

PERCEPTUAL MAPPING AND IDENTIFICATION OF THE DISCRIMINATING FACTORS AFFECTING THE CHOICE OF PASSENGER CARS

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ABSTRACT

This study explores the discriminant analysis and perceptual mapping of selected passenger car brands in Nagpur city, namely, Maruti Suzuki, Hyundai, Honda, Tata, Kia. The four identified variables of this study, namely, Performance and safety, brand and features, price and cost, after sales service. Discriminant analysis is used to arrive at discriminant functions for predicting consumer preferences for passenger car brands based on the importance assigned by them for the four identified parameters before purchasing a passenger car.

KEYWORDS: Passenger cars, perceptual mapping, discriminant analysis

INTRODUCTION

The Indian automobile industry is currently the fifth largest in the world. India became the fourth largest auto market in 2019 displacing Germany with about 3.99 million units sold in the passenger and commercial vehicles categories. India is expected to displace Japan as the third largest auto market by 2021.

As per the Society of Indian Automobile Manufacturers (SIAM), passenger vehicle wholesales in India increased by 26.45% to 2,72,027 units in September 2020, up from 2,15,124 in September 2019. Overall, automobile export reached 4.77 million vehicles in FY20, growing at a CAGR of 6.94% during FY16-FY20. It has also attracted many of the world's leading passenger manufacturers to invest in and market their products in India.

India is also a prominent auto exporter and has strong export growth expectations for the near future. In addition, several initiatives by the Government of India and major automobile players in the Indian market are expected to make India a leader in the two-wheeler and four-wheeler market in the world by 2020. India is the 4th largest passenger car manufacturer country at present.

LITERATURE REVIEW

Clement Sudhakar and Venkatapathy (2009) studied the influence of peer group in the purchase of car with reference to Coimbatore District. It was also found that the influence of friends is higher for the purchase of small sized and mid-sized cars.

Vidyavathi, the study throws light on various aspects that the manufactures should concentrate on to attract the prospective buyers. The demand for the small Automobile segment is increasing because of the growing number of nuclear families as well as

parking problems. Hence the manufactures should find out the needs, wants, tastes and preferences of consumers in order to design the products. Also fuel economy and driving comfort are the most important parameters followed by availability of spares and their price.

Balakrishnan Menon, Jagathy Raj V.P., study findings shows that due to price difference in Gasoline and Diesel, about one third of the car owners were having diesel vehicles. The research results showed that about one seventh of car for the city drive for family usage, while using the second car for office and business usage. Foreign brand cars show clear preference in the Kerala car market.

Nikhil Monga, Bhuvender Chaudhary, SaurabhTripathi, this research attempts to answer some of the questions regarding brand personality of selected cars in India by conducting the market research. This personality sketching will help in knowing what a customer (or a potential customer) thinks about a given brand of car and what are the possible factors guiding a possible purchase.

Prasanna Mohan Raj, studied the factors influencing customers brand preference of the economy segment SUV's and MUV's. Data collection was made through direct interaction and customer intercept survey using questionnaire. Descriptive analysis was used to transform data into understand format and factor analysis was used for identification of factors influencing customer preference.

SaminRezvani, GoodarzJavadianDehkordi, Muhammad Sabbir Rahman, this paper reviews the country of origin and different variables that influence consumer purchase intention, also highlight the relationship of variables and customer purchase intention. Study demonstrate that people care about which country products come from and where they are made and consider these factors when evaluating the quality of product.

RESEARCH METHODOLOGY

POPULATION

The target population for this research are the people of **Nagpur** city only. It is so because our research is limited to Nagpur only.

SAMPLE SIZE

It will be approximately around **150** people of Nagpur city only. It is so because this size will cover almost every aspect of our research and we can draw an appropriate conclusion of our research with this particular sample size.

SAMPLING TECHNIQUE

The sampling technique which is going to be used in this research is **Judgemental Sampling**. It is also called as purposive sampling or authoritative sampling, is a non-probability sampling technique in which the sample members are chosen only on the basis of the researcher's knowledge and judgment.

OBJECTIVES

1. **To identify the key factors which influence people to purchase a passenger car in Nagpur**
2. **To identify the differentiating parameters influencing the purchase of a passenger car in Nagpur**

DEMOGRAPHIC PROFILE OF RESPONDENTS

Gender	Female					Male				
	No.		%			No.		%		
	73		48.70%			77		51.30%		
Age Group	Below 25		25-34		35-44		45-54		Above 55	
	No.	%	No.	%	No.	%	No.	%	No.	%
	120	80%	16	10.70%	5	3.30%	5	3.30%	4	2.70%
Monthly income	0-25,000		25,000-35,000		35,000-45,000		45,000-55,000		Above 55,000	
	No.	%	No.	%	No.	%	No.	%	No.	%
	84	55.70%	16	10.70%	6	4%	6	4%	38	25.50%
Occupation	Student		Job		Business		Professional		Others	
	No.	%	No.	%	No.	%	No.	%	No.	%
	84	56%	29	19.30%	3	2%	26	17.30%	8	5.30%

DATA ANALYSIS

Factor analysis is a technique that is used to reduce a large number of variables into fewer numbers of **factors**. This technique extracts maximum common variance from all variables and puts them into a common score. As an index of all variables, we can use this score for further **analysis**. We had a total of seventeen variables identified for our study, so we reduced it to four variables. Percentage variance explained by these four factors is 71.552 %

Rotated Component Matrix				
	Component			
	1	2	3	4
PRICE			.801	
BRAND_NAME		.513		
ENGINE	.666			
LOOKS		.750		
FUEL	.765			
DISCOUNT			.805	
RESALE				.786
AFTER_SALES				.631
MAINTAIN_COST			.661	
CONVENIENCE_FEATURES		.599		
PERFORMANCE	.529			
PLEASURE		.535		
IMAGE		.637		
ECONOMICAL			.666	
COLOURS		.733		
SAFETY	.686			
ADVERTISING			.660	

The four factors are:

Factor 1: Performance & safety

Factor 2: Brand & Features

Factor 3: Price & Cost

Factor 4: After sale services

Objective 1: To identify the key factors influencing people to purchase a car.

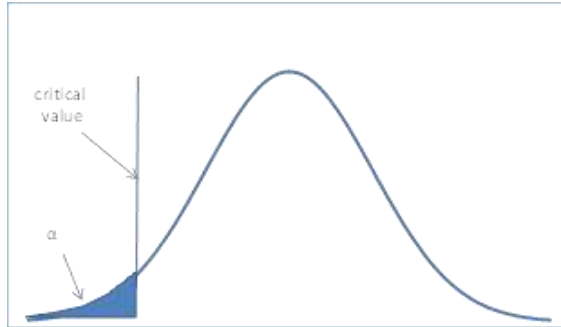
H1- Performance and safety is an important factor influencing the purchase of a car.

H2- Brand and features is an important factor influencing the purchase of a car.

H3- Price and cost is an important factor influencing the purchase of a car.

H4- After sales service is an important factor influencing the purchase of a car.

Z-test



H0- $\mu \geq 3$

H1- $\mu < 3$

	Performance and Safety	Brand and Features	Price and Cost	After Sale Services
μ	3	3	3	3
\bar{x}	1.97	2.02	2.15	2.12
σ	0.79	0.705	0.708	0.81
n	150	150	150	150
α	0.05	0.05	0.05	0.05
Decision (Null Hypo.)	Rejected	Rejected	Rejected	Rejected

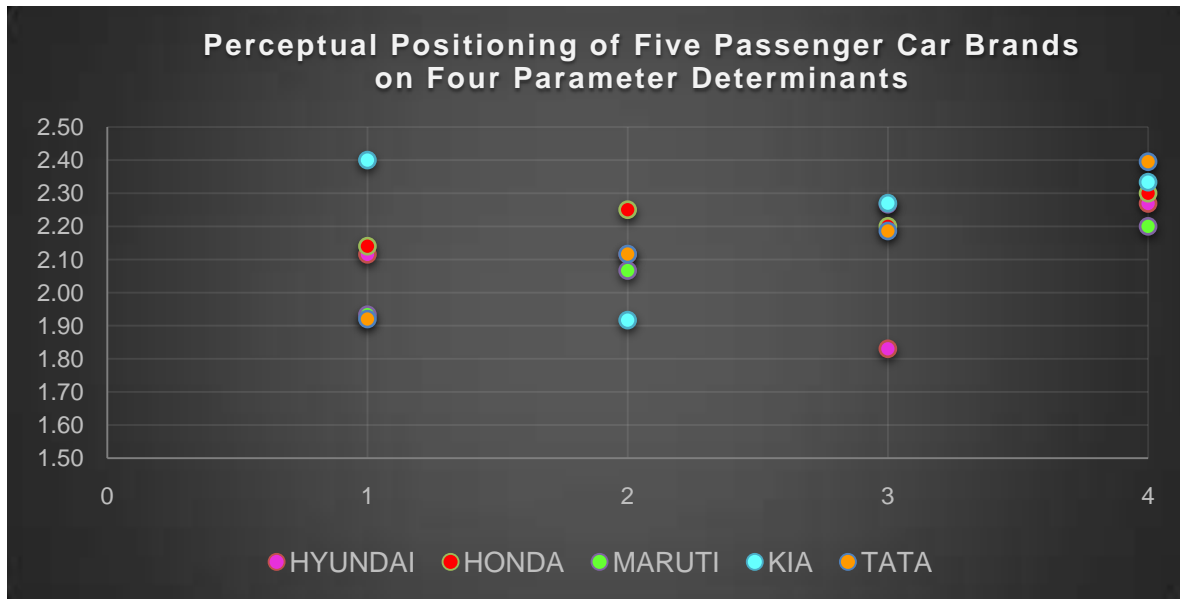
After analysing four of the factors (Performance, Brand, Price and After sales service), we can say that four of the factors can be identified as the key factors which influences people of Nagpur city to purchase a passenger car. Four of the above factors are almost equally important.

Objective 2:-To identify the differentiating parameters influencing the purchase of a passenger car in Nagpur

Out of total of 116(Rest 34 belong the other brands category) sample size, 75 respondent data has been used for predicting the discriminant model and the remaining 41 respondents as hold out sample data for testing the predicted membership

Group statistics**Group Statistics^a**

CAR_BRAND		Mean	Std. Deviation	Valid N (list wise)	
				Unweighted	Weighted
Maruti	PERFORMANCE	2.1395	.96563	28	28.000
	BRAND	2.1163	.73060	28	28.000
	PRICE	2.1860	.79450	28	28.000
	AFTERSALES	2.3953	.76031	28	28.000
Hyundai	PERFORMANCE	2.1154	.95192	19	19.000
	BRAND	2.1154	1.03255	19	19.000
	PRICE	2.2692	1.11562	19	19.000
	AFTERSALES	2.2692	1.07917	19	19.000
Honda	PERFORMANCE	2.4000	.59824	14	14.000
	BRAND	2.2500	.63867	14	14.000
	PRICE	2.2000	.61559	14	14.000
	AFTERSALES	2.3000	.47016	14	14.000
TATA	PERFORMANCE	1.9333	.88372	9	9.000
	BRAND	2.0667	.79881	9	9.000
	PRICE	2.2667	.88372	9	9.000
	AFTERSALES	2.2000	1.01419	9	9.000
KIA	PERFORMANCE	1.9167	.66856	5	5.000
	BRAND	1.9167	.79296	5	5.000
	PRICE	1.8333	.57735	5	5.000
	AFTERSALES	2.3333	.88763	5	5.000



FACTOR 1: PERFORMANCE & SAFETY

FACTOR 2: BRAND & FEATURES

FACTOR 3: PRICE & COST

FACTOR 4: AFTER SALES SERVICE

It is evident that TATA and Maruti Suzuki are ahead on 'Performance and Safety', while KIA is perceived to be the best on 'Brand and Features'. Hyundai is on top when it comes to Price and cost features. Maruti Suzuki takes the lead in 'After sales service', followed by Hyundai.

Discriminant Analysis of Passenger Car Brands

The number of discriminant functions is one less than the number of groups or equal to the number of predictors, whichever is less. In the present research, we have five groups and four predictor variables. Hence, the number of discriminant functions would be four. The functions give projections of the data that best discriminate among the groups.

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 4	0.389	13.98	16	0.000
2 through 4	0.452	7.493	9	0.000
3 through 4	0.468	5.499	4	0.001
4	0.495	2.035	1	0.001

All the p-values of the chi-square statistics associated with the function tests are less than 0.05. Therefore, the null hypothesis, i.e., 'There is no significant discriminating power in the variables', is rejected and the alternative hypothesis, i.e., 'There is significant discriminating power in the variables included in the model', is accepted.

The lower the value of Wilks' Lambda, better is the power of the function to discriminate. In the present study, all the values of Wilks' Lambda are below 0.5, indicating acceptable values.

Unstandardized Canonical Discriminant Function Coefficients				
	Function			
	1	2	3	4
PERFORMANCE	1.067	.952	.831	-.690
BRAND	.208	.627	.753	1.367
PRICE	-1.469	.767	.936	-.372
AFTERSALES	.654	-.962	.813	.108
(CONSTANT)	1.456	2.345	1.222	3.456

Formulating the Discriminant Functions:

The standard form of the discriminant function is:

$$Z = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4$$

Predictive Equations

The unstandardized canonical coefficients would be used to construct the predictive discriminant functions as follows:

$$Z_1 = 1.456 + 1.067 X_1 + 0.952 X_2 + 0.831 X_3 - 0.690 X_4$$

$$Z_2 = 2.345 + 0.952 X_1 + 0.627 X_2 + 0.767 X_3 - 0.962 X_4$$

$$Z_3 = 1.222 + 0.831 X_1 + 0.753 X_2 + 0.936 X_3 + 0.813 X_4$$

$$Z_4 = 3.456 - 0.690 X_1 + 1.367 X_2 - 0.372 X_3 + 0.108 X_4$$

Classification Results

Table below shows the predicted frequencies of groups from the analysis. The numbers in each row indicate how many of each brand were correctly and incorrectly classified by the discriminant model. For example, of the 15 cases of Maruti Suzuki, 9 were correctly predicted by the model. Likewise, out of the 7 cases of Hyundai, 4 were correctly classified, and similarly for the other three brands of passenger cars, as shown in the table. In the aggregate, nearly 64.86% of the cases are correctly classified, which is acceptable

Classification Results							
	Passenger Car	Predicted Group Membership					
		Maruti Suzuki	Hyundai	Honda	TATA	KIA	Total
Count	Maruti Suzuki	9	3	2	1	0	15
	Hyundai	1	4	2	0	0	7
	Honda	1	1	4	0	0	6
	TATA	1	0	0	5	0	6
	KIA	0	1	2	0	4	7
%	Maruti Suzuki	60%	20%	13%	7%	0%	100%
	Hyundai	14%	57%	29%	0%	0%	100%
	Honda	17%	17%	67%	0%	0%	100%
	TATA	17%	0%	0%	83%	0%	100%
	KIA	0%	14%	29%	0%	57%	100%

CONCLUSION

Performance and safety, brand and features, price and cost, after sales service, All of these four factors came out to be important factors which people majorly look out for before purchasing a passenger car in Nagpur city as four of these factors are approximately equally important.

Going by ownership pattern,

Maruti Suzuki is the most preferred passenger car brand in Nagpur city. It's rated first on only one parameter- after sales service. However, it is perceived to be the best in other two parameters- Brand and Features, Performance and Safety and is rated fourth on the basis of Price and Cost.

Hyundai is the second most owned car brand in Nagpur city. It's rated first (in terms of price and cost). It is rated second in terms of its after sales service followed by brand and features and performance and safety on third.

Honda is the third most owned car brand. It's not rated first, neither second in any of the parameters. It's rated third on two parameters – Price and Cost, After sales service and is rated fourth in the remaining two parameters- Performance and Safety and Brand and Features.

Tata is the fourth most owned automobile brand in Nagpur city. It's rated first on the basis of performance and safety. Then, rated second on price and cost. It's rated third on the basis of – brand and features and rated fifth on the basis of after sales service.

KIA stands fifth for the most owned car brands in Nagpur city. It's rated first on the basis of brand and features. It's rated fourth on two parameters- Price and Cost, after sales service and is rated fifth on the basis of performance and safet

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