

LOGISTIC REGRESSION MODELING FOR CONSUMER PURCHASE BEHAVIOUR OF PASSENGER CARS

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Abstract: Globalization and liberalization, with the entry of many prominent foreign manufacturers, changed the automobile scenario in India, since early 1990's. World Leaders in automobile manufacturing set up their manufacturing units in India in joint venture with their Indian counterpart companies, by making use of the Foreign Direct Investment policy of the Government of India. These manufacturers started capturing the hearts of Indian car customers with their choice of technological and innovative product features, with quality and reliability. This transformed the automobile scene from a sellers' market to buyers' market. Car customers had started developing their own personal preferences and purchasing patterns, which were hitherto unknown in the Indian automobile segment. The main purpose of this paper is to develop a model with major variables, which influence the consumer purchase behaviour of passenger car owners in the State of Kerala.

Though there are innumerable studies conducted in other countries, there are very few thesis and research work conducted to study the consumer behaviour of the passenger car industry in India and specifically in the State of Kerala. The results of the research contribute to the practical knowledge base of the automobile industry, specifically to the passenger car segment. It has also a great contributory value addition to the manufacturers and dealers for customizing their marketing strategy in the State.

Key Words: Consumer Behaviour, Passenger Cars, Marketing Strategy, Security Features.

1. Introduction

Though till early eighties, consumers had very limited options for passenger cars, the Automobile Industry has been in the booming phase for the past 15 years, on the strength of the Indian Government's liberalized economy policy and freedom from the License Raj. The Government of India allowed Foreign Direct Investment in Automobile Industry and encouraged Foreign Joint Ventures with Indian Automobile manufacturing industry since early 1990, with a view to make available a wider choice for customers. This was intended to develop healthy competition in the automobile sector. This saw many automobile giants entering the Indian market with their models, readily available, without much waiting time for the delivery. Sudden interest of major global players has made Indian auto industry very competitive, as India provides twin benefit of ready market and

low cost manufacturing base for them. With the explosion of the automobile industry, due to its globalization and liberalization, car manufacturers introduced much innovative and technological advancement in their models. Customers have started thinking to change over to the new models of cars, with related ease than before, to suit their changing life styles.

Automobile Industry in India is growing in a very high rate with more than 1 million passenger vehicle sales per annum and overall 10-15% growth annually. Now more and more foreign manufacturers are coming to India and existing companies are coming up with new models. India's automotive industry is now \$34 billion worth and expected to grow \$145 billion in another 10 years. Indian Automobile industry is the tenth largest in the world with an annual production of approximately 2 million units. In passenger vehicle segment, still Maruti Suzuki is the leader with around 50%, market share followed by Hyundai Motors with 19% and Tata Motors with 16%. Other players in this segment are Honda Sael Cars and Ford India Pvt. Ltd, Toyota, General Motors etc. Accordingly to Society of Indian Manufacturers (SIAM), sales of passenger vehicles segment grew by 31.34 percent in 2010. In 2011, analysts predicted that the sales momentum was to continue and might achieve a growth rate of 20-25 percent in the passenger vehicle segment alone.

2. Literature Review

The researcher evaluated various secondary studies conducted on the consumer behaviour of passenger cars by other researchers in the relevant area, in different countries, India and specifically in the State of Kerala. Sagar et al. (2004) discussed, as to how the Indian car industry has advanced technologically, driven by a confluence of factors such as intense competition, demanding consumer preferences, government policies (especially tightening emission standards), and the global strategies of the various players. They elaborate that cars manufactured in India are based on designs, incorporating advanced technologies, that are often comparable with those available globally and Indian car exports are also growing.

Mukherjee and Sastry (1996) discussed that penetration of passenger cars in rural and semi-urban areas is extremely low and could provide fresh markets. They opinion that new entrants will have to deal with uncertainty of demand, different and evolving customer needs, a relatively poor supplier base, a market crowded with competition and industry wide capacity shortages. As per Kotwal (2009), face off buyers now prefer to have cars with the space, comfort and luxury of a mid size saloon or sedan. With the growing affluence and technological advancement, there develops a certain maturity in taste, as evidenced by the growing popularity of the Indian Hatchback market.

2.1 *Role of Internet Marketing in Consumer Decision Process*

As Internet is rapidly growing and providing the platform for e-commerce marketing, many customers use Internet partly or even fully, for all the buying process stages. Just about one in seventeen people may have access to internet in India, but every third car buyer in the country's top cities start their search on the world-wide web. As per Sharma

(2010), four out of every ten new car buyers and three in every ten used car buyers, use internet to do initial research, before making the purchase.

2.2 *Consumer Politeness and Complaining Behaviour*

Research suggests that in many cases, companies make good-faith efforts to address the complaints from their disgruntled customers. Many managers, in certain cases, are often prepared to exceed consumer expectations beyond-the-contract or above their proscribed job specification, aimed at striving to address consumer complaints, as notified by Resnik and Harmon (1983)

2.3 *Family Influence in Consumer Behavior*

White (2004) discussed the factors that affect car-buyers' choices and comments that people expect to haggle with dealers over price and to receive substantial rebates or incentives as well as low-interest payment plans. He pointed out that with an increase in multi-car households, car dealers and advertisers needed to target the right audience, taking into account the pester power of children and the importance of life stage. Despite the fact that women are the primary buyers of most new cars, he admits that the motor trade has traditionally been contemptuous of women's role in the car-buying process.

2.4 *Virtual Brand Community Effect*

The importance of virtual brand communities is growing day by day as a result of consumers increasingly using online tools to contact fellow consumers in order to get information on which to base their decisions. Luis et al. (2007) proposed the positive effects of participation in a virtual community on both consumer trust and loyalty to the product, brand or organization around which the community is developed .

2.5 *Relationship, Service Package and Price*

In the car industry, which is predominantly driven by the product characterization, classification and orientation, establishing a long-term relationship is being considered to be essential marketing strategy at all distribution levels. Thus, customer knowledge and relationship building, through constantly addressing their needs, are considered to be vitally important selling ingredients to contribute to a car dealer's competitive advantage, as ascertained by Chojkacki (2000). Sharma and Patterson (1999) stated that car dealers were implementing a strategy to position themselves, more effectively in the market place than before, by means of continuous improvement of quality maintenance through services delivery packages, as car dealers are increasingly being confronted by demanding and technologically knowledgeable consumers, shortened product model lifecycles, intensified competition and fragmented market segments.

2.6 *Customer Satisfaction and Loyalty*

Customer satisfaction is often used as a predictive measurement of future consumer purchases as hypothesized by Newman and Werbel (1973). Satisfied customers are more

likely to resort to repeating purchases in the time of actual instance, as reported by Zeithaml, Berry and Parasuraman (1996) in their studies, Moreover, highly satisfied customers will convey their success stories of satisfaction and directly recommend that others try the source of satisfaction, as stated in the studies conducted by Reynolds and Arnold (2000). Fitzell (1998) suggested that such satisfied customers shall become less receptive to the competitor's offerings. A quick observation of customer loyalty is demonstrated by repeated purchase as in the studies by Ball, et al. (2004). In practical terms, firms want repeated purchases mainly because such behavior in consumers can apparently show the customer preference for a brand or product, as stated by Bowen and Shoemaker (1998).

2.7 Brand and Retail Loyalty

Customer satisfaction can be considered the central determinant in all phases of the contact chain. Multi-dimensional recording of customer loyalty reveals clear differences in the interactions, first, with brand loyalty and, second, with dealer loyalty. In contrast to the opinion widely held in practice, customers in the automotive sector definitely do not perceive the brand and the dealer as one unit. Since similar studies in different countries come to almost the same conclusions, it can be argued that the results are valid in several cultural settings. The results obtained by Huber and Herrmann (2001) are so fundamental that they can be translated into implications even by internationally operating companies.

In these days, car owners desire to upgrade their models and brands to avail of the new features and environmental changes and comforts of competing brands. On that account, whether to remain loyal to their existing brand / product or to switch over to a new brand / product is a million dollar question that bothers many car owners. There lie the fortunes of many automobile manufacturers and retailers. In this confusing scenario, some of the car buyers switch from one brand to another at trade-in time, whereas some other car owners display consistent choice of sticking to their brand / product from purchase to purchase, as hypothesized by Sambanandam and Lord (1995). When it comes to the product evaluation stage, quality products, positive showroom acoustics, ambience, positive showroom experience and a consistent and formidable after-sales-service, are all essential and central to the loyalty formula, and manufacturers have been concentrating on these considerable efforts in these directions, as illustrated by Illingworth (1991).

As the customer satisfaction level increases, in due course of the time, as more interaction takes place between the customer and the retailer, it results in a better customer relationship between the dealer and the customer. An increased level of customer satisfaction leads to customer delight. At this point of time, customer delight slowly culminates into customer loyalty towards the brand and the satisfied customer at this level will have no difficulty in recommending the brand to his friends, relatives and peers at office. This will definitely influence the customer's post purchase behaviour. On the other side, if the post purchase scenario does not lead to higher satisfaction level, customer may not be willing to recommend the brand to other; Moreover, dissatisfied customers tend to spread negative news on the brand to his associates. This behavioral

aspect influences his future upgrade of the car model, whenever the customer decides to go for a replacement of his car brand / model, in future course of time.

Ewing (2000) investigated brand loyalty by examining actual past behaviour and its impact on future behavioral intentions, as well as willingness to recommend the brand to another customer known to him. Findings indicated that purchase expectation / intention remain a valid research metric. It would appear that the brand / consumer interface offers greater predictive ability than the retailer / consumer interface. Willingness to recommend a brand to another consumer does not seem to be influenced by past behavior, but the higher the respondent's expectation to purchase the brand, the higher will be their willingness to recommend the brand.

Menon (Feb 2012) and Jacob & Khan (2010).reported in their studies that there was considerable proportion of modern women car buyers, which has increased three fold in the recent years. Companies have started to dig deep into the Indian women's psyche and attention for details. Marketers may need to look at the needs of women customers, who are increasingly growing in the segment. There is also a substantial influence of women in the car purchase decision of the family. The trend has replicated in the State of Kerala as well, where we can see many women driving the car in the city and towns. Menon (Feb 2012) also observed that car makers have woken up to the new reality of internet providing a key role in their marketing and communication strategies. Internet has witnessed increased brand building efforts by car companies over the past few years.

3. Rationale and Significance of the Study

Though there are customer satisfaction surveys conducted by car manufacturers / dealers and other agencies, there is still a research gap, as there is no organized comprehensive research study of the passenger car segments conducted in the State or in India. Kerala market is considered to be different from other states, due to its high consumerism. Consumerism in the state is also attributed to high literacy and booming economic conditions, in the middle class, due to the inflow of foreign money predominantly from gulf, USA and European countries Manufacturers and marketers treat Kerala as a test market, by launching their models in the City of Cochin.

The automobile market is getting saturated with many models of passenger cars. Companies are adopting new methods to see, if small families using the two wheelers, can be converted into the car buyers. Thus, the study is very relevant to measure the emerging customer preferences and tendencies in the passenger car industry, which can be very useful to the car manufacturers and marketers to better understand, strategize and orient their marketing programs accordingly.

4. Problem Definition for the Study

With the proliferation of the many passenger car makes and models in India, which are mostly offering similar value proposition in the passenger car segment, the car segment has largely been differentiated. The problem of the study is intended to explore and

unearth the differentiating parameters in such a homogenous and synchronized passenger car market, thus influencing the consumer purchase behavior of passenger cars in the State of Kerala.

5. Objectives

The major objective was to build up a Consumer Purchase Behaviour Model, with major parameters influencing the behavioural patterns of the passenger car owners. More specifically, the objectives were to study the influence in terms of:

- Information Gathering and Consumer Purchase Initiation – from peers, internet websites, advertisements, visit to the dealer.
- Personal Preferences of Car Features – based on personal needs, convenience factors, comfort factors
- Influence Factors based on the Car Manufacturer / Dealer – Dealer and show room experience, status symbol, after-sales service, Dealer offers
- Influence Factors based on car model – advanced technology, mileage, market value of the brand & model, price, interior and exterior design, security and safety features, driving comfort and entertainment features.
- External Influence - Family, parents, friends, colleagues, market goodwill and car loan availability
- Satisfaction Level – Mileage, brand, model, re-sale value, technology, safety, security, riding comfort, performance and style

6. Research Methodology

The research methodology adopted in this research study comprises of the following stages:

- Literature Review, that is the secondary research
- An exploratory stage that is the Primary Research, consisting of Depth interviews with Car Dealers of new and second-sale cars, Car Financing Agencies and car owners in the city of Cochin. Questionnaires were devised to drive the in-depth interview with car dealers of various manufacturers, second-hand car dealers, car financing agencies, and car owners in the city of Cochin, Kerala, India.
- For depth interviews, sample selection of dealers of 10 major car brands such as Maruti Suzuki, Tata Motors, Ford, Toyota, General Motors, Skoda, Hyundai, Honda, Renault, Mitsubishi, Hindustan Motors, Tata Motors, and Fiat India were chosen from the City of Cochin. A few of the second-sale dealers were chosen from the City of Cochin, again randomly, to get their views on preferences of buyers of second-sale cars. Similarly agents of most of the car financing agencies were chosen randomly from the city of Cochin. Twenty five Car owners were chosen randomly from the city neighborhood, to elicit their preferences on the car purchase and related features.

- A quantitative survey of consumers in the federal State of Kerala. The study was targeted to the passenger car owners in the State of Kerala, as a population. All the brands of car users in the segments of Small Car, Hatch Back, Sedan, Higher Sedan and Multi Purpose Vehicle (MPV) consisted of the population size. Both the new cars and used cars were covered as the population. Both rural and urban areas of the State were considered. The population was synchronous, as the car market in the State was highly developed and the dealers had been following well-defined operational procedures mandated by their manufacturers to conduct the sales, delivery and service in their premises.
- The sampling strategy implemented for the research study was multistage sampling method. Firstly, all the 14 districts of the State were taken in the first stage. In the second stage, 5 districts were shortlisted. It was seen that the number of cars sold in these districts were the highest, based on the data obtained from Motor Vehicles Department of the State. In the third stage, 2 municipalities (urban area) and two Pachayaths (rural area) were identified within each district, by the random sampling method. From each of the identified areas in the districts, every 10th household owning a car was chosen for the sample survey. The final questionnaire was administered to 750 respondents, who were car owners from the rural and urban areas of the five districts of the State. Survey was conducted by in-person structured interview method, using a pre-determined questionnaire.

6.1 Theoretical Model for the Study

Based on the information collated through literature study, in-depth interviews and the subsequent final version of questionnaire formalized, the researcher conceptualized a model of consumer purchase behaviour, with major factors influencing the purchase of passenger cars, shown in Figure 1.1.

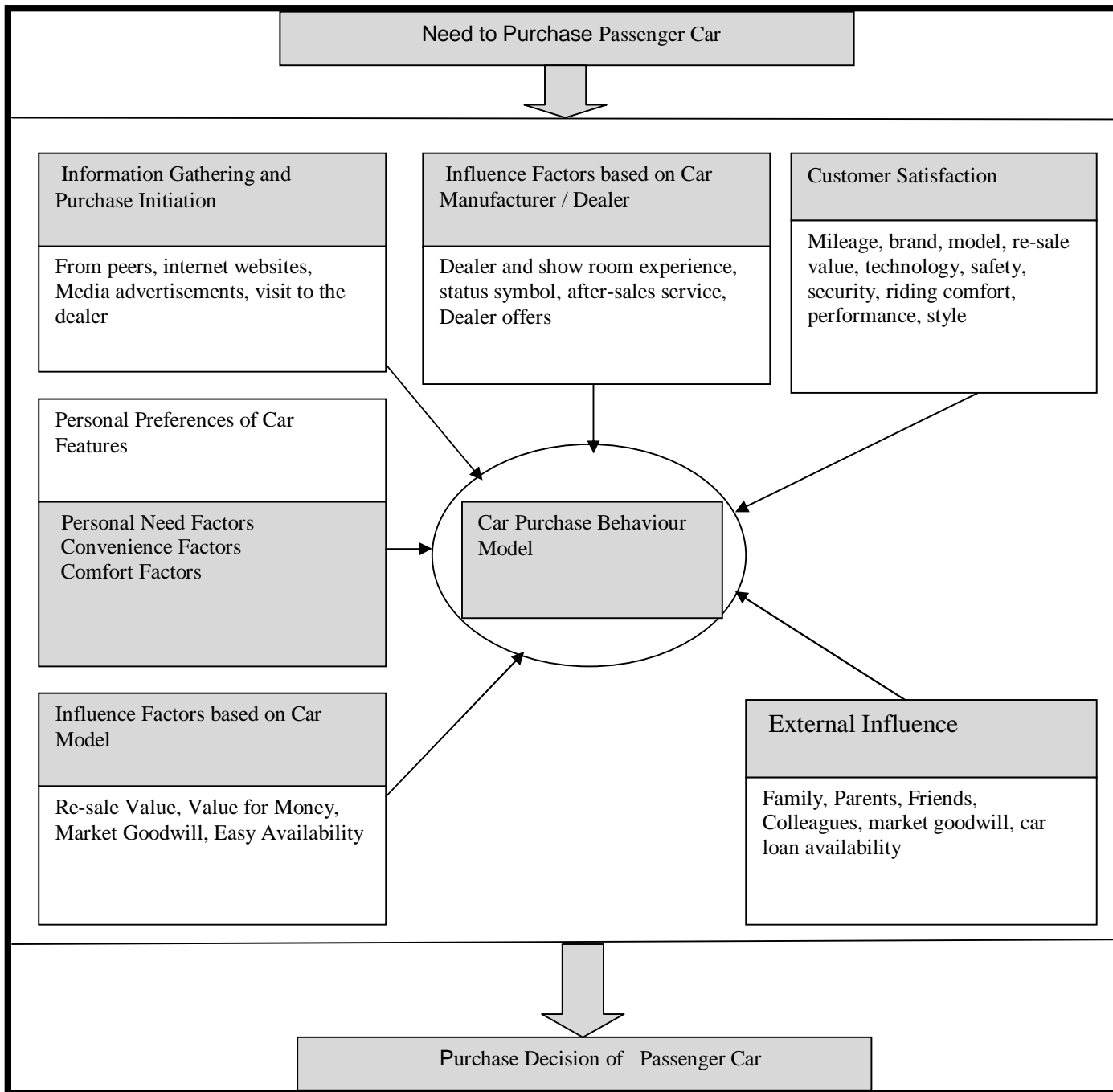


Figure 1.1 – Car Purchase Behaviour Model, consisting of Input - Need to Purchase Car, Process - Eight influencing factors, and Output – Purchase Decision of Passenger Car

6.2 Usage of Statistical Tools and Application

The data collected from the respondents was examined, verified, edited wherever necessary, for completeness, accuracy and reliability. Thereafter, data was further analyzed using statistical package SPSS version 17.0.

The data collected through the well structured questionnaire, was classified and tabulated for analysis, in compliance with the framework laid down and clearly defined, in accordance with the objectives framed at the time of the research methodology.

Regression methods form an integral part of data analysis, concerned with describing the relationship between the response variable (independent variable) and one or more explanatory variables / outcome variable (dependent variables). What distinguishes a logistic regression model from linear regression model is that the outcome variable in logistic regression is binary or dichotomous. Multinomial logistic regression is the extension of (binary) logistic regression, when categorical dependent outcome has more than one level. In this case, if the gender of the respondent is considered as the dependent variable, it has got two levels – male and female. Again, if we consider another dependent variable as car segment, it has got five levels and they are small cars, hatch back, sedan, higher sedan and Multi-Purpose Vehicle (MPV).

The purpose was to develop multinomial logistic regression models / equations by developing the relationship with the factors / predictor variables with the independent variables. The dependent variables for the research study are different age groups, car segments, gender, location, occupation etc. The independent variables were the eight major variables of the car purchase behaviour model described in sections 6.1 and 7.

Initially log likely hood of the model was developed for the given dependent and independent variables and significance of the model was tested at $p = 0.05$ level. Further statistical significance of all the individual predictor variables/factors are conducted by means of likelihood ratio tests at 0.05 level. While developing the multinomial logit models for the different car segments, the reference category / base group was taken as MPV (Multi Purpose Vehicle).

The ratio of the probability of choosing one particular category is often referred as relative risk (and it is also sometimes called as odds). The parameter estimates give the odds ratio of the independent variable at 95% confidence interval. The improvement in dependent variable due to unit increase in the independent variable are explained by means of the log odds and odds ratio for that independent variable obtained during the analysis.

Multinomial Logical Regression modeling was used to find the relationship of independent variable, which was car segments, with the factors / predictor factor variables of each of the major eight major variables.

A five point scale was used to measure the sub items of each of the 8 major variables, mentioned above. The questionnaire respondents were asked to specify their choices for each of the sub items of these major variables, using a five-point Likert's scaling technique (strongly agree, agree, neutral, disagree, and strongly disagree). The score 1 was represented for the option "strongly disagree", while the score 5 on the scale, represented the category "strongly agree", for all the positive questions. A reverse scoring pattern was used for all those negative questions, using a five-point scale (5 representing strongly disagree and 1 representing strongly agree). Cronbach's reliability test was used to test the degree of dependability, consistency or stability of the scale adopted.

One sample Z-test was used to establish dominance of various factors, influencing the purchase behaviour of cars, to test the hypotheses listed.

7. Data Analysis, Results and Interpretation

In tune with the research objectives, this chapter has been structured into major sections, dealing with the data analysis of the various major parameters, which influence the purchase behavior of the passenger car customers, in terms of:

- (1) Information Gathering and Consumer Purchase initiation (IGCP)
- (2) Preference based on Personal needs (PPP)
- (3) Personal Preference based on convenience factors (PPC)
- (4) Personal Preference based on Comfort factors (PPCF)
- (5) Influence factor based on car Manufacturers / Dealer (IFD)
- (6) Influence factor based on car model (IFM)
- (7) External Influence (EI)
- (8) Satisfaction level (SL)

7.1 Information Gathering and Consumer Purchase initiation (IGCP)

This is the beginning of the purchase process of passenger cars, wherein customers start identifying the need for a passenger car and start the information collection of various car manufacturers and models. This main variable was explored using a set of 8 factors (IGCP1 to IGCP8) in the question: What is your opinion to the following sources of information gathering and purchase initiation, for passenger cars?

	Least Important (1)	Less Important (2)	Neutral (3)	Important (4)	Most Important (5)
Search in Internet websites of the manufacturer (IGGP1)	[1]	[2]	[3]	[4]	[5]
Information received from friends (IGGP2)	[1]	[2]	[3]	[4]	[5]
Information received from	[1]	[2]	[3]	[4]	[5]

office colleagues (IGGP3)

Opinion from family members (IGGP4)	[1]	[2]	[3]	[4]	[5]
Advertisement in news papers / magazine (IGGP5)	[1]	[2]	[3]	[4]	[5]
TV commercials on car models and brands (IGGP6)	[1]	[2]	[3]	[4]	[5]
Visit to dealers / distributors (IGGP7)	[1]	[2]	[3]	[4]	[5]
Dealer Sales Staff assurance (IGGP8)	[1]	[2]	[3]	[4]	[5]

The initial log likelihood value obtained is 1617, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1544 and this is measure of a model, by considering all independent variables. The difference between these two measures is the model chi-square value, which is obtained as 72.191 and this has a significance $p < 0.001$ (Since p value = Probability (Type I error) = 0.001, which is less than < 0.05 , significance considered for testing being at 5% level). Since we are setting the significance level $\alpha = 0.05$, we can conclude that there is a significant relationship between dependent variable – Car Segment - and the set of independent variables – IGCP1 to IGCP8.

With the reference category as: MPV (Multi Purpose Vehicle), the multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations:

$$\text{Log (p(small segment)/p(MPV))} = 5.123 - 0.144 \text{ IGCP1} - 0.273 \text{ IGCP2} + 0.376 \text{ IGCP3} - 0.278 \text{ IGCP4} - 0.010 \text{ IGCP5} - 0.559 \text{ IGCP6} - 0.121 \text{ IGCP7} - 0.281 \text{ IGCP8}.$$

$$\text{Log (p(Hatchback)/p(MPV))} = 5.272 + 0.024 \text{ IGCP1} - 0.165 \text{ IGCP2} + 0.194 \text{ IGCP3} - 0.341 \text{ IGCP4} - 0.028 \text{ IGCP5} - 0.0485 \text{ IGCP6} - 0.218 \text{ IGCP7} - 0.019 \text{ IGCP8}.$$

$$\text{Log (p(Sedan)/p(MPV))} = 3.024 - 0.185 \text{ IGCP1} - 0.239 \text{ IGCP2} + 0.379 \text{ IGCP3} + 0.124 \text{ IGCP4} - 0.033 \text{ IGCP5} - 0.350 \text{ IGCP6} - 0.293 \text{ IGCP7} - 0.061 \text{ IGCP8}.$$

$$\text{Log (p(Higher Sedan)/p(MPV))} = - 4.755 + 0.020 \text{ IGCP1} - 0.614 \text{ IGCP2} + 0.434 \text{ IGCP3} + 0.362 \text{ IGCP4} + 0.666 \text{ IGCP5} - 0.435 \text{ IGCP6} + 0.118 \text{ IGCP7} + 0.392 \text{ IGCP8}.$$

Based on these equations, it was established that the car segment wise major influencing factors for the IGCP variable were as follows:

- Information received from the office colleagues (IGCP3) topped the rank of influencers, in the case of small car segment. There were no other positive influencers for this segment.

- Information received from the office colleagues (IGCP3) topped the rank of influencers, in the case of hatch back segment as well and searching in the internet websites of the manufacturer (IGCP1) occupied the second spot.
- In the case of Sedan segment, Information received from the office colleagues (IGCP3) topped the rank of influencers and opinion from family members (IGCP4) took the second spot.
- In the case of Higher Sedan segment, advertisement in newspapers / magazines (IGCP5) topped the ranks, information received from the office colleagues (IGCP3) took the second rank and influence of dealer sales staff (IGCP8) took the third rank.

7.2 Preference based on Personal Needs (PPP)

Personal Preference based on Personal needs (PPP) is the second major variable identified for study and data analysis. Once a need is identified and a few initial information gathering process steps are done, the car customers start to short list their manufacturers and models, based on certain preferences. Preference based on personal needs (PPP) is one of them. This main variable was explored using a set of 9 factors (PPP1 to PPP9), in the question: What is the level of importance you attach to the following preference factors based on personal needs, in deciding in favour of your chosen car?

	Least Important (1)	Less Important (2)	Neutral (3)	Important (4)	Most Important (5)
Need to upgrade from two-wheeler to four-wheeler(PPP1)	[1]	[2]	[3]	[4]	[5]
Need of your business firm(PPP2)	[1]	[2]	[3]	[4]	[5]
Peer pressure from family members owning a car (PPP3)	[1]	[2]	[3]	[4]	[5]
Need of Fuel Efficiency (PPP4)	[1]	[2]	[3]	[4]	[5]
Upgraded the model to suit personal ambition (PPP5)	[1]	[2]	[3]	[4]	[5]
Family wanted a car for functions, social gathering (PPP6)	[1]	[2]	[3]	[4]	[5]
Need to travel long distance on Trips (PPP7)	[1]	[2]	[3]	[4]	[5]
Need to suit social	[1]	[2]	[3]	[4]	[5]

standings (PPP8)

Social pressure from friends / neighbours (PPP9) [1] [2] [3] [4] [5]

The initial log likelihood value obtained is 1782, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1686 and this is measure of a model, by considering all independent variables. The difference between the these two measures is the model chi-square value, which is obtained as 96.003 and this has a significance $p < 0.001$ (Since $p\text{-value} < 0.05$), if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable – Car Segment - and the set of independent variables – PPP1 to PPP8.

With the reference category as: MPV (Multi Purpose Vehicle), the multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations:-

$$\text{Log (p(small segment)/p(MPV))} = 3.756 + 0.648 \text{ PPP1} - 1.084 \text{ PPP2} + 0.113 \text{ PPP3} - 0.140 \text{ PPP4} - 0.249 \text{ PPP5} + 0.286 \text{ PPP6} - 0.371 \text{ PPP7} - 0.204 \text{ PPP8} + 0.011 \text{ PPP9}$$

$$\text{Log (p(Hatchback segment)/p(MPV))} = 3.026 + 0.456 \text{ PPP1} - 0.893 \text{ PPP2} + 0.306 \text{ PPP3} - 0.177 \text{ PPP4} - 0.247 \text{ PPP5} + 0.101 \text{ PPP6} + 0.019 \text{ PPP7} - 0.188 \text{ PPP8} + 0.155 \text{ PPP9}$$

$$\text{Log (p(Sedan segment)/p(MPV))} = 1.687 + 0.202 \text{ PPP1} - 0.605 \text{ PPP2} + 0.189 \text{ PPP3} - 0.124 \text{ PPP4} - 0.171 \text{ PPP5} + 0.235 \text{ PPP6} - 0.032 \text{ PPP7} + 0.052 \text{ PPP8} - 0.048 \text{ PPP9}$$

$$\text{Log (p(Higher segment)/p(MPV))} = -2.904 + 0.106 \text{ PPP1} - 0.274 \text{ PPP2} + 0.414 \text{ PPP3} - 0.380 \text{ PPP4} + 0.134 \text{ PPP5} - 0.019 \text{ PPP6} - 0.051 \text{ PPP7} - 0.034 \text{ PPP8} + 0.592 \text{ PPP9}$$

Based on these equations, it was established that the car segment wise major influencing factors for the PPP variable were as follows:

- Need to upgrade from two-wheeler to four-wheeler (PPP1) captured the top slot, followed by Family wanted a car for functions, social gatherings (PPP6) taking the second slot and Peer pressure from other family members owning a car (PPP3) occupying the third slot for Small Car segment.
- Need to upgrade from two-wheeler to four-wheeler (PPP1) capturing the first rank, Peer pressure from other family members owning a car (PPP3) taking the second rank and Social pressure from friends / neighbours / family members (PPP9) taking the third rank, in the case of Hatch Back segment.
- Family wanted a car for functions, social gatherings (PPP6), taking the first rank, Need to upgrade from two-wheeler to four-wheeler (PPP1), occupying the second rank, and Peer pressure from other family members owning a car (PPP3) taking the third rank, for the Sedan Segment.

- Social pressure from friends / neighbours / family members (PPP9) taking the first slot, Peer pressure from other family members owning a car (PPP3) capturing the second rank and upgraded the model to suit personal ambition (PPP5) took the third rank, for the Higher Sedan segment.

7.3 Personal Preference based on Convenience Factors (PPC)

Personal Preference based on Convenience needs (PPC) is the third major variable identified for the study and data analysis. When the car customers start to short list their manufacturers and models, based on certain criteria, preference based on convenience needs (PPC) is yet another major variable, contributing to the influence of the purchase behaviour. This PPC variable was explored, using a set of 8 factors (PPC1 to PPC8) in the question: Your opinion on the following factors on personal preferences, based on convenience factors:

	Least Important (1)	Less Important (2)	Neutral (3)	Important (4)	Most Important (5)
Inconvenience of public transport for family journeys (PPC1)	[1]	[2]	[3]	[4]	[5]
Easy Availability of Bank Loans (PPC2)	[1]	[2]	[3]	[4]	[5]
Easy car availability in the market (PPP3)	[1]	[2]	[3]	[4]	[5]
Compact Car (PPP4)	[1]	[2]	[3]	[4]	[5]
Good After- Sales Service (PPC5)	[1]	[2]	[3]	[4]	[5]
Re-sale Value (PPC6)	[1]	[2]	[3]	[4]	[5]
Safety & Security (PPC7)	[1]	[2]	[3]	[4]	[5]
Engine Performance (PPC8)	[1]	[2]	[3]	[4]	[5]

The initial log likelihood value obtained is 1585, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1511 and this is measure of a model, by considering all independent variables. The difference between the these two measures is the model chi-square value, which is obtained as 74.406 and this has a significance $p < 0.001$ (Since $p\text{-value} < 0.05$), if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable – Car Segment - and the set of independent variables – PPC1 to PPC8.

With the reference category as: MPV (Multi Purpose Vehicle), the multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations:

$$\text{Log (p(small segment)/p(MPV))} = 4.364 - 0.093 \text{ PPC1} - 0.361 \text{ PPC2} - 0.263 \text{ PPC3} + 0.257 \text{ PPC4} + 0.344 \text{ PPC5} + 0.067 \text{ PPC6} - 0.590 \text{ PPC7} - 0.414 \text{ PPC8}.$$

$$\text{Log (p(Hatchback segment)/p(MPV))} = 2.555 + 0.163 \text{ PPC1} - 0.071 \text{ PPC2} - 0.142 \text{ PPC3} + 0.215 \text{ PPC4} + 0.143 \text{ PPC5} - 0.319 \text{ PPC6} - 0.094 \text{ PPC7} - 0.196 \text{ PPC8}.$$

$$\text{Log (p(Sedan segment)/p(MPV))} = 1.590 - 0.127 \text{ PPC1} - 0.165 \text{ PPC2} - 0.198 \text{ PPC3} + 0.091 \text{ PPC4} + 0.132 \text{ PPC5} + 0.043 \text{ PPC6} + 0.249 \text{ PPC7} - 0.294 \text{ PPC8}.$$

$$\text{Log (p(Higher segment)/p(MPV))} = -2.343 - 0.318 \text{ PPC1} + 0.294 \text{ PPC2} + 0.457 \text{ PPC3} + 0.153 \text{ PPC4} - 0.614 \text{ PPC5} - 0.082 \text{ PPC6} + 0.701 \text{ PPC7} - 0.308 \text{ PPC8}.$$

Based on these equations, it was established that the car segment wise major influencing factors for the PPC variable were as follows:

- Good after-sales service (PPC5) occupied the first position, compact car (PPC4) took the second position and re-sale value (PPC6) took the third position for the Small Car segment.
- Compact car (PPC4) took the first position, inconvenience of public transport for family journeys (PPC1) took the second position, and good after-sales service (PPC5) took the third position, in the case of Hatch Back segment.
- Safety and security (PPC7) occupied the first rank, good after-sales service (PPC5) the second rank and compact car (PPC4) occupied the third rank, in the case of Sedan segment.
- Safety and security (PPC7) took the first rank, Easy car availability in the market (PPC3) took the second rank, and easy availability of bank loans (PPC2) took the third rank, in the case of Higher Sedan segment.

7.4 Personal Preference based on Comfort Factors (PPCF)

Personal Preference based on Comfort needs (PPCF) is the fourth major variable identified for the study and data analysis. When the car customers start to short list their manufacturers and models, based on certain criteria, preference based on comfort factor (PPCF) is yet another major variable, contributing to the influence of the purchase behaviour. This PPCF variable was explored using a set of 6 factors (PPCF1 to PPCF6) in the question: Your opinion on personal preferences, based on comfort factors:

Least	Less	Neutral	Important	Most
<u>Important (1)</u>	<u>Important (2)</u>	<u>(3)</u>	<u>(4)</u>	<u>Important (5)</u>

Style & Looks of the car (PPCF1)	[1]	[2]	[3]	[4]	[5]
Exterior Design (PPCF2)	[1]	[2]	[3]	[4]	[5]
Interior Design (PPCF3)	[1]	[2]	[3]	[4]	[5]
Comfort in driving (PPCF4)	[1]	[2]	[3]	[4]	[5]
Brand Name (PPCF5)	[1]	[2]	[3]	[4]	[5]
Value for Money (PPCF6)	[1]	[2]	[3]	[4]	[5]

The initial log likelihood value obtained is 1140, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1083 and this is measure of a model, by considering all independent variables. The difference between the these two measures is the model chi-square value, which is obtained as 57.569 and this has a significance $p < 0.001$ (Since $p\text{-value} < 0.05$), if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable – Car Segment - and the set of independent variables – PPCF1 to PPCF6.

With the reference category as: MPV (Multi Purpose Vehicle), the multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations.

$$\text{Log (p(small segment)/p(MPV))} = 4.767 - 0.049 \text{ PPCF1} - 0.643 \text{ PPCF2} - 0.410 \text{ PPCF3} + 0.100 \text{ PPCF4} + 0.002 \text{ PPCF5} - 0.145 \text{ PPCF6}$$

$$\text{Log (p(Hatchback segment)/p(MPV))} = 3.203 + 0.270 \text{ PPCF1} - 0.475 \text{ PPCF2} + 0.223 \text{ PPCF3} + 0.106 \text{ PPCF4} - 0.139 \text{ PPCF5} - 0.009 \text{ PPCF6}$$

$$\text{Log (p(Sedan segment)/p(MPV))} = 0.206 + 0.136 \text{ PPCF1} - 0.089 \text{ PPCF2} + 0.061 \text{ PPCF3} + 0.073 \text{ PPCF4} + 0.046 \text{ PPCF5} - 0.131 \text{ PPCF6}$$

$$\text{Log (p(Higher segment)/p(MPV))} = -6.753 + 0.533 \text{ PPCF1} + 0.279 \text{ PPCF2} - 0.203 \text{ PPCF3} + 0.637 \text{ PPCF4} - 0.141 \text{ PPCF5} + 0.275 \text{ PPCF6}$$

Based on these equations, it was established that the car segment wise major influencing factors for the PPCF variable were as follows:

- Comfort in driving (PPCF4) took the only positive factor for Small Car segment.
- Style & looks of the car (PPCF1) took the first position, interior design (PPCF3) took the second position and Comfort in driving (PPCF4) took the third position for the Hatch Back segment.

- Style & looks of the car (PPCF1) took the first position, comfort in driving (PPCF4) and interior design (PPCF3) took the third position for the Sedan Segment.
- Comfort in driving (PPCF4) took the first position, style & looks of the car (PPCF1) took the second position and exterior design (PPCF2) took the third position, in the case of Higher Sedan segment.

7.5 Influence factor based on Car Dealer (IFD)

Influencing Factor based on car Dealer (IFD) is the fifth major variable identified for the study and data analysis. When the customers finally decide choose from the available short listed alternatives, Influencing Factor based on car Dealer (IFD) is a major substantial variable, contributing to the influence of the purchase behaviour. In many cases, it is found that the car manufacturer / dealer of the specific brand plays a major part in the customers deciding their car band choice based on it. This IFD variable was explored using a set of 7 sub factors (IFD1 to IFD7) identified by Question: Please tell the level of importance you attached to the following influencing factors, which resulted in the purchase of your chosen car, that is, Influencing factors based on the car dealer / manufacturer:

	Least Important (1)	Less Important (2)	Neutral (3)	Important (4)	Most Important (5)
Dealer and show room experience (IFD1)	[1]	[2]	[3]	[4]	[5]
Your car as a Status Symbol / Prestige Value (IFD2)	[1]	[2]	[3]	[4]	[5]
Car served to project your image to the society (IFD3)	[1]	[2]	[3]	[4]	[5]
Importance you attached to the Manufacturer (IFD4)	[1]	[2]	[3]	[4]	[5]
Importance attached to the car Brand (IFD5)	[1]	[2]	[3]	[4]	[5]
Dealer Offers of your specific car model (IFD6)	[1]	[2]	[3]	[4]	[5]
After-sales service package (IFD7)	[1]	[2]	[3]	[4]	[5]

The initial log likelihood value obtained is 1475, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1402 and this is measure of a model, by considering all independent variables. The difference between the these two measures is the model chi-square value, which is obtained as 73.237 and this has a significance $p < 0.001$ (Since $p\text{-value} < 0.05$), if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable – Car Segment - and the set of independent variables – IFD1 to IFD7.

With the reference category as: MPV (Multi Purpose Vehicle) The multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations:

$$\text{Log (p(small segment)/p(MPV))} = 4.468 + 0.167 \text{ IFD1} - 0.431 \text{ IFD2} - 0.602 \text{ IFD3} + 0.288 \text{ IFD4} - 0.408 \text{ IFD5} - 0.236 \text{ IFD6} + 0.128 \text{ IFD7}$$

$$\text{Log (p(Hatchback segment)/p(MPV))} = 4.271 + 0.175 \text{ IFD1} - 0.588 \text{ IFD2} - 0.263 \text{ IFD3} + 0.071 \text{ IFD4} - 0.334 \text{ IFD5} - 0.058 \text{ IFD6} + 0.242 \text{ IFD7}$$

$$\text{Log (p(Sedan segment)/p(MPV))} = 2.288 + 0.133 \text{ IFD1} - 0.238 \text{ IFD2} - 0.237 \text{ IFD3} + 0.167 \text{ IFD4} - 0.304 \text{ IFD5} - 0.102 \text{ IFD6} + 0.149 \text{ IFD7}$$

$$\text{Log (p(Higher segment)/p(MPV))} = - 6.189 - 0.326 \text{ IFD1} + 0.866 \text{ IFD2} + 0.073 \text{ IFD3} + 0.364 \text{ IFD4} + 0.164 \text{ IFD5} + 0.275 \text{ IFD6} - 0.158 \text{ IFD7}$$

Based on these equations, it was established that the car segment wise major influencing factors for the IFD variable were as follows:

- Importance you attached to the manufacturer (IFD4) took the first position, dealer and show room experience (IFD1) took the second position and after-sales service package (IFD7) took the third position, in the case of Small Car segment.
- After-sales service package (IFD7) took the first position, dealer and show room experience (IFD1) took the second position and importance you attached to the manufacturer (IFD4) took the third position, in the case of Hatch Back segment.
- Importance you attached to the manufacturer (IFD4) took the first position, after-sales service package (IFD7) took the second position and dealer & show room experience (IFD1) took the third position, in the case of Sedan segment.
- Your car as a status symbol / prestige value (IFD2) took the first position, importance you attached to the manufacturer (IFD4) took the second position, and dealer offers of your specific car model (IFD6) took the third position, in the case of Higher Sedan segment

7.6 Influence factor based on Car Model (IFM)

Influencing Factor based on car Model (IFM) is the sixth major variable identified for the study and data analysis. When the car customers finally choose from the available

alternatives from the short list, Influencing Factor based on car Model (IFM) is yet another substantial variable, contributing to the closing influencing phenomenon of the purchase behaviour. In many cases, it is found that the car model of the specific brand plays a major part in the customers deciding their car choice based on it. This IFM variable was explored using a set of 11 factors (IFM1 to IFM11) identified by the question: Please tell the level of importance you attached to the following influencing factors, which resulted in the purchase of your chosen car, that is, Influencing factors based on the car model:

	Least (1)	Less Important (2)	Neutral (3)	Important (4)	Most Important (5)
Advanced Technology of your model (IFM1)	[1]	[2]	[3]	[4]	[5]
Willing to pay a higher price for Fuel Efficiency (Mileage) alone of your specific model (IFM2)	[1]	[2]	[3]	[4]	[5]
Market value of the brand of your car (IFM3)	[1]	[2]	[3]	[4]	[5]
Market value of model of your specific car IFM4)	[1]	[2]	[3]	[4]	[5]
The Price of your specific model (IFM5)	[1]	[2]	[3]	[4]	[5]
Interior Design (IFM6)	[1]	[2]	[3]	[4]	[5]
Exterior Design (IFM7)	[1]	[2]	[3]	[4]	[5]
Security features of the specific model (IFM8)	[1]	[2]	[3]	[4]	[5]
Safety of your specific car (IFM9)	[1]	[2]	[3]	[4]	[5]
Driving Comfort of your specific car (IFM10)	[1]	[2]	[3]	[4]	[5]
Entertainment Features of your specific car (IFM11)	[1]	[2]	[3]	[4]	[5]

The initial log likelihood value obtained is 1789, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1670 and this is measure of a model, by considering all independent variables.

The difference between these two measures is the model chi-square value, which is obtained as 119.030 and this has a significance $p < 0.001$ (Since $p\text{-value} < 0.05$), if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable – Car Segment - and the set of independent variables – IFM1 to IFM11.

With the reference category is: MPV (Multi Purpose Vehicle), the multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations:

$$\text{Log } (p(\text{small segment})/p(\text{MPV})) = 8.708 - 0.451 \text{ IFM1} + 0.173 \text{ IFM2} - 0.086 \text{ IFM3} - 0.107 \text{ IFM4} - 0.034 \text{ IFM5} - 0.418 \text{ IFM6} - 0.145 \text{ IFM7} + 0.243 \text{ IFM8} - 0.561 \text{ IFM9} - 0.362 \text{ IFM10} - 0.373 \text{ IFM11}$$

$$\text{Log } (p(\text{Hatchback segment})/p(\text{MPV})) = 6.340 + 0.185 \text{ IFM1} + 0.122 \text{ IFM2} - 0.027 \text{ IFM3} - 0.440 \text{ IFM4} - 0.166 \text{ IFM5} - 0.019 \text{ IFM6} - 0.073 \text{ IFM7} - 0.065 \text{ IFM8} - 0.694 \text{ IFM9} - 0.159 \text{ IFM10} - 0.026 \text{ IFM11}$$

$$\text{Log } (p(\text{Sedan segment})/p(\text{MPV})) = 3.016 + 0.334 \text{ IFM1} + 0.238 \text{ IFM2} + 0.041 \text{ IFM3} - 0.371 \text{ IFM4} - 0.231 \text{ IFM5} - 0.022 \text{ IFM6} + 0.077 \text{ IFM7} + 0.229 \text{ IFM8} - 0.587 \text{ IFM9} - 0.176 \text{ IFM10} - 0.117 \text{ IFM11}$$

$$\text{Log } (p(\text{Higher segment})/p(\text{MPV})) = - 6.973 - 0.319 \text{ IFM1} + 0.278 \text{ IFM2} + 0.148 \text{ IFM3} - 0.375 \text{ IFM4} + 0.078 \text{ IFM5} + 0.258 \text{ IFM6} + 0.809 \text{ IFM7} + 0.215 \text{ IFM8} + 0.137 \text{ IFM9} - 0.041 \text{ IFM10} + 0.250 \text{ IFM11}$$

Based on these equations, it was established that the car segment wise major influencing factors for the IFM variable were as follows:

- Security features of the specific model (IFM8) occupied the first rank and willingness to pay a higher price for fuel efficiency and (mileage) alone of your specific model (IFM2) occupied the second rank, in case of Small Car segment.
- Advanced Technology of your model (IFM1) took the first position and willing to pay a higher price for fuel efficiency and (mileage) alone of your specific model (IFM2) took the second position, in the case of Hatch Back segment.
- Advanced Technology of your model (IFM1) occupied the first rank, willing to pay a higher price for fuel efficiency and (mileage) alone of your specific model (IFM2) captured the second rank and security features of the specific model (IFM8) got the third rank, in the case of Higher Sedan segment.
- Exterior design (IFM7) took the first rank, willing to pay a higher price for fuel efficiency and (mileage) alone of your specific model (IFM2) took the second rank and Interior design (IFM6) took the third rank, in the case of Higher Sedan segment.

7.7 External Influence (EI)

Influencing Factor based on car Model (EI) is the seventh major variable identified for the study and data analysis. When the car customers finally choose from the available alternatives from the short list, External Influence (EI) is a major variable, contributing to the influence of the purchase behaviour. In many cases, it is found that the car model of the specific brand plays a major part in the customers deciding their car choice based on it. This EI variable was explored using a set of 9 sub factors (EI1 to EI9), identified by the question: What is your opinion on the following external influences that you considered important, when you bought your car?

	Least Important (1)	Less Important (2)	Neutral (3)	Important (4)	Most Important (5)
Family (Wife, Son / Daughter) (EI1)	[1]	[2]	[3]	[4]	[5]
Parents (EI2)	[1]	[2]	[3]	[4]	[5]
Relatives (EI3)	[1]	[2]	[3]	[4]	[5]
Friends (EI4)	[1]	[2]	[3]	[4]	[5]
Opinion of your colleagues (EI5)	[1]	[2]	[3]	[4]	[5]
Market goodwill (EI6)	[1]	[2]	[3]	[4]	[5]
Car Loan availability (EI7)	[1]	[2]	[3]	[4]	[5]
Advertisement of Cars (EI8)	[1]	[2]	[3]	[4]	[5]
Car Melas / shows (EI9)	[1]	[2]	[3]	[4]	[5]

The initial log likelihood value obtained is 282.741, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 248.589 and this is measure of a model, by considering all independent variables. The difference between the these two measures is the model chi-square value, which is obtained as 34.153 and this has a significance $p < 0.001$ (Since $p\text{-value} < 0.05$), if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable and the set of independent variables.

With the reference category as: MPV (Multi Purpose Vehicle), the multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations:

$$\text{Log } (p(\text{small segment})/p(\text{MPV})) = 4.162 - 1.186 \text{ EI1} - 0.282 \text{ EI2} + 0.162 \text{ EI3} + 0.920 \text{ EI4} - 0.017 \text{ EI5} + 0.492 \text{ EI6} + 0.309 \text{ EI7} - 1.240 \text{ EI8} + 0.437 \text{ EI9}$$

$$\text{Log } (p(\text{Hatchback})/p(\text{MPV})) = 3.061 - 0.143 \text{ EI1} + 0.177 \text{ EI2} + 0.136 \text{ EI3} + 0.370 \text{ EI4} - 0.421 \text{ EI5} + 0.434 \text{ EI6} - 0.031 \text{ EI7} - 1.027 \text{ EI8} + 0.093 \text{ EI9}$$

$$\text{Log } (p(\text{Sedan})/p(\text{MPV})) = 4.620 - 0.936 \text{ EI1} + 0.810 \text{ EI2} - 0.050 \text{ EI3} + 0.466 \text{ EI4} - 0.511 \text{ EI5} + 0.263 \text{ EI6} - 0.059 \text{ EI7} - 0.904 \text{ EI8} - 0.069 \text{ EI9}$$

$$\text{Log} (p(\text{Higher Sedan})/p(\text{MPV})) = - 20.425 -1.438 \text{EI1} + 0.474 \text{EI2} - 1.012 \text{EI3} - 0.505 \text{EI4} + 2.624 \text{EI5} + 0.701 \text{EI6} + 2.185 \text{EI7} + 2.488 \text{EI8} - 1.637 \text{EI9}$$

Based on these equations, it was established that the car segment wise major influencing factors for the EI variable were as follows:

- Friends (EI4) occupied the first position, market goodwill (EI6) took the second position and other reasons (EI9) took the third rank, in the case of Small Car segment.
- Market goodwill (EI6) occupied the first rank, friends (EI4) took the second rank and parents (EI2) took the third rank, in the case of Hatch Back segment.
- Parents (EI2) took the first rank, friends (EI4) took the second and market goodwill (EI6) occupied the third rank, in the case of Sedan segment.
- Opinion of your colleagues (EI5) took the first rank, advertisement of cars (EI8) took the second rank and car loan availability (EI7) took the third rank, in the case of Higher Sedan segment.

7.8 Satisfaction Level (SL)

Customer Satisfaction Level (SL) is the seventh major variable identified for the study and data analysis. Customer satisfaction plays, as a strong contributing factor to spread word-of-mouth publicity to other customers. It will also influence customers on their future purchase behaviour. This SL variable was explored using a set of 15 sub factors (SL1 to SL15), identified by Question: Please tell us about your customer satisfaction level of your car, in terms of the following aspects:

	Least Satisfied (1)	Less Satisfied(2)	Neutral (3)	Satisfied (4)	Most Satisfied(5)
Fuel Efficiency (SL1)	[1]	[2]	[3]	[4]	[5]
Value for Money (SL2)	[1]	[2]	[3]	[4]	[5]
Power of the car (SL3)	[1]	[2]	[3]	[4]	[5]
Brand (SL4)	[1]	[2]	[3]	[4]	[5]
Model (SL5)	[1]	[2]	[3]	[4]	[5]
Re-Sale Value (SL6)	[1]	[2]	[3]	[4]	[5]
Technology (SL7)	[1]	[2]	[3]	[4]	[5]
Safety (SL8)	[1]	[2]	[3]	[4]	[5]
Security (SL9)	[1]	[2]	[3]	[4]	[5]
Riding comfort (SL10)	[1]	[2]	[3]	[4]	[5]
Convenience (SL11)	[1]	[2]	[3]	[4]	[5]
Performance (SL12)	[1]	[2]	[3]	[4]	[5]
Style of the car (SL13)	[1]	[2]	[3]	[4]	[5]
Appearance (SL14)	[1]	[2]	[3]	[4]	[5]
After-sale service experience of your car (SL15)	[1]	[2]	[3]	[4]	[5]

The initial log likelihood value obtained is 1864, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1710 and this is measure of a model, by considering all independent variables. The difference between the these two measures is the model chi-square value, which is obtained as 153.717 and this has a significance $p < 0.001$ (Since $p\text{-value} < 0.05$), if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable – Car Segment - and the set of independent variables – SL 1 to SL 15.

With the reference category as: MPV (Multi Purpose Vehicle), the multinomial logit model developed has four parts, labeled with categories of outcome variable car segment. They correspond to the following four equations:

$$\text{Log (p(small segment)/p(MPV))} = 3.304 + 0.247 \text{ SL1} + 0.586 \text{ SL2} - 0.363 \text{ SL3} + 0.662 \text{ SL4} - 0.116 \text{ SL5} - 0.358 \text{ SL6} - 0.440 \text{ SL7} - 0.222 \text{ SL8} - 0.195 \text{ SL9} - 0.141 \text{ SL10} + 0.157 \text{ SL11} - 0.602 \text{ SL12} - 0.033 \text{ SL13} - 0.481 \text{ SL14} + 0.497 \text{ SL15}$$

$$\text{Log (p(Hatchback)/p(MPV))} = 2.784 + 0.104 \text{ SL1} + 359 \text{ Q17_2} + 0.165 \text{ SL3} - 0.337 \text{ SL4} - 0.209 \text{ SL5} - 0.433 \text{ SL6} - 0.114 \text{ SL7} + 0.247 \text{ SL8} - 0.362 \text{ SL9} - 0.172 \text{ SL10} + 0.221 \text{ SL11} - 0.678 \text{ SL12} + 0.156 \text{ SL13} - 0.350 \text{ SL14} + 0.372 \text{ SL15}$$

$$\text{Log (p(Sedan)/p(MPV))} = 1.072 - 0.476 \text{ SL1} + 0.300 \text{ SL2} + 0.434 \text{ SL3} + 0.182 \text{ SL4} - 0.276 \text{ SL5} - 0.405 \text{ SL6} - 0.132 \text{ SL7} + 0.175 \text{ SL8} + 0.086 \text{ SL9} + 0.030 \text{ SL10} - 0.075 \text{ SL11} - 0.314 \text{ SL12} + 0.103 \text{ SL13} - 0.238 \text{ SL14} + 0.503 \text{ SL15}$$

$$\text{Log (p(Higher Sedan)/p(MPV))} = - 6.201 - 1.081 \text{ SL1} + 0.680 \text{ SL2} + 0.204 \text{ SL3} + 0.357 \text{ SL4} - 0.683 \text{ SL5} - 0.447 \text{ SL6} + 0.818 \text{ SL7} + 0.141 \text{ SL8} - 0.009 \text{ SL9} - 0.266 \text{ SL10} + 0.784 \text{ SL11} - 0.829 \text{ SL12} - 0.139 \text{ SL13} + 1.015 \text{ SL14} + 0.686 \text{ SL15}$$

Based on these equations, it was established that the car segment wise major influencing factors for the SL variable were as follows:

- Brand (SL4) took the first rank, value for money (SL2) the second rank and after-sale service experience of your car (EL15) the third rank, in the case of Small Car segment.
- After-sale service experience of your car (EL15) took the first rank, value for money (SL2) the second rank and safety (SL8), the third rank, in the case of Hatch Back segment.
- After-sale service experience of your car (EL15) occupied the first rank, power of the car (SL3), the second rank and value for money (SL2), the third rank, in the case of Sedan segment.
- Appearance (SL14) took the first rank, technology (SL7), the second rank and convenience (SL11), the third rank, in the case of Higher Sedan segment.

8. Validation and Acceptability of the Model

8.1 Reliability Analysis

It was seen that all the values of the Cronbach Alpha for the 8 major variables under study as shown in Section 7, are all above the value of 0.70. The values showed that refined scale is reliable and consistent, as the calculated values of the Cronbach Alpha is well above the recommended value of 0.70, demonstrating a high reliability of the data collected. The following figure 1.2 shows the diagrammatic representation of the entire validated model with eight major influencing variables.

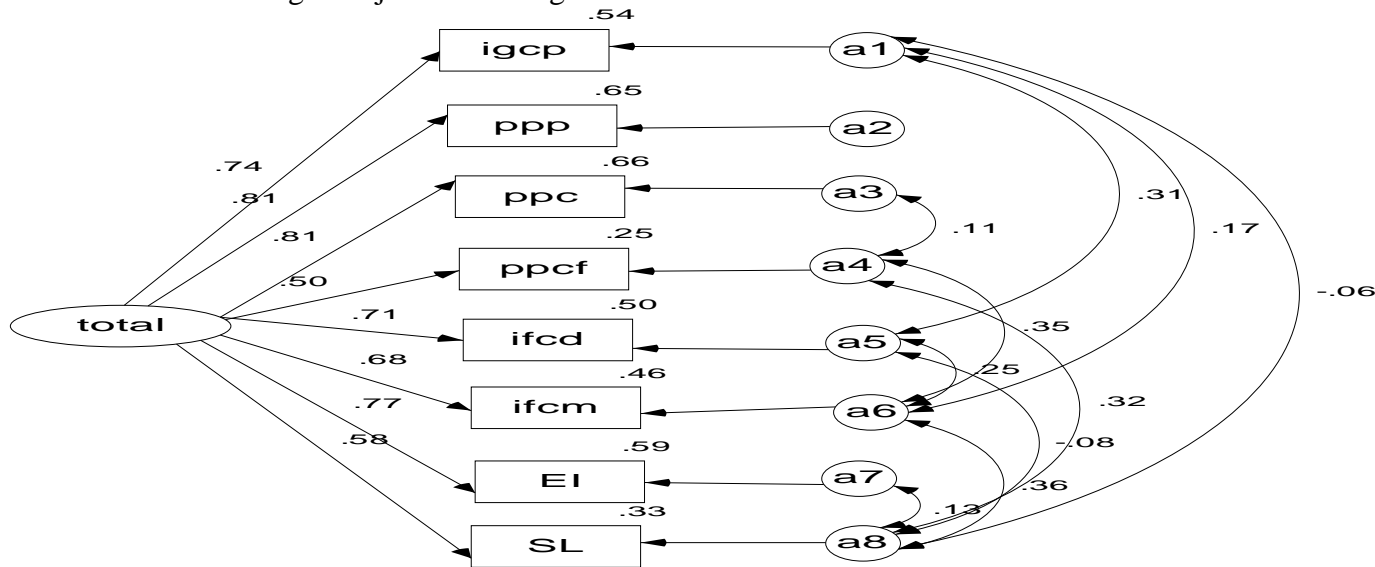


Fig. 1.2 – Figure showing the Purchase Intention Model, Variables, their correlations and regression coefficients

In the Fig 1.2, the figures 0.74, 0.81, 0.81 etc are the regression coefficients, showing their contributing share in the influence on the Total Purchase Intention (PI) variable by the sub factors IGGP, PPP, PPC and so on. Again the figures 0.54, 0.65, 0.66 etc are the squares of correlation coefficients between the Total (IP) and IGCP, PPP, PPC and so on. The model of Purchase Intention (PI) can be expressed in the form of the following equation:

$$PI = 0.735 IGGP + 0.808 PPP + 0.810 PPC + 0.496 PPCF + 0.705 IFCD + 0.681 IFCM + 0.771 EI + 0.578 SL$$

9. Testing of Hypotheses

There were many hypotheses, which were tested and validated. A few of them are listed in the table below:

Table 1.2 - Z-test (one sided tailed test to the right)

H₀: Mean % score = 70 against H₁: Mean % score > 70). Significant Level 5%, Z-Table value for right one-tailed right sided test at 5% level = 1.645

Hypotheses Testing	Mean	Std. Deviation	Mean % Score	Z-Value	Test Result
H01: After sales service has a dominant positive influence on the purchasing behavior	7.56	1.16	75.58	12.68	H01 Accepted
H02: There is a positive influence of dealers and show room experience, which affect the car purchase decision of customers	3.74	0.77	74.86	8.27	H02 Accepted
H03: Price of the car has a positive influence on the purchasing decision	3.92	0.74	78.41	14.97	H03 Accepted
H04: Advanced technology of the car model plays a positive image in the purchase behaviour	3.97	.641	79.34	19.17	H04 Accepted
H05: There is a significant majority of customers, who prefer the second-hand cars, due to their personal and market considerations	3.27	0.57	65.31	-2.88	H05 Rejected
H06: The make and brand name have no dominance in the purchase behavior of low-end cars	3.70	0.74	36.97	-116.98	H06 Accepted

The mean percentage score is above 70% in all the cases, except for H05. It indicates that the values have positive influence on the purchasing decision, except for H05, which is for second-hand cars. Further to test whether this value is significant or not (i.e. Mean % Score is above 70 or not), we conducted the one sample Z test and the result is exhibited in the above table. Test is found to be significant in all the cases (except for H05), as the calculated Z-value is greater than the tabled value of 1.645, at 5%. In the case of H05, it is insignificant, as the Z-calculated is less than the 1.645.

10. Summary of Major Findings

- About one third of the car owners were having diesel vehicles. This showed a preference towards diesel passenger cars. The research results showed that about one seventh of car owners owned a second car in the family, which indicated an increasing trend for buying another passenger car for the city drive for family usage, while using the first car for office and business usage.
- Foreign manufacturers occupied over a simple majority market share the cars purchased by the car owners, showing a clear preference of foreign brands in the Kerala car market.
- It was found that there was a significant difference between the five car segments, while customers evaluated their customer satisfaction level for their passenger cars.

- It was observed across all the segments that in the information gathering and consumer purchase initiation stage, TV commercials on car models and brands, search in internet websites of the manufacturer and visit to dealers / distributors were the prime sources where customers gathered information on car models and brands.
- When it came to short listing from the alternative brands and models, personal preference based on personal needs was one of the criterion used by car passengers. In this criterion, across all the segments, car passenger prime requirement needs in the top slots were - the need of the business firm, peer pressure from other family members owning a car and upgraded the model to suit personal ambition.
- Personal preference based on convenience factors was yet another criterion to short list brands and models. Across all the segments, compact car, easy availability of bank loans and easy car availability in the market were the dominant factors.
- In the category of personal preferences based on comfort factor requirement of the car owners, the dominant factors across all the segments were comfort in driving, value for money and interior design.
- In the category of identifying the cars based on the manufacturer criterion, it was established across all the segments that car served to project your image to the society, dealer offers of your specific car model and importance you attached to the manufacturer were the dominant factors.
- When it came to the question of why the customers choose their favorite brands, based on influencing factor of specific car models, across all the segments, entertainment features of your specific car, market value of model of your specific car, and willing to pay a higher price for Fuel Efficiency and (mileage) alone of your specific model were the dominant factors.
- External Influence was a dominating influential factor, in car customers choosing their selected car models. Across all the segments, opinion of your colleagues, Relatives and Parents were the dominating influential factors.
- On the question of customer satisfaction on their chosen models, across all the segments, the factors re-sale value, technology and Riding comfort, as the top reasons for their satisfaction.
- When it came to specific hypothesized statements on the chosen models, price of the car, advanced technology, market re-sale value of the brand and model, security features, safety features and driving comfort were the consolidating factors, which contributed to the ultimate selection of their chosen models.

11. Summary of Major Recommendations

- The increasing number of women car owners, using the car for their office, personal and family work, thus becoming an influential group, calls for the attention of car manufacturers and marketers to focus their strategic efforts in this direction.
- There were sizeable numbers of car customers, with clear preferences for diesel cars, due to the ever increasing cost of petrol in the last few years. Manufacturers might

need to tackle this increasing need for diesel car customers and their preferences. It is evidently acknowledging this fact that the focus of manufacturers to bring out diesel version of their car models.

- Since there is perceptible and significant difference between the five car segments, marketers might need to address segment wise behavioral patterns and preferences to meet up with their requirements.
- Since, TV commercials on car models and brands, search in internet websites of the manufacturer and visit to dealers / distributors were the prime sources where customers gathered information on car models and brands, marketers might want to focus on these factors to catch the attention of the intending future customers.
- When it came to personal preferences based on personal needs, the top slot needs were - the need of the business firm, peer pressure from other family members owning a car and upgraded the model to suit personal ambition. Marketers need to understand these requirements and focus their marketing strategies towards these customer requirements.
- When it came to short listing cars on personal preferences based on convenience factors, Compact car, easy availability of bank loans and easy car availability in the market topped the consumer requirements list. Easy availability of car models in the market was also a deciding requirement factor. Customers were tempted to switch over to competing brands and models, if their chosen model is readily available in the market. Marketers and Dealers need to tie up car financing agencies to make sure that the car loans are made available on demand, to boost up their sales. It also calls for tremendous amount of market awareness, intelligence and strengthen the availability of popular models in the market, based on these specific requirement needs.
- In the category of personal preferences on comfort factors, dominant factors were comfort in driving, value for money and interior design, which topped the requirement list. Car segment wise analysis also brought out these specific comfort requirements across all the brands. Manufacturers might look into these aspects to their car design, so to attract car passengers, prone to decide the models based on these criteria.
- Based on the manufacturer criterion for selection, the dealer and show room experience, car served to project your image to the society, dealer offers of your specific car model and importance you attached to the manufacturer topped the requirement category list. Car manufacturers and dealers might look into these specific aspects of social and status symbol requirements, based on the manufacturer brand, to boost up their demand. It was also known that the foreign cars provided a better perception on these requirements category. Thus, the joint ventures with known car makers in the world (specifically Japanese and US make cars) were the favorites) might prove to be an additional image booster to the Indian car manufacturers.
- When it came to the question of why the customers choose their favorite brands, based on influencing factor of specific car models, entertainment features of your specific car, market value of model of your specific car, and willing to pay a higher price for Fuel Efficiency and (mileage) alone of your specific model were the deciding criterion chosen by the car customers. The car manufacturers might need to concentrate on these parametric factors, which played a dominant role in short listing the models and brands.

- External Influence was a dominating influential factor, in car customers choosing their selected car models. . Opinion of your colleagues, Relatives and Parents topped the list of criteria for selection. Marketing techniques to influence these deciding factors might be useful to the dealers and manufacturers.
- On the question of customer satisfaction on their chosen models, car customers chose re-sale value, technology and Riding comfort, as the top reasons for their satisfaction. Manufacturers might need to focus on these factors to ensure higher customer satisfaction for their models.

12. Limitations of the Study

The study was restricted to the passenger car owners of the State. Due to the wide spread of the city, the questionnaire was administered to the urban and rural areas of the five districts of the State. The sample size of 750 was also chosen, considering the cost involved in covering more units in each selected district. The survey was also limited to five car segments – Small Car, Hatch Back, Sedan, Higher Sedan and Multi Purpose Vehicle (MPV).

13. Scope for Further Research

There is further scope to cover other car segments, like Sports Utility Vehicle (SUV), Executive Sedan, Luxury Segments etc. Also study could be extended to other districts of the State. There is also scope for conducting the study in other States of India, as that would open up more findings.

14. Conclusion

As in other industries, the scenario in domestic Indian Automobile Industry is quite different from the Global Automobile Industry. The industry actually developed in two clear stages - .the Maruti era (1983 onwards) and the post-liberalization era (1992 onwards). Compared to the global automobile sector, where substantial research has been done, very little empirical research has been conducted on the Indian automobile industry. Moreover, no organized study has been conducted in the area of passenger car industry, with specific reference to the State of Kerala. Kerala State is well known for its consumerism, due to the higher purchasing power, very high literacy rate and inflow of foreign money into the State, from the huge number of people of the State working in US, Europe, Australia, and other Asian and Gulf countries. With many car manufacturers launching their product in the Kerala state, the study will definitely benefit the stakeholders of car manufacturers, dealers, financing agencies, to formalize and strategize their policies towards an effective marketing strategy. The eight parameters developed and the model which was conceptualized was tested through an extensive research and quantitative analysis, to establish its acceptability.

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