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ANALYZING CONSUMER RETENTION AND BRAND SWITCHING BEHAVIOR IN THE MOBILE PHONE INDUSTRY USING MARKOV CHAINS

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Abstract: Consumer loyalty plays a vital role in determining brand sustainability and competitive advantage, particularly in dynamic sectors such as mobile phones. This study applies the principles of Markov chain modeling to estimate and analyze consumer loyalty by examining brand-switching behavior over time. Transition probability matrices were constructed based on survey data collected from a representative sample of consumers. These matrices facilitated the identification of steady-state probabilities, which represent long-term loyalty levels associated with each brand. The analysis reveals significant differences in brand retention rates between the two product categories, highlighting consumer behavior trends and brand-switching tendencies. The findings underscore the effectiveness of Markov chains as a predictive tool in marketing analytics and provide valuable insights for brand managers aiming to enhance customer retention and loyalty strategies.

Keywords: Consumer loyalty, Markov chain, brand switching, transition matrix, mobile phone brands, customer retention.

I.INTRODUCTION:

Products and brands today face intense competition, driven by rapid technological advancements and increasingly innovative marketing and promotional strategies from companies across the board. As a result, markets are becoming more crowded and competitive, with brand rivalry growing fiercer than ever. Alongside traditional methods, the digital era has reshaped how promotion works—digital platforms now dominate the marketing landscape, offering countless opportunities for brands that are prepared to leverage them.

In most product categories, only a few brands manage to stand out and earn consistent consumer preference. Consumers tend to favor specific brands, but various factors can lead to dissatisfaction. These may stem from the product itself such as a mismatch between advertised features and actual performance or from external influences. This issue is often described by the phrase, “over-promise and under-deliver,” where brands raise consumer expectations through advertising but fail to meet them in practice. On the other hand, if a brand promotes its product honestly and delivers what it promises, consumer satisfaction tends to increase.

Customers are more forgiving when a brand sets realistic expectations and delivers accordingly. While consumers desire high-quality products at fair prices, availability also plays a crucial role. If a product becomes hard to find, customers may become dissatisfied and switch to competitors. External factors such as changing trends or influence from peers can also affect brand loyalty. People often trust the recommendations of those they respect and may choose a product based on what friends, family, or influencers are using, rather than relying solely on advertisements.

Consumer loyalty plays a big role in brand preference. While they may try competing products, consumers often return to the brand that best meets their expectations. Brand preference is shaped not just by product quality but also by how well it fits into the consumer’s lifestyle and circumstances. Price sensitivity, or price elasticity of demand, also influences consumer behavior. It reflects how changes in price impact the demand for a product. For instance, in industries like mobile phones, brands must carefully manage pricing, as consumers today are quick to switch if they feel they’re not getting value for money. Even when a brand is familiar and trusted, a perceived imbalance between price and quality can lead to customer loss.

Contrary to popular belief, simply lowering prices is not always the solution. In fact, discounts and price cuts may introduce new challenges rather than solving existing ones. When faced with too many choices, consumers often revert to trusted brands to avoid risk. Familiarity and emotional connection with a brand often outweigh the lure of cheaper alternatives.

Brand loyalty plays a crucial role in consumer decision-making. Strong brands provide customers with a sense of certainty and are often seen as prestigious assets. A brand with solid equity can withstand competition and maintain its market presence over time. Consumers today have a wide range of choices, and brands must work hard to differentiate themselves and remain relevant [1].

In the mobile phone market, for example, many brands offer similar features, making it harder for consumers to distinguish between them. Popular brands include:Samsung**,** OnePlus, Realme**,** Oppo, Vivo, Redmi, Nokiaand Others.

II. DATA SET:

The dataset for this study was obtained from a sample of approximately 150 respondents, comprising college students, their family members, and staff. The participants ranged in age from 18 years to over 55 years. Data collection was carried out using a structured Google Form, which gathered information on the participants’ current mobile phone brand usage. Additionally, respondents were asked to indicate which brand they would prefer if they were to switch from their current brand. This dataset serves as the basis for analyzing consumer brand loyalty in the mobile phone market.

III. METHODOLOGY:

The primary objective of the data analysis is to investigate and interpret the patterns of **brand switching behavior** among mobile phone consumers, specifically within a population consisting of students and staff members. The analysis seeks to identify the tendency of individuals to switch from one brand to another in both product categories, and to understand the underlying factors influencing these transitions.

A **descriptive analysis** approach is employed to explore the switching patterns from one mobile phone or coffee brand to another. The **magnitude of transition opportunities** is quantified using a **transition probability model**, represented by the following equation:

The transition probability from one brand to another is calculated using the following equation:

$$P_{ij} = n_{ij}(t) / n_i(t)$$

Where:

- P_{ij} = Probability of switching from brand i to brand j
- $n_{ij}(t)$ = Number of consumers who moved from brand i to brand j during time t
- $n_i(t)$ = Number of consumers using brand i at the beginning of time t [2]

3.1 Factors Influencing Brand Switching

In addition to tracking transitions, the study also examines the factors influencing consumer decision-making in brand selection and switching. This includes analyzing the reasons cited by respondents when changing brands, such as price, availability, peer influence, perceived quality, and satisfaction.Descriptive statistics were used to tabulate brand choices and preferences, and the proportion of users for each brand was computed using percentage comparisons relative to the total number of respondents.

3.2 Market Share Projection Using Markov Chain Model

To forecast the future market share of each brand, a Markov Chain model was applied. This model predicts brand market share in the next period based on current market share and transition probabilities. The formula used is:

$$\mathbf{M_{(t)} = MK_{(t-1)} \times P}$$

Where:

- MK(t) = Market share in the subsequent period
- MK(t-1) = Market share in the current period
- P = Transition probability matrix

This model enables the prediction of how brand dynamics might evolve over time, assuming that the switching behavior remains consistent. The analysis thus provides a dynamic view of consumer loyalty and the competitive position of each brand.

IV. RESULTS AND DISCUSSION

4.1 Characteristics of Respondents

The characteristics of respondents include key socio-economic variables such as age, educational status, and income. The distribution of respondents by age group is presented in Table 1 below.

Table 4.1: Age-wise Distribution of Respondents

Age Group	Number of Respondents	Percentage (%)
18 – 24	64	42.7
25 – 29	35	23.3
30 – 34	13	8.7
35 – 39	17	11.3
40 – 44	11	7.3
45 – 49	1	0.7
50 – 54	8	5.3
Above 55	1	0.7
Total	150	100.0

4.2 Pattern of Mobile Phone Brand Switching

Consumer behavior in the mobile phone market reveals a dynamic pattern of brand switching. Table 2 presents a comparison of the number of consumers currently using each brand with those who used the same brand in the past (defined as one year prior), as well as the number of consumers who switched from or to a particular brand.

Table 4.2: Brand-wise Consumer Switching Pattern in the

Brand	Past Users	Current Users	Switching Incidents
Samsung	26	25	35
Oneplus	10	22	24
Realme	17	19	4
Oppo	21	30	17
Vivo	24	26	13
Redmi	29	14	2
Nokia	12	2	3
Others	11	12	25
Total	150	150	123

Mobile Phone Market

In addition to the increase in consumers gained from other brands, the following table also presents data on consumers who have switched away from various mobile phone brands to alternative options.

Brand /Additionofotherbrands								
Brands	**Samsung**	**Oneplus**	**Realme**	**Oppo**	**Vivo**	**Redmi**	**Nokia**	**Others**
Samsung		4	1	0	2	1	1	8
Oneplus	5		0	4	1	0	0	8
Realme	8	6		2	1	0	0	0
Oppo	9	6	1		4	0	0	7
Vivo	5	4	1	8		1	1	1
Redmi	2	4	1	2	3		0	1
Nokia	1	0	0	0	0	0		0
Others	5	0	0	1	2	0	1	
Total	35	24	4	17	13	2	3	25

Table4.3:Consumer swhoswitch to other brand sin different Mobile Phone

From	To								
Brand	**Samsung**	**Oneplus**	**Realme**	**Oppo**	**Vivo**	**Redmi**	**Nokia**	**Others**	**Past**
Samsung	8	4	1	0	2	1	1	8	25
Oneplus	5	4	0	4	1	0	0	8	22
Realme	8	6	2	2	1	0	0	0	19
Oppo	9	6	1	3	4	0	0	7	30
Vivo	5	4	1	8	5	1	1	1	26
Redmi	2	4	1	2	3	1	0	1	14
Nokia	1	0	0	0	0	0	1	0	2
Others	5	0	0	1	2	0	1	3	12
Current	43	28	6	20	18	3	4	28	150

Table4.4: Brand Switching Pattern

Brand switching patterns reflect the dynamic nature of consumer preferences. Tables 2 and 3 show the frequency of consumers moving from one mobile phone brand to another. These transitions highlight which brands gain or lose market share through substitution effects. The switching behavior is further summarized in Table 4, which cross-tabulates past and current brand usage.

4.3 Reasons for Consumers Choosing and Switching Brand:

Table4.5: MobilePhoneBrandsandNumberofConsumers.

Brand	**Current**	**Proposition(in%)**
Samsung	43	28.67
Oneplus	28	18.67
Realme	6	4
Oppo	20	13.33
Vivo	18	12
Redmi	3	2
Nokia	4	2.66
Others	28	18.67
Total	150	100

Reasons	**Qty**	**Percentage**
Better Performance	50	40.65
ImprovedCameraQuality	10	8.13
BatteryLife& FastCharging	7	5.69
BetterValue forMoney	24	19.51
InnovativeFeatures	8	6.50
Others	24	19.51
Total	123	100

Table 4.6: Consumers Reason Switch to Mobile Phone Brand.

Table 5 outlines the current distribution of mobile phone brand usage, revealing that Samsung leads the market with 28.67% of users, followed by Oneplus and a notable share attributed to 'Others'. The reasons for switching, summarized in Table 6, include better performance (40.65%), better value for money (19.51%), and various other technological and functional enhancements. These factors strongly influence consumers' decisions to change brands.

4.4 Market Share Analysis of Current Mobile Phone

Based on the results of data processing,the authors obtained information on the amount of initial market share by each Mobile Phone brands. Table 6 describes the size and market share of each Mobile Phone brands. Then this initial market share is used as a reference for further calculations. The initial market share of Mobile Phone brands is presented in the following table.

Brand	**Current**	**MarketSharein(%)**
Samsung	43	28.67
Oneplus	28	18.67
Realme	6	4
Oppo	20	13.33
Vivo	18	12
Redmi	3	2
Nokia	4	2.66
Others	28	18.67
Total	150	100

Table4.7:Market-share of current

4.5Predicted Market Share of Mobile Phone with Markov Chain

It is a method that studies the properties of a variable in the present-based on the past traits as an effort to assess the properties of those variables in-the future.In Markov's analysis, the result is probabilistic information that can be used to assist decision-making, this analysis is not an optimization technique but a descriptive technique. The assumptions in the Markov Chain relate to the transitional state which is as follows:

1. The number of state transition probabilitiesis
2. The transition probability does-not changeover
3. The transition probability depends only on the current status,not the period The calculation of transition probabilities is presented in the following table.

Table 4.8:Probability of Brand Switching of Mobile Phone

	From					To		
Brand	Samsung	Oneplus	Realme	Oppo	Vivo	Redmi	Nokia	Others
Samsung	0.32	0.16	0.04	0.00	0.08	0.04	0.04	0.32
Oneplus	0.23	0.18	0.00	0.18	0.05	0.00	0.00	0.36
Realme	0.42	0.32	0.11	0.11	0.05	0.00	0.00	0.00
Oppo	0.30	0.20	0.03	0.10	0.13	0.00	0.00	0.23
Vivo	0.19	0.15	0.04	0.31	0.19	0.04	0.04	0.04
Redmi	0.14	0.29	0.07	0.14	0.21	0.07	0.00	0.07
Nokia	0.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00
Others	0.42	0.00	0.00	0.08	0.17	0.00	0.08	0.25
Market Share	0.29	0.19	0.04	0.13	0.12	0.02	0.03	0.19

Predicted market share in thefirst, second and-third periods for each Mobile Phone brands are illustrated in the following table:

Brand	Currentin(%)	Period 1in(%)	Period2-3in (%)	Averagein(%)
Samsung	28.67	31.2	32.42	30.76
Oneplus	18.67	14.3	12.66	15.21
Realme	4	2.61	2.41	3.01
Oppo	13.33	10.68	9.52	11.18
Vivo	12	11.09	11.31	11.47
Redmi	2	1.78	1.81	1.86
Nokia	2.66	4.66	5.94	4.42
Others	18.67	24.4	24.23	22.43
Total	100	100	100	100

Table4.9: Market Share Prediction Upcoming Years

Based on the initial market shares (Table 7), a Markov Chain model was applied to forecast future brand dominance. Transition probability matrices (Table 8) were constructed from observed switching behavior. The transition matrix P was used to predict market share in subsequent periods using the equation:

$MK(t) = MK(t-1) \times P$

Here, MK(t) represents the predicted market share at time t, MK(t−1) is the initial market share vector, and P is the transition probability matrix.

The predicted market shares for the first, second, and third periods are provided in Table 9. The analysis indicates that Samsung and 'Others' are expected to experience significant growth in market share, while brands like Oneplus and Oppo may see a relative decline. Nokia, despite its lower starting share, shows a projected increase in future periods.

RESULT:

The findings indicate that a significant proportion of consumers switch to Samsung mobile devices, while a majority of existing Samsung users demonstrate strong brand loyalty by continuing with the same brand.

V. CONCLUSION:

This study has examined the patterns of mobile phone brand switching among students and staff in Medan, focusing on current brand usage, switching behavior, consumer preferences, and projected market share using a Markov Chain model. The results reveal that brand loyalty varies significantly across brands**, with-Samsung** emerging as the most preferred brand**,** attracting new users while retaining the majority of its existing consumers.

The primary factors influencing brand switching include performance, value for money, camera quality, battery efficiency, and innovative features**.** These insights suggest that consumers are not only price-sensitive but also highly responsive to technological improvements and product reliability. The transition probability analysis further highlights that while some brands lose users to competitors, others, such as Samsung and the 'Others' category, are projected to gain market share over time.

The Markov Chain analysis effectively demonstrates the shifting dynamics in consumer behavior, with projected growth in market share for a few brands and decline for others. These trends underscore the importance of maintaining product quality, aligning marketing strategies with consumer expectations, and fostering brand trust.

In summary, brand switching is a multifaceted phenomenon influenced by both product attributes and market perception. Brands that consistently deliver quality and innovation while managing customer expectations are more likely to retain consumer loyalty and sustain long-term market competitiveness.

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