

A Case study for Technology Fusion on Rise in Parking Woes as against Affinity for Advancement in Automobile Design & Manufacturing

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Abstract : Automobiles i.e. *autós*, "self" , mobiles, "movable" i.e. self movable devices meaning a vehicle that moves itself, that enable reduced human/animal effort providing comfort and speed of travel. History is witness to the ever changing scenario in automobiles, since the industrial revolution ushered in various scientific laws and machines that enabled new significant developments and therefore newer machines and thus paved the way for research towards improvement upon the two mentioned factors above viz. comfort and speed in travel. The research today has reached to such zeniths that even the parameter of fuel shortages due to worldwide dwindling resources of conventional fuels seems to have been tackled or on the verge of it by introducing new fuel energy resources/technologies such that automobiles can still be seen on the roads. But having speed, comfort, fuel in abundance i.e. renewable sources of course, are we having enough parking space/system to keep our priceless automobiles when not in use because estimated research findings say that on an average, a vehicle remains parked 95% of the time, occupying near about 50 square feet of primed space valued more than the cost of the vehicle parked. If yes, do we have enough security for the same in that available parking space/system? This paper highlights the poor conditions for security in automobiles arising due to;

- Space crunch all over the world with rise in population
- Congestion and pollution due to search for free street parking
- Rise in purchasing power in people
- Varieties of automobiles (Price, types, shape, size, etc.)
- Rise in cost of the vehicles (due to new facilities/features, etc.)

All above points have made appropriate parking difficult not only in residential but also public/commercial complexes, leading to encroaching into non-parking/unsuitable parking zones thereby resulting in damage, theft or confiscation by Public Authorities and severe mental agony in retrieving back the same from them.

Keywords: Automobile, History, Research, Parking, Mental agony

INTRODUCTION

Based on the scheme of things occurring in nature there seem to exist a place to survive for all animate or inanimate entities. If no place is available which may be due to whatsoever causes ranging from resistance to change or resistance to new technology then extinction results for the simple reason in not falling in line with nature. However in above case for automobiles although new changes are happening at a rapid pace but still no place to accommodate them. Hence, to proceed with further discussions it was

imperative to borrow certain statistics as presented in the next section in order to highlight;

- The urgent need of appropriate parking as compared to
 - Incorporating newer technologies for the sake of enhancing only aesthetic appeal
- as against the more importance of the latter for the sake of improving fuel saving and efficiency and also for the sake of complete changeover to renewable fuel energy with good efficiency and other parameters. Thus the urgency in need of appropriate parking area/system design increases fourfold when newer smart technologies are installed for purposes other than enhancing such aesthetic appeals.

LITERATURE REVIEW

Growth & competition in automobile industry:

Reference [1] shows that the Indian economy has grown at an average rate of around 9 percent over the past five years and is expected to continue this growth in the medium term. This is predicted to drive an increase in the percentage of the Indian population able to afford vehicles. India's car per capita ratio (expressed in cars per 1,000 populations) is currently among the lowest in the world's top 10 auto markets. The twin phenomena of low car penetration and rising incomes, when combined with increasing affordability of cars, are expected to contribute to an increase in India's automobile demand. Some statistics observed as in [1] are given below:

- From Source: EIU KPMG Research; the gross domestic product or GDP (USD Billion) in 2009 was 3561 as against 4968 in 2013. The volumes of automobiles in million sold were 1.95 in 2009 as against 3.07 in 2013.
- From Source: World Bank, KPMG Research; Cars owned per 1000 population was below 200 for India, China, Brazil as compared to UK and Russia who were below 400 and USA, Spain, Italy, Germany, France were below 600. The cars manufactured in million the same year were highest for USA around 140 and least for India at below 20 and for the rest below 50.
- From Source: NCAER Estimates; For year 2001 – 2002, the number of households in 000's belonging to HIG (>180K per month) were 13.8 rose to 46.7 (~16% rise) in 2009 – 2010. Similarly, MIG (45K to 180K per month) were 109.2 rose to 140.7 (~3% rise), LIG (>45K per month) were 65.2 dropped to 41 (~6% fall).
- From Source: SIAM the growth rate of automobiles from 2004-05, 2005-06, 2006-07, 2007-08, 2008-09 and 2009-10

were 15%, 12%, 13%, -5%, 1%, 25% respectively and the domestic vehicle volumes in million were 08, 09, 10, 09, 09 and 12 respectively.

The Indian automobile industry witnessed interesting dynamics in recent times with the effect of the global downturn, followed by recovery in domestic demand. The future of the industry in the medium term based on current trends was analyzed as in [1] along two broad themes in the global automobile industry viz.

1. Growth: As from [1]

o From Source: SIAM the Indian Automobile Market 2009-10 Domestic Sales Volumes hit at 12.3 million vehicles with around 76% of two wheelers, 16% passenger vehicles, 4% commercial vehicles, 4% three wheelers.

o From Source: KPMG Research, EIU vehicle affordability for the year 2010 in US; the personal disposable income was 36380 USD as against 27000 USD being the average price of a car but in China; the personal disposable income was only 1860 USD as against 17000 USD being the average price of a car and in India the figures being 1080 USD as against 8500 USD.

o From Source: SIAM the domestic sales growth, say scooters was 12.6% CAGR with an increasing trend from 2005-06 to 2009-10 viz. 0.91 million units of sales in 2005-06, 0.94 million units in 2006-07, 1.05 million units in 2007-08, 1.15 million units in 2008-09, 1.46 million units in 2009-10, respectively.

o From Source: SIAM KPMG Research the Luxury car sales in units from 2007-08, 2008-09 and 2009-10 were 9731, 14802, 18772, respectively.

o From Source: EMKAY Research NCAER, growth in rural demand for passenger vehicles as against urban demand for 1999-00, 2004-05 and 2009-10 were 6.0%, 8.8% and 10.2% respectively for the former and 94.0%, 91.2% and 89.8% respectively for the latter with 0.73 million, 1.06 million and 1.95 million vehicles manufactured for the respective periods.

2. Consolidation of Passenger cars and CV's: As from [1];

o Year 1900, presence of Fiat India, only as 4 wheelers.

o Year 1920, presence of Fiat India and General Motars India, only.

o Year 1940, presence of Fiat India, Standard, General Motars India, M & M, Tata Motars, Premier Automobiles, Hindustan Motars and presence of API as 2 wheelers.

o Year 1950, presence of Standard, M & M, Tata Motars, Premier Automobiles, Hindustan Motars, Force Motars, Ashok Leyland and presence of Royal Enfield, Bajaj Auto, API.

o Year 1960, presence of same as above viz. Standard, M & M, Tata Motars, Premier Automobiles, Hindustan Motars, Force Motars, Ashok Leyland and presence of Ideal Java, Mopeds Indas, TVS Suzuki, Escorts Group, Royal Enfield, Bajaj Auto, API.

o Year 1970, presence of Sipani, Standard, M & M, Tata Motars, Premier Automobiles, Hindustan Motars, Force Motars, Ashok Leyland and presence of LML India, Ideal Java, Mopeds Indas, TVS Suzuki, Escorts Group, Royal Enfield, Bajaj Auto, API, Atul Auto, Scooters India.

o Year 1980, presence of Sipani, Maruti Suzuki India, M & M, Tata Motars, Premier Automobiles, Hindustan Motars, JCBL, Swaraj Mazda, VE-CVs Eicher, Force Motars, Ashok Leyland and presence of Kinetic Motar Company, LML India, Ideal Java, Mopeds Indas, Hero Honda Motars, TVS Suzuki, Escorts Group, Royal Enfield, Bajaj Auto, API, Atul Auto, Scooters India.

o Year 1990, presence of General Motars India, Mitshubishi, Fiat India, Toyota Kirloskar Motars, Hyundai Motars India, Honda Siel Cars India, Ford India, Mercedes Benz, Rover, Sipani, Maruti Suzuki India, M & M, Tata Motars, Premier Automobiles, Hindustan Motars, JCBL, Swaraj Mazda, VE-CVs Eicher, Force Motars, Ashok Leyland and presence of HMSI, Kinetic Motar Company, LML India, Ideal Java, Mopeds Indas, Hero Honda Motars, TVS Suzuki, Escorts Group, Royal Enfield, Bajaj Auto, API, Piaggio, Atul Auto, Scooters India.

o Year 2000, presence of Volkswagen India, General Motars India, Mitshubishi, BMW, Fiat India, Toyota Kirloskar Motars, Hyundai Motars India, Honda Siel Cars India, Ford India, Mercedes Benz, Skoda Auto India, Volkswagen Audi, Maruti Suzuki India, M & M, Tata Motars, Premier Automobiles, Hindustan Motars, Asia Motar Works, Kamaz Vectra Motars, JCBL, Swaraj Mazda, VE-CVs Eicher, Force Motars, Ashok Leyland and presence of Electrothem, Suzuki Motarcycle India, Yamaha, M&M, Hero Honda Motars, HMSI, TVS Motar Company, Royal Enfield, Bajaj Auto, Piaggio, Atul Auto, Scooters India.

A summary of the above statistics reflects the presence of a strong affinity towards advancement in design and manufacturing of more and more better automobiles in tune with changing times and needs.

Demographics in Indian context:

Demographics are statistical characteristics (vague) of a population. These types of data are used widely in public opinion polling and marketing. Commonly examined demographics include gender, age, ethnicity, knowledge of languages, disabilities, mobility, home ownership, employment status, and even location. Marketers typically combine several variables to define a demographic profile. A demographic profile (often shortened to "a demographic") provides enough information about the typical member of this group to create a mental picture of this hypothetical aggregate. For example, a marketer might speak of the single, female, middle-class, age 18 to 24 demographic. The data below from [1] shows India's changing demographic profile (in Mn) across age groups as follows;

o For the period 2002, 2007 and 2012 the rise in population in million increased from 1028 to 1111 to 1195 respectively. The pattern across different age groups for these three years were 59% to 62% to 64% for under 15 age group, 34% to 30% to 28% for 15-59 age group and 7% to 8% to again 8% for 60+ age group.

o Density of population of India in a chronological order the last updated below data was on 25 August 2011 as in [2].

Year	Density of population per sq km (number of persons per square kilometre)
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1901	77
1911	82
1921	81
1931	90
1941	103
1951	117
1961	142
1971	177
1981	216
1991	274
2001	324
2011	500

Table 1. Density of population per sq km

A summary of the above statistics reflects the rise in population year after year and space crunch due to limited occupancy area especially in not so newly developed residential/commercial complexes that results in parking outside the complex/s. This rise in parking woes is explained in the form of a case study as shown in the next section.

CASE STUDY

Residential complex details:

- o Address: Sector 10, JN-4 Type, Building Nos. 1 to 8, Vashi - 400703 Navi Mumbai
- o Number of Residential buildings: 08 Nos.
- o Number of Office building: 01 No.
- o Garden plots: 02 Nos. (G1 & G2)
- o No. of mobile towers: 03 Nos. (M1, M2 & M3)
- o Area outside society: 03 Nos. (OS)
- o Functional gates: 02 Nos. (GF & GB)
- o Greenery space: Adjacent to the buildings
- o Parking slots availability: Adjacent to the buildings.

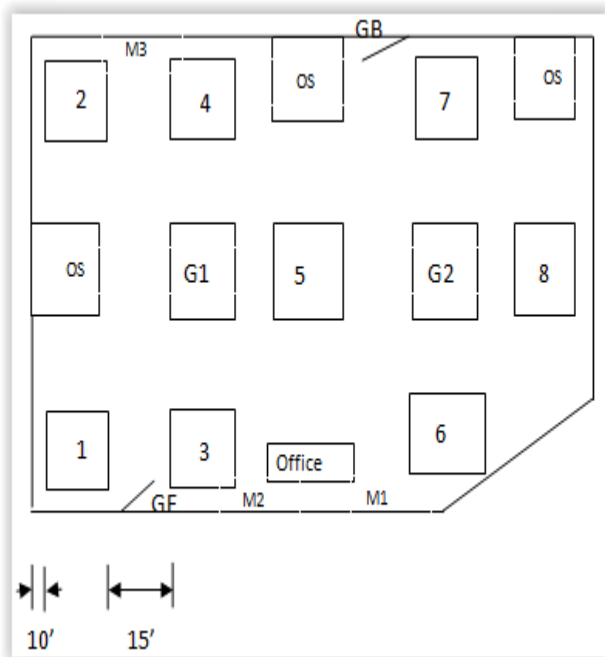


Fig 1: Approximate layout of residential society

- o Statistics per building
 - 1 flat= 708.94 sq. feet ~ 710 sq. feet
 - 4 flats~710*4= 2840 sq. feet

- 1 building~ 3000 sq. feet
- Outside society area (OS) ~ 3000 sq. feet
- o Statistics per garden
 - 1garden~ 2840 sq.foot
- o Statistics for office
 - 1 office= 500 sq.foot
- o Other details
 - Walking/vehicle lanes~ Width 5 feet
 - Assume 5 feet distance around each structural area as per appropriate building legal codes.
 - Building & boundary distance = 10 feet
 - Between buildings = 15 feet
 - Between buildings & garden = Either 10 feet or 15 feet
 - Vehicle occupancy area = 10 feet * 5 feet = 50 sq.foot
 - Vehicle occupancy area per side of each building/structure = 30 feet * 5 feet = 150 sq.foot
 - Assume all the space adjacent to the 8 buildings, 2 gardens, 1 office and 3 outside society boundaries are used for parking. Then, the available empty space per available sides ~ 33
 - None of the above 33 lanes run parallel side by side i.e. between two structures, there is only one parking lane of 30 feet * 5 feet.
 - Hence, total Vehicle occupancy area = 150 sq.foot * 33 = 4950 sq.foot
 - Total vehicles that can be accommodated for parking = 4950/50 = 99 (Assume all are 4 wheelers)
- o Statistics of families:
 - All buildings are g+3 types
 - Each floor has 4 flats
 - Flats per building = 16
 - Flats for 8 building = 16*8= 128
 - Assume 1 vehicle per flat, then required parking space needed is for 128 minimum vehicles

RESULTS

- Approximately, $\frac{3}{4}$ vehicles only could be parked within residential society complex.

Extrapolating the above result to the statistics given before on “Growth & competition in automobile industry” and “Demographics in Indian context” we find its severe impact for evaluating fixed costs (normal items such as loan repayments, annually fixed - insurance premiums, license plate renewal etc.) and variable costs (normal items such as oil changes, cost for new tires, filter changes, gas prices, normal scheduled maintenance whose repairs are not covered by warranty, in case of an accident - deductible / parking fees / toll road fees, timing belt change at around 100k miles i.e. belts will need changing preferably around 75k miles, etc.) on household car ownership issues. This is because illegal parking invites unethical costly practices such as corruption, high probability of theft occurrences, damage due to natural or man-made causes, etc. resulting in further increased costs with not to mention severe mental agony. It would therefore

not be wrong then to call ownership of such a depreciating commodity with such high fixed/variable costs as a White Elephant because if the fixed/variable costs increase then the total costs would increase (total costs = total fixed costs plus total variable costs). The effect is illustrated in the Fig 2. The total cost curves pivots upwards. This causes the profitable use of a vehicle difficult to achieve for any given usage parameter/s and the break-even point to be at a higher usage level i.e. Increase in fixed/variable costs, increases break-even level for the usage output. At this point, if depreciation of the vehicle on such higher usage be superimposed then it may never be possible to reach the break-even and losses may become inevitable during the entire expected life of the vehicle.

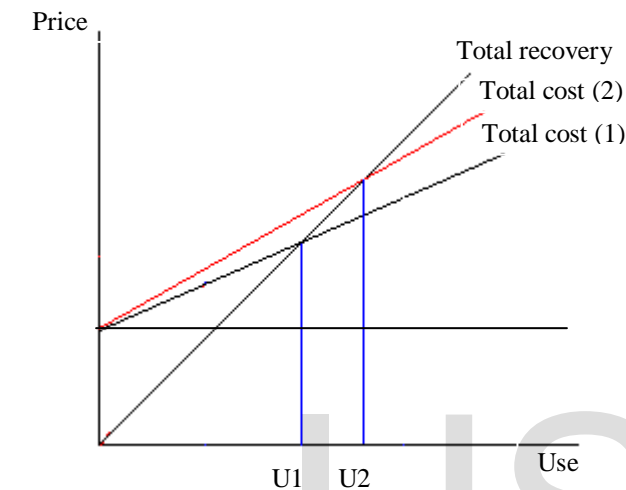


Fig 2: Breakeven chart

CONCLUSION

Apart from space area constraint as discussed in the previous section other parameters needing attention directly/indirectly are:

- Protective parking areas due to extensive mechatronics involved in vehicles.
- Efficient parking systems for parking/retrieving purposes.
- Security in parking areas/systems considering the extensive use of Information Technology involved for travel in recent generation of vehicles.

The results thus give a clear insight on the need to develop an affinity to control this problem and free our inner space for deliberations on this issue even if it is at the cost of other important tasks. Solution reviews for this problem although not the aim of this paper would be:

- A system of storing and retrieving vehicles with little or no human intervention i.e. vehicles packed in the air (above grade) or under the ground (below grade) thereby maximizing the use of scarce or expensive land e.g. parking space on top of closed drainage systems.
- Regulation in the use of domestic vehicles in areas as and where possible by encouraging the use of public transport systems viz. rickshaws, taxis, buses, rails and metros.

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