CUSTOMERS BASED MODELLING AND DESIGNING OF OTORHOME/RECREATIONAL VEHICLE (WITH SPECIAL REFERENCE TO INDIAN FAMILIES OF THE SELECTED CITIES)

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ABSTRACT

Most of Indian families prefer to travel by road and while preferring this mode of transportation, they have a wide variety of vehicles such as two-wheelers, four wheelers and so on so forth. The selection of any vehicle depends on factors like family size, family income, nature of work, importance of work, time, comfort, safety, security, facilities, entertainments etc. With rising incomes, Indians will have the opportunity to realize comforts and pleasures enjoyed by middle-class families across the world. Around 1.65 crore Indian families in the country own a personal four wheeler out of which, 11 crore urban families have a four wheeler. A new trend is witnessed among the Indian families advocate that a motor-home is considered as a life time investment and buyers do not mind spending on technology, comforts, facilities and efficiency which is all available in these luxury vehicles. Customer Based designing and modeling of motorhome/recreational vehicle for Indian Families appears to be need of hour for Indian Automobile industry.

KEYWORDS

Motorhome, Recreational vehicle, Indian Family, Modelling, Designing, Factors.

1. INTRODUCTION

The big cities of India are transforming into the great hubs of commerce, education, science, politics, and government, upon which the functioning of the nation largely depends. As per the latest report of National Council of Applied Economic Research (NCAER), India has 46.7 million high income households. At the present times, a great number of Indian families whether it is from rural or urban prefer to own their own four wheelers. It is revealed in an article published in the Tribune that in India everybody is rushing to buy a car. Around 1.65 crore Indian families in the country own a personal four wheeler out of which, 11 crore urban families have a four wheeler. India is home to a vibrant automobile of more than 40 million vehicles. It has been one of the few worldwide which saw growing passenger car sales during the recession of the past two years.[1]

Not only this, there is a significant growth in the used-car sales which is around 20% a year. India's emergence as the world's fifth-largest consumer economy may benefit the world. With

rising incomes, Indians will have the opportunity to realize comforts and pleasures enjoyed by middle-class families across the world. For the world's businesses, India represents one of the largest consumer market opportunities for the next two decades. As the Indian economy grows, there are more people who move into the higher middle class bracket. They open up a new customer base altogether for Motorhomes/recreational vehicles market.

2. INDIAN FAMILY STRUCTURE

India is the seventh-largest country by area (3,288,000 km²), the second-most populous country with over 1.2 billion people, and the most populous democracy across the globe. India. More than a sixth of the world's population resides in India and it has 17.5% of the world's population. India is projected to be the world's most populous country by 2025; its population growth rate is 1.41%. In India, family has been considered as a basic unit of society and is an important link between individual and community. The joint family is considered as an age old Indian institution but it has witnessed significant change in the late twentieth century. As joint families grow ever larger, they divide into smaller units, passing through a predictable cycle in a stipulated time frame. Transportation is the largest category of expense after food. The highest growth comes from car purchases.

The country's middle class is expected to grow from about 5 per cent of the population to more than 40 percent and will be the world's fifth-largest consumer market. India's rapid economic growth has set the tone for rapid change amidst the country's consumers. McKinsey Global Institute (MGI) report suggested that if India continues its recent growth, average household incomes will triple over the next two decades and it will become the world's 5th-largest consumer economy by 2025.[2]

3. LITERATURE REVIEW

Caravanning and camping is a leisure activity that consists of a number of sequential experiences.[3] Several of the manufacturers surveyed said their RVs are manufactured with satellite capability, cable and telephone hookups, and other options such as large entertainment centers, washers and dryers, dishwashers, etc., in response to consumers' demand for "...more equipment, more luxury, just plain more of everything. Recreational vehicle manufacturing has evolved dramatically in the past 90 years, far from the days of the "tent and bed" Model T. New technology has produced the vehicle that offers every comfort of home while at the same time stretching the limits of acceptability regarding size and service requirements. Clearly surpassing the ability of many public campgrounds to accommodate such vehicles, today's RVs are forcing campground managers to consider expensive redesign or new campground construction. [4]

Recreational vehicle manufacturers are implementing greener technologies such as hydrogen generating systems, high efficiency solar panels and biodiesel fuels for the next generation of RVs.[5] Indian public may be interested in motorhome due to their value for money, comfort and pleasure. [6] There has not been much of research work conducted on the subject matter related to motorhomes. Some commendable work has been conducted in other countries. [7]

Following gaps were identified from the structured review of literature:

Gap 1: Features Based Modeling of Motorhome for Indian Families is not fully explored and not much has been done in Indian context.

Gap 2: Very little literature is available Features Based Modeling of Motorhome for Indian Families.

4. MEANS OF TRANSPORTATION FOR INDIAN FAMILIES

In the context of Indian families, transportation plays a very pivotal role in their sustainable social and economic growth. The transport system in India largely looms upon a number of distinct means such as railways, roads, road transport, ports, inland water transport, coastal shipping, airports, and airlines. Out of all these modes of transportation Railways and roads are the most convenient, easily accessible, reliable and popular means of transportation for Indian families. However, in urban India high class and high middle class families prefer to travel by Air as they find it as the fastest means to reach in any corner of the world. But still, 95% of total traffic generated in the country prefers to travel by road or railways.

5. PREFERENCE OF INDIAN FAMILIES FOR FOUR WHEELERS

As per the latest report of National Council of Applied Economic Research (NCAER), India has 46.7 million high income households. At the present time, a great number of Indian families whether it is from rural or urban prefer to own their own four wheelers. It is revealed in an article published in the Tribune that in India everybody is rushing to buy a car. Around 1.65 crore Indian families in the country own a personal four wheeler out of which, 11 crore urban families have a four wheeler.

Generally, owning of cars are regarded an emblem of progress in India, and surprisingly crosses many income brackets. Over the period of time, the Indian car market has grown by leaps and bounds. This phenomenal growth is an outcome of ever growing and ever changing technology, developing economy and steadfast demand for cars amidst Indian families. Today, several new features car models are available in varied colors, sizes, models and prices to cater to the expanding customer base in India. Factors affecting demand for four wheelers equipped with luxuries and comforts are listed as:

- Living standard of people.
- Income of people.
- Prices of the four wheelers.
- Price of fuel.
- Family size.
- Number of buyers.
- Price of other four wheelers.
- Future prices.
- Quality of the four wheelers manufactured by different four wheeler companies.

6. OBJECTIVE AND RESEARCH METHODOLOGY

The present paper aims to study customer based designing and modeling of motorhome/recreational vehicle for Indian Families with special reference to Indian Families of the selected cities. The results of the present study are based on descriptive statistics such as frequency distribution and mean score of variables. The secondary data collected from various websites, journals, magazines, newspapers and reference books. Literature review has shown prior research work done in this area.

7. SAMPLE SIZE AND SAMPLING METHOD

The sample size of the study was 200 respondents from the selected 5 major cities of India. The sampling method selected by the researcher was non-probability judgment sampling method. The sample was drawn from 5 selected cities of India belonging to upper and higher middle class. In this research work, a self-administered and non-disguised five-point scale questionnaire that consisted of 20 closed-ended statements for the purpose of primary data collection was applied. Each statement out of 20 had a five-point scale (i.e. 5- Strongly Agree to 1- Strongly Disagree). The respondents had to tick either of the five-point choices. The scores on the individual items/statements were added to construct a total score for the respondent. 200 respondents from urban areas of India namely: Mumbai, New Delhi, Bangalore, Kolkata and Indore. The researcher visited house to house with convenient and judgmental basis in urban localities in order to administer the questionnaire.

Figure 1: Graphical Representation of Respondents' Response

8. DATA ANALYSIS

The excel sheet was prepared where the response of all 200 respondents against 20 statements was entered. Descriptive statistics used in this study included mean, frequencies, percentages and standard deviations. The data analysis and modeling tools applied in this research work were as: Cronbach's Alpha Model, Mean, Standard Deviation, Factor Analysis, Autodesk Inventor 2014 Professional Solid Works 2014, CATIA V5 R20 and Key Shots 5.0 Pro. were used for planning, design and development of the concept of feature based motorhome for Indian families.

In this study, Cronbach's Alpha Model was used for internal consistency, based on the average inter-item correlation. A value of 0.70 or more indicates very good internal consistency reliability in exploratory. In this study, the Cronbach's Alpha value is .693, which assumes good internal consistency among the items in the Questionnaire. Of the 200 respondents, 136 were male and 64 were female, 90 respondents were between 39-48 age groups, Family Size consisting 3-5 Members were 108 and 104 respondents fall into the income

Out of 200 respondents, 74 strongly agreed that space is available in Motorhome than their existing car. The calculated mean value 4.04 proved this point. Majority of respondents disagreed that Motorhome have more aesthetic appearance than their present car. The calculated mean value 3.00 proved this point. 83 respondents found the group above Rs 50000/-. Motorhome offer them more privacy and security than their owned car. The calculated mean value 4.18 proved this

point. Most of the respondents strongly agreed that Motorhome has more amenities like kitchen, bed, sofa set, dining area, lavatory, and kitchen than a traditional car. The calculated mean value 3.71 proved this point.

Further, factors used in the study were analyzed using Factor Analysis and the findings are described. The Key Six Factors Were Extracted Using Factor Analysis.

Table 1: Mean, Median, Mode and Std. Deviation of Questions

S. No	Question	Mean	Median	Mode	Std. Dev.
1	The concept of Motorhome is new for you to understand.	3.48	4.00	4	.839
2	Do you consider car trip is the best option for your families enjoyment/ pleasure /entertainment /sightseeing during your holidays?	2.68	3.00	3	1.114
3	Your present car trips are comfortable journey affairs.	2.27	2.00	3	.986
4	Motorhome may add more comfort/pleasure to your family tour.	3.51	4.00	4	.862
5	There may be more space available in Motorhome than your existing car.	4.04	4.00	5	.835
6	Motorhome may have more aesthetic appearance than your present car.	3.00	2.00	2	1.409
7	Motorhome may offer you more privacy and security than your owned car.	4.18	4.00	5	.783
8	Motorhome has more amenities like kitchen, bed, sofa set, dining area, lavatory etc. than a traditional car.	3.71	4.00	4	.631
9	Motorhome has a wide range of entertainment facilities for all the members of family than a regular car.	3.74	4.00	4	.698
10	Parking may be the key concern for Motorhome owners.	3.92	4.00	5	1.113
11	The concept of recreational / Motorhome parks for parking is different from traditional way of parking.	3.48	3.00	3	.820
12	Is the cost of Motorhome feasible for your family?	2.15	2.00	3	.788
13	Motorhome may increase your family's living standards.	3.98	4.00	4	.496
14	Motorhome may protect you from all kinds of climatic condition/weather.	3.12	3.00	3	.778
15	Maintenance may be the key factor in the Motorhome driving.	2.97	3.00	3	.795
16	Workshop and garages at recreational park may add value to the services of Motorhome.	3.09	3.00	4	.816
17	Use of renewable energy in Motorhome may reduce expenses on fuel and may protect the environment.	2.84	2.00	2	1.061
18	Designing and Modeling may be vital in making a buying decision.	3.83	4.00	3	.815
19	The Motorhome, available in the present market is user friendly.	2.44	3.00	1	1.247
20	Motorhome Model having facilities such as kitchen, lavatory, bed room, TV, AC, sofa set, dining table, and so on may solve all your travelling hazards.	3.27	3.00	4	.986

Table 2: Rotated Component Matrix

S. No.	Question	Rotated Component Matrix ^a					
		Component					
		1	2	3	4	5	6
1	The concept of Motorhome is new for you to understand.	-.023	.008	.039	.907	-.104	-.011
2	Do you consider car trip is the best option for your families enjoyment/ pleasure /entertainment /sightseeing during your holidays?	.787	.198	-.325	-.295	-.028	-.029
3	Your present car trips are comfortable journey affairs.	.903	.037	.118	.055	.051	.074
4	Motorhome may add more comfort/ pleasure to your family tour.	.405	.041	.602	-.021	-.014	.217
5	There may be more space available in Motorhome than your existing car.	.493	-.743	.152	.177	.048	.139
6	Motorhome may have more aesthetic appearance than your present car.	.282	-.288	-.624	.543	.113	.099
7	Motorhome may offer you more privacy and security than your owned car.	.149	-.086	.255	.048	.745	-.125
8	Motorhome has more amenities like kitchen, bed, sofa set, dining area, lavatory etc. than a traditional car.	.070	-.028	-.107	-.145	.808	.175
9	Motorhome has a wide range of entertainment facilities for all the members of family than a regular car.	.816	.014	.271	.049	.019	-.093
10	Parking may be the key concern for Motorhome owners.	.605	-.023	-.212	.086	-.011	-.218
11	The concept of recreational / Motorhome parks for parking is different from traditional way of parking.	-.003	.041	.000	.083	.060	.713

12	Is the cost of Motorhome feasible for your family?	.257	.004	.303	-.025	.288	.286
13	Motorhome may increase your family's living standards.	.336	-.426	.748	-.143	.061	.028
14	Motorhome may protect you from all kinds of climatic condition/weather.	.146	.883	.354	-.023	-.033	-.073
15	Maintenance may be the key factor in the Motorhome driving.	-.252	-.412	.276	-.295	.206	-.157
16	Workshop and garages at recreational park may add value to the services of Motorhome.	.217	.028	-.673	-.159	-.170	.103
17	Use of renewable energy in Motorhome may reduce expenses on fuel and may protect the environment.	.330	.883	-.238	.009	-.017	-.061
18	Designing and Modeling may be vital in making a buying decision.	.117	.189	.010	.065	.019	-.703
19	The Motorhome, available in the present market is user friendly.	-.645	.687	-.067	-.012	-.043	-.064
20	Motorhome Model having facilities such as kitchen, lavatory, bed room, TV, AC, sofa set, dining table, and so on may solve all your travelling hazards.	.912	-.002	.093	.065	.088	.044
Extraction Method: Principal Component Analysis.Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 7 iterations.							

Table 3: Factors Generated

S. No	FACTORS	1	2	3	4	5	6
1	The concept of Motorhome is new for you to understand.				.907		
2	Car trip is the best option for your <u>family's</u> enjoyment /pleasure/entertainment/sightseeing during your holidays.	.787					
3	Your present car trips are comfortable journey affairs.	.903					
4	Motor home may add more comfort/pleasure to your family			.602			
5	There may be more space available in Motorhome than your existing car.	.493					

6	Motorhome may have more aesthetic appearance than your present car.				.543		
7	Motorhome may offer you more privacy and security than your owned car.					.745	
8	Motorhome has more amenities like kitchen, bed, sofa set, dining area, lavatory etc. than a traditional car.					.808	
9	Motorhome has a wide range of entertainment facilities for all the members of family than a regular car.	.816					
10	Parking may be the key concern for Motorhome owners.	.605					
11	The concept of recreational / Motorhome parks for parking is different from traditional way of parking.						.713
12	Is the cost of Motorhome feasible for your family?			.303			
13	Motorhome may increase your family's living standards.			.748			
14	Motorhome may protect you from all kinds of climatic condition/weather.		.883				
15	Maintenance may be the key factor in the Motorhome driving.			.276			
16	Workshop and garages at recreational park may add value to the services of Motorhome.	.217					
17	Use of renewable energy in Motorhome may reduce expenses on fuel and may protect the environment.		.883				
18	Designing and Modeling may be vital in making a buying decision.		.189				
19	The Motorhome, available in the present market is user friendly.		.687				
20	Motorhome Model having facilities such as kitchen, lavatory, bed room, TV, AC, sofa set, dining table, and so on may solve all your travelling hazards.	.917					

Table 4: Preferences of the Extracted Factors

Factor	Privacy and Security	Motorhome Park	Facilities	Modeling and Designing	Maintenance and comfort	User friendly
Average Score	3.94	3.48	3.28	3.24	3.15	3.05
Rank	I	II	III	IV	V	VI

Above Table clearly depicts that Factor Privacy and Security Level ranks the highest on the list (3.94), Motorhome Park (3.00), Facilities (3.33) as the most preferred one, followed by Modeling, and Designing (3.24), Maintenance and Comfort (3.23) and at the last, we have factor of User Friendly (3.15) .

9. CONCLUSIONS

Motorhome/RV designed to provide temporary living quarters for recreational, camping or travel use, is built on or permanently attached to a self-propelled motor vehicle chassis or on a chassis cab or van that is an integral part of the completed vehicle. A Motorhome/RV is like owning a very nice home that one can take it on the road along with family members. Owning a Motorhome/RV makes family camping easy.

Results of the study clearly highlighted that Indian family living in the selected metro cities are more aware about the concept of Motorhome/RV and appeared keen to vouch for it. For developing/structuring a luxury Motorhome/RV, the fittings are usually made from very high quality materials as real wood, polished steel, and natural materials like leather, wool, and silk. These materials should fulfill safety guidelines, such as being fire resistant. The design of the interior of the coach maximizes space, often in ingenious ways, and may include luxurious touches like built-in vases or design features from architects and graphic designers.

Thus, the study found that mostly Indian families like to spend their holiday or weekends with their family members by going on an outdoor tour to any serene and calm place where they can have all the pleasure, fun and comforts. Privacy, safety and security of family are the key concerns for them. Under such circumstances, caravan tourism is really offering them a sigh of relief.

10. PROPOSED FEATURE BASED MODELLING OF MOTOR HOME/ RECREATIONAL VEHICLE FOR INDIAN FAMILIES

Motorhome means a “Special Purpose Vehicle (SPV)” is application limited to seats designated for normal use when the vehicle is travelling on the road. Designing and modeling of Motorhome/RV is a quite stimulating work. Luxury motorhome is a motorhome with extra features and amenities that are not considered standard, such as leather seating. It may be part of a company's product lineup or it can be custom built to satisfy specific customer requirements. Companies that manufacture luxury motorhomes often offer new and used vehicles, and some may also provide access to rentals for customers who do not want to purchase but use a Motorhome/RV for a planned trip or event.

The size/design is kept within legal limitations so it can be driven on the open road, and it may provide sleeping room for a range of people, generally between two and eight. The vehicle will also have an enclosed kitchen and bathroom. Features like a tow hitch for a private car to use while the Motorhome/RV is parked at a facility are often available, along with fold-out awnings to create a shady outdoor area. The luxury motorhome may have more facilities as built-in bars, extra storage space, and other tools that the owner may find purposeful. Storage under the coach for bulky items people may travel with, like skis and diving gear may also be provided. Power to the motorhome may be supplied through batteries or a separate generator to make sure the owner never lacks of power, and care is taken to make the interior as pleasant as possible.

Price for luxury motorhome designs can be very high due to increased design costs as well as the more expensive base materials. Additions can increase the base price, especially if they require substantial custom modifications. At least lap belts are required in all rear seating positions. Seats which are not designated for use when vehicle is travelling on the road shall be clearly identified to users either by means of pictogram or a sign with an appropriate text. With living accommodation, space which contains the following equipments as a minimum:

- Seats and table,
- Sleeping accommodation which may be converted from the seats,
- Cooking facilities,
- Storage facilities.

This equipment shall be rigidly fixed to the living compartment. However, the table may be designed to be easily removable. Requirements for the equipments in the living accommodation space are provided as per standards.

11. PROPOSED FEATURES FOR MOTOR HOME/RECREATIONAL VEHICLE

11.1. Vehicle Features:

- Vehicle chassis, Engine / Fuel, Transmission, Fuel Tank, Fuel Consumption, Power Steering.

11.2. Vehicle Dimensions:

- Length, Width, Interior Height, External Height.

11.3. Electrical System:

- A. Power Supply :12v / 240v Mains power
- B. AM/FM Radio/CD player
- C. TV / DVD/Satellite TV
- D. Dual Batteries

11.4. Interior Features:

- Seatbelts, Driver's Cabin, Main Cabin (behind Driver's side seat), and Child Restraints: (Child seat anchor points are located on the forward facing dinette seat only).

11.5. Air Conditioning/Heating:

- Driver's Cabin, Rear, Internal Walkthrough.

11.6. Water Tank:

- Water Tank Capacity, Hot and Cold Pressurized Water ,Shower ,Toilet

11.7. Vehicle Bedding Dimensions:

- Double Bed (Behind Driver's Cabin), Double Bed (Back side of vehicle), Single Bed (Over Back side of vehicle).

11.8. Kitchen and Bathroom Amenity:

- Sink Gas Bottle, Microwave, Gas Stove, and Fridge/Freezer.

11.9. Cargo Area of Vehicle:

- A. Safety Equipment
 - a. Fire Extinguisher,
 - b. LPG Detector,
 - c. Smoke Alarm,
 - d. Carbon Monoxide Detector,
 - e. Emergency Exit.
- B. Tires.
- C. Spare Tire.
- D. The Side Step.
- E. Smoking Policy.

11.10. Driver's cab Accessories:

- A. The Dashboard,
- B. Gauges, lights and controls,
- C. Starting the engine,
- D. Warning lights and buzzers,
- E. Turn signals, cruise control and emergency flashers,
- F. Brakes,
- G. The Transmission.

11.11. Small Accessories cabin in vehicle

- A. The Monitor Panel
- B. The Generator
- C. The Auxiliary Battery
- D. Slide-Outs
- E. The Electrical system
 - a. 12-volt, 110-volt,
 - b. Chassis,
 - c. The Power Converter,
 - d. Fuses, GFI and Circuit Breakers,
 - e. Main Battery Cut-off.
- F. Electrical appliances
 - a. Microwave,
 - b. Air Conditioner
 - c. The Refrigerator.

G. Propane appliances

- a. Stove Top and Oven,
- b. The Furnace,
- c. The Water Heater.

H. The Water system

- a. Fresh Water,
- b. Waste Water,
- c. The Bathroom,
- d. Winter use and Freeze Precautions.

I. Television (if so equipped)

12. PROPOSED FEATURE BASED MODELLING AND 3D RENDERING OF MOTORHOME/ RECREATIONAL VEHICLE FOR INDIAN FAMILIES

Figure 2: Interior Views of Proposed Motor home/ Recreational Vehicle Model for Indian Families

Figure 3: Chassis of Proposed Motorhome/ Recreational Vehicle for Indian Families

Figure 4: Transparent Model Exterior View of Proposed Motorhome/ Recreational Vehicle for Indian Families

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