



RESEARCH ARTICLE

Brand competitiveness and consumer preference towards milk and milk-based products Multi-Dimensional Scaling (MDS)

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Abstract

This study investigates brand competitiveness and consumer preferences for milk and milk-based products like curd, ghee, butter, sweets, paneer, etc. utilizing Factor Analysis and Multi-dimensional Scaling (MDS) to provide insights into key dimensions influencing brand perception. Factor Analysis identified five critical dimensions that together explain 70.67% of the total variance in brand competitiveness. These dimensions include Best Brand and Customer Satisfaction (18.25%), Quality, Brand Trust and Awareness (14.47%), Price-Value Perception, Availability and Packaging (14.14%), New Products and Health/Nutrition (12.56%) and Loyal Customers and Recommendations (11.23%). The findings emphasize that Brand Reputation, Customer Satisfaction, Quality and Brand Trust are crucial in shaping brand competitiveness, underscoring the importance of meeting consumer expectations. In parallel, MDS analysis mapped consumer perceptions of eight milk brands, highlighting those brands like Tirumala, Sreeja and Sri Venkateswara are positively viewed in terms of value and taste. Conversely, brands such as Vijaya, Arokya, Heritage and Dodla received lower ratings; this suggests a gap between their price and quality or taste of their offerings. These insights are valuable for brands aiming to enhance their market position and align more closely with consumer preferences.

Keywords

brand competitiveness; factors; milk; Multi-Dimensional Scaling (MDS)

Introduction

The dairy industry plays a crucial role in the global food economy, with milk and milk-based products being staples in the diet of millions. The increasing competition among dairy brands has intensified the need for companies to build strong brand identities and differentiate themselves to capture consumer loyalty. Brand competitiveness in the dairy industry is determined by various factors such as product quality, price, packaging, advertising and distribution strategies (1). Consumer perception, on the other hand, shapes purchasing decisions and brand preferences. It is influenced by factors like trust, nutritional value and the overall image of the brand. In particular, consumers today are increasingly concerned about health, sustainability and ethical practices, which affect how they perceive milk and its value-added products (2). Understanding the interplay between brand competitiveness and consumer perception is essential for businesses to thrive in this dynamic and evolving market.

Several studies have examined the influence of brand competitiveness and consumer perception on purchasing behavior in the dairy sector. For instance, research has shown that brands that prioritize quality, sustainability and health

benefits tend to be more successful in attracting and retaining consumers (3). Similarly, consumer preferences for milk products are often shaped by their perceptions of their nutritional value, ethical sourcing and eco-friendly packaging (4). This paper aims to explore the relationship between brand competitiveness and consumer perception, focusing on how these factors influence consumer behaviour in the milk and dairy market. By examining both historical trends and current challenges, this study fills a gap in existing research on consumer-driven branding in the dairy sector.

Materials and Methods

In this study, Chittoor district of Andhra Pradesh was chosen for its significant contribution to dairy production and its key role in the state's agricultural sector. The convenience sampling method was used to collect the data from 100 consumers through a structured questionnaire (5).

Percentage analysis

Percentage analysis was employed to assess the demographic characteristics of the sample population, including age, gender, education, marital status,

$$\text{Percentage Analysis} = \frac{\text{No. of samples taken}}{\text{Total No. of samples taken}} \times 100$$

occupation and income. The formula for percentage analysis is given by (6):

Factor analysis

Factor analysis is a statistical method used to reduce many observed variables (X1, X2... Xk) into a smaller number of underlying factors, thereby simplifying the analysis and revealing relationships among the variables. The equation represents the relationship between each observed variable (Xi) and the underlying common and unique factors. The variables are modeled as a linear combination of both the common and unique factors.

$$X_i = A_{i1}F_1 + A_{i2}F_2 + A_{i3}F_3 + \dots + A_{im}F_m + V_iU_i$$

Where,

X_i = i^{th} Standardized variable

A_{ij} = Standardized multiple regression coefficient of variable i on common factor j

F = Common factor

V_i = Standardized regression coefficient of variable i on unique factor i

U_i = Unique factor for variable i

m = Number of common factors

The observed variables are represented as a linear combination of the common factors, with distinct elements being unrelated to both the common factors and each other.

$$F_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \dots + W_{ik}X_k$$

Where,

F_i = Estimate of i^{th} factor

W_i = Weight or factor score coefficient

K = Number of variables

$X_1, X_2, X_3 \dots X_k$ = Factors

Multi-Dimensional Scaling (MDS)

MDS was used to analyze consumer perceptions of milk and milk-based products from a firm in Chittoor, Andhra Pradesh. MDS (Multidimensional Scaling) was used to visualize consumer perceptions of similarity and dissimilarity based on attributes like taste, quality and packaging. The method translates subjective judgments into spatial distances, grouping similar brands closer together and highlighting differences between those further apart. This approach offers valuable insights into brand positioning and consumer preferences, helping to understand competitive dynamics in the milk market. Based on consumers' similarity and dissimilarity judgments, the analysis was conducted using IBM SPSS Software 2022, helping visualize and interpret these perceptions effectively.

Results and Discussion

Table 1 denotes the demographic characteristics of the respondents. The age distribution reveals that 50% of respondents are in the 15-24 age group, followed by 28% in the 25-34 age group. The representation of older age groups is smaller, with 7% aged 35-44, 4% aged 45-54 and 11% aged 55 and above. Gender is nearly balanced, with 55% males and 45% females. Marital status indicates 57% are unmarried and 43% are married. Regarding education, 3% of respondents are

Table 1. Demographic characters of the respondents

S. No.	Particulars	Respondents	Percentage
1.	Age		
	15-24	50	50
	25-34	28	28
	35-44	7	7
	45-54	4	4
	Above 55	11	11
	Total	100	100
2.	Gender		
	Male	55	55
	Female	45	45
	Total	100	100
3.	Marital Status		
	Unmarried	57	57
	Married	43	43
	Total	100	100
4.	Education		
	Illiterate	3	3
	Primary School	17	17
	Secondary	34	34
	Graduation	16	16
	Post Graduation	30	30
	Total	100	100
5.	Annual Income (Rs)		
	Below 20000	12	12
	20000-40000	43	43
	40000-60000	18	18
	60000-80000	20	20
	Above 80000	7	7
	Total	100	100

illiterate, 17% completed primary education, 34% have secondary education, 16% are graduates and 30% hold postgraduate degrees. Income-wise, 12% earn below Rs.20000, 43% earn Rs.20000-Rs.40000, 18% earn Rs.40000-Rs.60000, 20% earn Rs.60000-Rs.80000 and 7% earn above Rs.80000.

Brand competitiveness

The brand competitiveness of the case firm's milk products was assessed using a 5-point Likert scale across 12 items. Factor Analysis, with a KMO value of 0.6 (a KMO value above 0.5 is considered acceptable for factor analysis) identified five principal components with eigenvalues greater than one,

Table 2. KMO and Bartlett's test

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.664
	Approx. Chi-Square	354.142
Bartlett's Test of Sphericity	Df	66
	Sig.	0.000

Table 3. Rotated Component Matrix

	Rotated Component Matrix				
	Component				
	1	2	3	4	5
Best Brand	0.897	0.074	0.076	-0.052	0.093
Customer Satisfaction	0.869	-0.084	0.191	0.198	0.161
Better Quality	0.151	0.816	-0.037	-0.087	0.045
Brand Trust	-0.011	0.772	-0.036	0.204	0.190
Brand awareness	-0.217	0.627	-0.049	-0.221	-0.468
Price- Value perception	0.040	-0.129	0.774	0.296	0.059
Availability	0.055	-0.029	0.733	-0.079	0.297
Packaging	0.468	0.075	0.644	-0.200	-0.136
New Products Variety	0.057	0.003	0.034	0.827	-0.041
Health and Nutrition	0.146	0.114	-0.005	0.566	0.135
Loyal Customer	0.108	0.049	0.301	0.086	0.748
Recommendations and Reviews	-0.150	-0.175	0.082	0.472	-0.605

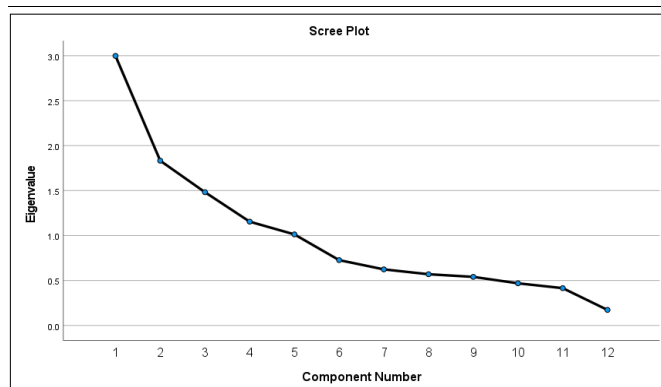


Fig. 1. Scree Plot.

accounting for 70.67% of the variance. These components, highlighted in the Rotated Component Matrix (Table 2 and Table 3), provide key insights into consumer perceptions and competitive strengths, guiding strategic decisions. The scree plot for the factor analysis is mentioned in Fig.1.

First Dimension (18.25%)

The first dimension (18.25%) includes factors such as Best Brands (7) and Customer Satisfaction (8), which emphasize brand reputation, customer relationships and understanding consumer needs.

Second Dimension (14.47%)

This dimension highlights Better Quality (9), Brand Trust (10) and Brand Awareness (11), showing the importance of product quality and emotional connections.

Third Dimension (14.14%)

It centers on Price-Value Perception (8), Availability (12) and Packaging (13), indicating the significance of cost, product accessibility and presentation.

Fourth Dimension (12.56%)

It includes New Products Variety and Health and Nutrition, showcasing the role of health considerations and product variety in consumer choices.

Fifth Dimension (11.23%)

It focuses on Loyal Customers and Recommendations/Reviews, reflecting the importance of customer loyalty and peer endorsements.

Consumer perception

The brands examined in this study comprised Heritage, Dodla, Jersey, Tirumala, Arokya, Sri Venkateswara, Sreeja and Vijaya. The MSD analysis (14) presented in Table 4, aims to assess the perceived similarities and differences among these brands across two distinct dimensions: Value (Dimension 1) and Taste (Dimension 2).

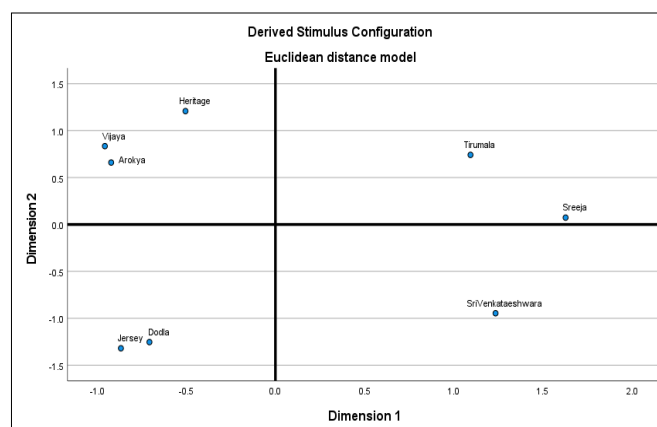


Fig. 2. Perceptual map of milk and milk-based products brands.

As illustrated in Fig.2, the Tirumala, Sreeja and Sri Venkateswara were positioned within the positive quadrant of Dimension 1, indicating that consumers viewed these brands as offering good value for the price relative to the quantity of product received. This suggests that the sample consumers felt these brands provided an adequate return on their investment.

In the negative quadrant of Dimension 1, we find Vijaya, Arokya, Heritage, Jersey and Dodla. The positioning of these brands in this quadrant indicates that consumers perceived them as offering lower value and taste. This suggests a disconnect between the price point and the quantity or quality of the products provided. Therefore Tirumala, Sreeja and Sri Venkateswara are perceived as offering products whose price is justified by the quantity provided brands. In Dimension 2, which assesses on Taste, brands such as the Tirumala, Sreeja and Sri Venkateswara occupy positive quadrant. This positioning reflects a favorable consumer perception regarding the taste of

Table 4. Dissimilarity matrix of 8 milk brands

	Heritage	Dodla	Jersey	Tirumala	Arokya	Sri Venkateswara	Sreeja	Vijaya
Heritage	0	4.25	5.4	3.5	4.9	5.6	3.75	2.85
Dodla	4.25	0	3.2	5.1	4.75	6.35	4.1	4.5
Jersey	5.4	3.2	0	4.45	5.25	6.1	5.35	4.15
Tirumala	3.5	5.1	4.45	0	3.9	5.8	4.5	5.05
Arokya	4.9	4.75	5.25	3.9	0	6.25	5.6	5.2
Sri Venkateswara	5.6	6.35	6.1	5.8	6.25	0	6.5	5.35
Sreeja	3.75	4.1	5.35	4.5	5.6	6.5	0	4.9
Vijaya	2.85	4.5	4.15	5.05	5.2	5.35	4.9	0

their products, suggesting that these brands are recognized for delivering enjoyable flavors. In contrast, Vijaya, Arokya, Heritage, Jersey and Dodla were positioned in the negative quadrant of Dimension 2, indicating that consumers perceived these brands' products as having less appealing taste profiles (Table 4)

This suggests that Tirumala, Sreeja and Sri Venkateswara are seen as superior in taste compared to their competitors, with favorable consumer perceptions reinforcing their competitive edge in the market. Overall, these insights provide valuable implications for understanding consumer preferences and brand positioning within the market for milk and milk-based food products.

Conclusion

The factor analysis identified five key dimensions influencing brand competitiveness, including customer satisfaction, brand trust, quality, price-value perception and customer loyalty. Overall, these insights reveal the competitive strengths of certain brands, providing valuable direction for brands looking to align with consumer preferences and improve their marketing position in the milk products market. The analysis highlights that Tirumala, Sreeja and Sri Venkateswara brands are perceived positively in terms of both value and taste, offering favorable price-to-quality ratios and flavors that customers find enjoyable. In contrast, Vijaya, Arokya, Heritage, Jersey and Dodla are seen less favorably on these dimensions, indicating that these brands may need to address gaps in value and taste to remain competitive.

Authors' contributions

GG carried out the experiment studies and acquisition of data. BP and SK carried out the drafting the article. VB and MK carried out analysis and interpretation of data. RR and MK carried out critical review of important intellectual content. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

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