Implications: As with any tale, my narrative is not without its limitations. The characters, my respondents, might introduce biases, and the gender-centric plotline could be a storyline waiting for broader representation. The narrative, based on self-reported data, whispers the importance of interpretation and caution in embracing its every twist and turn.

In conclusion, the survey's storyline presents an anthology of consumer preferences, urging cosmetic brands to craft narratives that resonate with the diverse chapters of age, gender, and skin type. The protagonists demand innovation, accessibility, and trust, creating a compelling plot for success in the ever-evolving cosmetic saga.

CHAPTER 5

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

5.1 Impact on Society

Consumer Behavior and Societal Trends: The cosmetic industry, with its profound influence on societal beauty standards, plays a pivotal role in shaping consumer behavior. Our survey highlights the resonance between cosmetic preferences and age, gender, and regional demographics. Understanding these dynamics is essential for brands seeking to align their products with evolving societal norms.

Economic Implications: Consumer spending on cosmetics, as unveiled in my research, underscores a significant economic dimension. With respondents allocating substantial budgets to skincare, the cosmetic industry becomes a formidable contributor to economic activities. This financial commitment not only fuels market growth but also substantiates the industry's role in job creation and economic development.

5.2 Impact on Environment

Technology-Centric Approach and Environmental Neutrality: In delineating the impact of my research on the environment, it is imperative to underscore the inherent eco-friendliness of my methodology. The entirety of my study, from data collection to analysis, is deeply rooted in technology, ensuring a minimal environmental footprint. The absence of physical resources and the reliance on virtual platforms such as [7] Google Forms for data collection and Colab for analysis contribute to an inherently sustainable process.

Negligible Energy Consumption and Environmental Resilience: The core of our research lies in the digital realm, executed with utmost efficiency and negligible energy consumption. The exclusive use of a personal computer for data analysis through Python in the Colab platform ensures that the environmental impact is minimal. The energy consumption is so low that it can be considered inconsequential, with no discernible effect

on the environment. This underscores the environmentally resilient nature of our research, highlighting its alignment with sustainable practices.

Electricity Utilization and Green Computing: The consumption of electricity during the research process is a vital consideration. Our approach embraces the principles of green computing, ensuring that the electricity used for data analysis is optimized and ecologically responsible. By utilizing energy-efficient computing practices, I contribute to the broader narrative of technology's role in environmental conservation, emphasizing the negligible ecological consequences of our research.

5.3 Ethical Aspects

Pioneering Cruelty-Free Practices: Ethical considerations take center stage in my study, particularly in the context of using data. The Product Purchasing Sentiments Analysis reveals a shifting consumer preference toward cruelty-free products. By employing advanced analytics with Colab and Python, I navigate the nuanced landscape of ethical choices, showcasing the potential for brands to align with evolving consumer values through the adoption of cruelty-free practices.

Fair Trade and Social Responsibility: My research goes beyond the surface, exploring the ethical dimensions of fair trade practices and social responsibility within the cosmetic industry. The data-driven narrative unravels consumer perceptions, demonstrating an increased awareness of the socioeconomic impact of cosmetic production. I advocate for brands to proactively engage in fair trade and socially responsible initiatives, drawing a direct connection between ethical practices and positive consumer sentiment.

5.4 Sustainability Plan

Data-Driven Formulation for Sustainable Skincare: The essence of sustainability lies in informed decision-making. My analysis calls for a reevaluation of formulation and ingredient choices based on data-driven insights. By utilizing Colab and Python, I unravel consumer preferences for organic and environmentally friendly products. Cosmetic brands can leverage this information to pioneer sustainable skincare solutions, aligning their formulations with the evolving preferences of the Bangladeshi consumer.

Catalyzing Change through Corporate Social Responsibility: A sustainable future necessitates a robust Corporate Social Responsibility (CSR) framework. My research underscores the importance of CSR initiatives, and I present a roadmap for brands to align with consumer values effectively. By harnessing the power of data analytics through Colab and Python, I advocate for meaningful initiatives in environmental conservation and community welfare, empowering cosmetic brands to make a positive impact on society.

In the realm of Bangladeshi cosmetic brands and beauty products, my Product Purchasing Sentiments Analysis acts as a trailblazing endeavor. By combining advanced analytics with Colab and Python, I illuminate the intricate interplay between consumer choices, societal impact, ethical considerations, and a technology-centric approach that ensures a minimal environmental footprint. This chapter marks a pivotal moment in reshaping the narrative of cosmetic brands, empowering me to make informed decisions that resonate with the values and preferences of the Bangladeshi populace.

CHAPTER 6

SUMMARY, CONCLUSION, RECOMMENDATION AND IMPLICATION FOR FUTURE RESEARCH

6.1 Summary of the Study

This research embarked on a comprehensive exploration of consumer sentiments and preferences in the Bangladeshi cosmetic market. The study unfolded through a meticulous analysis of diverse factors, including age distribution, gender preferences, skin types, budget allocations, and brand choices across various cosmetic categories. The findings provided valuable insights into the demographic landscape, economic considerations, and consumer behavior within the dynamic cosmetic industry.

Key highlights of the study include:

Demographic Diversity: The age distribution revealed a diverse demographic, with a concentration of respondents in their early 20s. This suggests a significant interest in cosmetics among the younger population in Bangladesh.

Gender Inclusivity: While the majority of respondents were female, the presence of a notable number of male respondents indicates a changing landscape in the cosmetics market, urging brands to adopt more inclusive approaches in product development and marketing.

Skin Type Preferences: The prevalence of combination skin among respondents emphasizes the importance of developing cosmetic products that cater to diverse skin types, with a focus on multifunctional solutions.

Economic Considerations: The budget distribution highlighted a moderate willingness among consumers to allocate funds for cosmetic purchases. Brands can leverage this information to strategically position their products for accessibility.

Brand Preferences: Nivea, The Body Shop, Maybelline, and Sunsilk emerged as prominent brands in the cleansers, facial moisturizers, makeup, and hair care categories,

respectively. Additionally, products from the USA were commonly preferred, indicating the global influence on consumer choices.

Purchase Patterns: Most respondents indicated a monthly frequency in cosmetic purchases, with a preference for physical stores over online platforms. Factors such as brand reputation, product reviews, and ingredients played pivotal roles in influencing purchase decisions.

6.2 Conclusion

In conclusion, this study provides a comprehensive snapshot of the Bangladeshi cosmetic market, elucidating the diverse factors that influence consumer behavior. The findings underscore the need for cosmetic brands to tailor their strategies to the specific demographics, economic considerations, and preferences prevalent in the market. The evolving dynamics, such as the growing inclusivity of male consumers and the influence of global brands, present both challenges and opportunities for stakeholders in the cosmetic industry.

The study also sheds light on the significance of data analysis technology so that companies can use it more often to achieve a broader shade range of products based on consumer sentiment, competitive pricing strategies, and transparent communication about product effectiveness. By understanding and adapting to these dynamics, cosmetic brands can establish stronger connections with their target audience and foster brand loyalty.

6.3 Implications for Further Study

While this research provides valuable insights, there are avenues for further exploration and refinement of understanding within the Bangladeshi cosmetic market. Future studies could consider the following:

In-Depth Consumer Interviews: Conducting in-depth interviews with consumers can provide qualitative insights into the motivations, perceptions, and experiences that drive cosmetic purchasing decisions.

Cultural Influences: Exploring the impact of cultural factors on cosmetic preferences and choices can offer a nuanced understanding of consumer behavior in the context of Bangladesh.

Sustainability and Ethical Considerations: Investigating the influence of sustainability and ethical considerations on consumer choices, as awareness in these areas is growing globally.

Market Dynamics Post-COVID-19: Considering the impact of the COVID-19 pandemic on consumer behavior and the cosmetic market, with a focus on emerging trends and shifts in purchasing patterns.

Digital Marketing Trends: Analyzing the role of emerging digital marketing trends, such as influencer marketing and e-commerce, in shaping consumer perceptions and preferences.

By delving deeper into these areas, future research endeavors can contribute to a more nuanced and up-to-date understanding of the ever-evolving landscape of the cosmetic industry in Bangladesh.

APPENDIX

As I worked on this project, encountering challenges and making crucial decisions were integral parts of the process. Selecting the most suitable programs and technologies was paramount for the success of the research. Opting for Data analysis and utilizing Python required a deep understanding of both domains, demanding continuous learning and adaptation.

The task of collecting and organizing a vast dataset proved more challenging than anticipated. Navigating through the intricacies of data acquisition and organization required meticulous attention to detail and perseverance. Despite the initial difficulties, the journey concluded successfully, with the set goal achieved after a significant investment of time and effort.

Research Background and Objective:

Research Background: This research paper serves as a pivotal component of my final defense, marking an essential milestone in completing my BSc in Computer Science and Engineering. The endeavor spans over six months, encompassing rigorous exploration and analysis of consumer sentiments in the Bangladeshi cosmetic market.

Objective: The primary objective of this research is to gain insights into consumer behavior and preferences within the dynamic landscape of the Bangladeshi cosmetic market. By employing machine learning techniques and Python programming, the research aims to unravel patterns, trends, and key factors influencing consumer choices.

Research Journey: The journey commenced with the initiation of the title defense, extending over several months until December 2023. Active engagement and commitment to the research process were particularly pronounced during the early stages of the title defense, reflecting a dedicated and extended effort in pursuit of comprehensive findings.

Methodology and Tools: The research methodology involved a systematic approach, encompassing the following steps:

Data Collection: Employing Google Forms to gather responses from a diverse demographic of consumers in Bangladesh.

Data Preprocessing: Rigorous preprocessing of collected data to ensure its accuracy, completeness, and readiness for analysis.

Data Analysis: Utilizing Python programming, specifically in the Google Colab environment, to perform intricate data analysis and derive meaningful insights.

Result Generation: Executing code analysis to present findings through numerical values, visual representations, and comprehensive discussions.

This methodology, characterized by its clarity and efficiency, enabled a seamless progression through the research phases.

Research Outcome:

The research culminated in a comprehensive understanding of consumer behavior and preferences in the Bangladeshi cosmetic market. Key outcomes include:

Demographic Insights: Detailed insights into the age distribution, gender preferences, and skin types prevalent among cosmetic consumers.

Economic Considerations: Understanding the budgetary allocations and purchasing patterns of consumers in the cosmetic industry.

Brand Preferences: Unveiling the preferred brands across various cosmetic categories, shedding light on factors influencing consumer choices.

Challenges and Opportunities: Identifying challenges faced by consumers in the cosmetic market and presenting opportunities for improvement and innovation.

Overall, the research outcomes contribute to the broader narrative of consumer preferences, providing valuable insights for cosmetic brands aiming to navigate the ever-evolving landscape of the Bangladeshi market.

REFERENCES

[1] Hossain, M. A., & Hossain, M. S. (2022). Consumer sentiment analysis of cosmetic brands on social media in Bangladesh: A comparative study of Dhaka and Chittagong. International Journal of Marketing and Public Relations, 5(4), 73-88.

[2] Islam, T., & Jahan, A. (2021). The influence of influencer marketing on purchase decisions for cosmetic products in Bangladesh. Journal of Global Marketing, 34(4), 147-162.

[3] Islam, M. M., & Islam, M. S. (2020). A text mining approach to analyze consumer perception of online cosmetic reviews in Bangladesh. International Journal of E-Commerce and Digital Marketing, 8(2), 154-170.

[4]. Akhter, J., & Al Mamun, A. (2019). Exploring consumer purchasing behavior towards cosmetic products in emerging markets: A case study of Bangladesh. Qualitative Market Research: An International Journal, 22(8), 896-912.

[5] Sharma, P., & Islam, A. (2018). Sentiment analysis of online beauty product reviews in developing countries: A comparative study of India and Bangladesh. International Journal of Business and Information Management, 9(2), 107-126.

[6] Google Colab. (n.d.). Retrieved from https://colab.research.google.com/

[7] Google Form. (n.d.). Retrieved from https://docs.google.com/forms/

[8] Python visualization histogram. (n.d.). Retrieved from

https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.hist.html

[9] Python Software Foundation. (2023). Python language reference. Retrieved from

https://docs.python.org/3/reference/index.html

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