

An Analysis on Sport Utility Vehicles Development in India and Its Safety

Mr.P.M.Subramanian, Dr.V.Muthu

Abstract— Sports utility vehicles (SUVs) are known for their ruggedness and aggressive design often defined as a light truck-like vehicle used for personal transport. During the 1990s, sport utility vehicles (SUVs) became the fastest growing segment of the automotive industry globally. SUVs are larger and heavier than conventional passenger cars. SUVs with their higher height and weight will cause severe injury for occupants of passenger cars during collision on the highway. As per National Highway Traffic Safety Administration (NHTSA) SUVs are more prone to roll-overs than other passenger cars. In spite of their roll over propensity, Indians love SUVs in a way like the Americans. Indian automotive sector show sign of increasing in popularity for SUVs. They will be occupying the most dominant position among other passenger cars in future. Over the past years, SUV's sales have ballooned, accounting for one in every four passenger vehicles sold by automobile industry in India. As per Society of Indian Automobile Manufacturers (SIAM) in 2017 SUV sales rise by 30% than last year where car sales grew only by over 4%. The expanding SUV markets coerce the manufacturers to add SUVs in their vehicle lineup.to gain the market share. This research aims at analyzing the purpose for rapid increase in popularity of SUV in India. This paper also examines the impact of SUVs on passenger car sales, technological development and Highway safety.

Index Terms— SUVs Development, SUVs Impact, SUVs Safety, SUVs Sales, SUVs Technological Advancement

I. INTRODUCTION

SUV or sport-ute is an automotive classification resembling a station wagon or estate car along with off-road vehicle appearance. SUV have features like raised ground clearance and ruggedness, possibly as a four-wheel drive [14]. Many SUVs are historically built on a light-truck chassis but operated as a family vehicle. SUV though designed to be used on rougher surfaces, most often used on city streets or highways. The analysis of influence of SUVs in Indian automotive sector is done by the following methodology. The market share of SUVs in India is estimated and compared with other passenger vehicles. The sales trends of SUV are compared with sales of other types of vehicles. The technological development taken place in SUV design is observed over a period of years. The safety issues associated with SUVs are examined and fatality details from ministry of road and transportation have been depicted [1].

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Mr.P.M.Subramanian, Assistant Professor, Mechanical Engineering, Prathyusha Engineering College, Tiruvallur, Anna University India

Dr V.Muthu, Professor ,Automobile Engineering, Rajalakshmi Engineering College Anna University, , Thandalam, Anna University India

II. INDIAN SUV MARKET

Sport utility vehicles (SUVs) which were a rare on India's roads a decade ago, are slowly becoming the most sought after cars. Rising congestion in cities and improvement in technology are one of the prime reasons for the rising demand for SUVs, which come equipped with latest technology. India's car market is the world's sixth largest and is expected to grow to number three by 2020, with the rise in income levels. Compact SUV sales in India are likely to more than quadruple to 9,70,000 vehicles in the decade to 2020, according to industry. As shown in the figure 1; by 2030 India will be among the global big 3 nations in passenger vehicle sales[11].

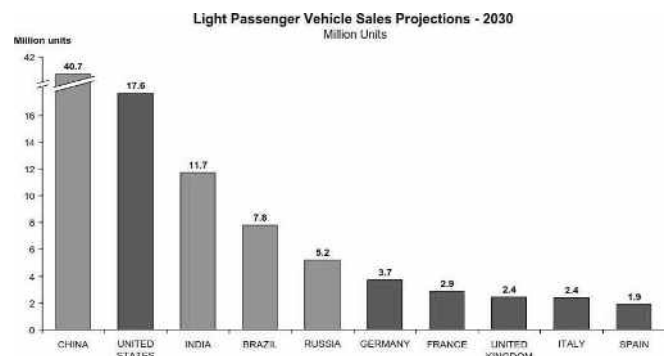


Fig.1 Global Passenger Vehicles Sales Projection in 2030

Starting in 2015, sales of SUVs started dominating the industry. In 2016 global market researcher Euro monitor International released news that world-wide SUV sales surged 22 percent since 2015. Fig 2 shows SUVs overtook lower medium cars to become the largest automotive segment in 2015, accounting for 22.9 percent of light vehicle sales. [2].

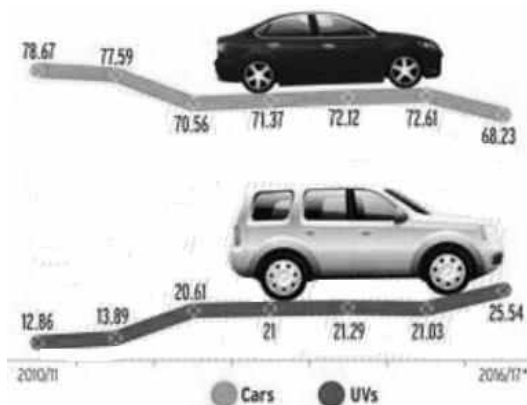


Fig.2 Cars and UVs Market Share (%) Comparison (2010 to 2017) (Source: SIAM)

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In 2010, utility vehicles (UV) constituted just about 14% of the overall passenger vehicle sales. Today, they account for over 25%, as per Society of Indian Automobile Manufacturers (SIAM). In the year 2017, over 21 million vehicles were sold in India, of which more than three million were cars. Of this three million, over 700,000 were utility vehicles. UVs despite their higher cost and lower mileage rose to 25.54 per cent in the first quarter of 2016/17, a significant rise in market share from 21 per cent in 2015/16[3].

Indian Credit Ratings Association (ICRA) states in FY2017 and H1 FY2018, the SUV segment has consecutively done better than the other vehicle segments. In FY2017, the SUV segments have sold 7,61,997 inputs marking a 29.9 per cent year-on-year (Y-o-Y) increase from FY2016. Fig.3 shows in H1 FY2018, the segment has recorded an increase of 17.8 per cent, selling 4,40,010 units. UV sales in India are predicted to cross the 1 million units mark annually by 2020 demand [3].

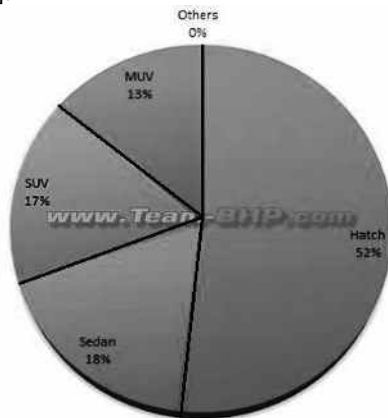


Fig.3 Passenger cars Segment wise Sales (%) - April 2018
(Source: Team BHP)

III. FACTORS ENHANCED UVS POPULARITY IN INDIA

In India SUVs are becoming smaller and wider. Increasingly, they are being built on unibody vehicle structures, which are also used as platforms in making hatchbacks and small sedans. The compact SUVs became most preferred passenger cars among customers. Surging demand for utility vehicles, both in town and country, is also having an impact on the passenger car market. Autocar Professional's analysis reveals that over the past seven fiscal years, even as the overall passenger vehicle market size has grown, the overall share of the passenger car market has fallen by 10 percent while that of UVs has risen by 12.5 percent, clearly indicating that SUVs have eaten into the car market and same trend will exist in future [8].

The continuing demand for compact SUVs and a marked shift of customer preference of such models over conventional hatchback improved automotive manufacturer focus towards SUVs. The prevailing demand can be attributed to the aggressive marketing of SUVs by OEMs and new consistent models launches in certain types of SUVs. Rising disposable income, declining cost of ownership, and lower EMI rates are key factors that influence consumers

purchasing behavior. SUVs are doing well in both urban area and in rural India. The rural segment accounts for 25 to 27 per cent of the domestic passenger vehicles sales. The factors enhancing up the rural area sales are adequate rains in the monsoon season and enactment of seventh pay commission. The urban contributors to growth are more or less similar in terms of income along with factors like the festive season and change in customer behavior[9].

Thus the two major elements to the success of utility vehicles in India are compact SUVs have become affordable for the Indian consumer and conscious effort from the automakers to launch more SUV models in the country. In March 2018, Honda launched the WR-V, a compact SUV jointly developed by its research teams of India and Japan. Volkswagen and Skoda are planning to launch new SUVs in India. The automakers are fine-tuning the UVs designs and bringing innovations to suit Indian conditions. The shape and style of the SUV is continuously changing to suit the requirements and expectations of customers. Older UV models like Scorpio and Safari use a traditional body-on-frame construction, which are rugged, bulky and not too comfortable. Their fuel economy is also low compared to compact SUVs[11]. Fig.5 shows the difference between body-on-frame and unibody construction.

The modern SUV is a crossover and has characteristics closely matching with a car. This makes SUVs comfortable for urban driving and also results in higher fuel economy. The compact SUVs result in more degree of customer satisfaction and emerge as the second major passenger car segment in the Indian automotive market.

IV. SUV MARKET SEGMENT CLASSIFICATIONS

Mini SUV also called subcompact SUV or subcompact crossover is a class of small sport utility vehicles.

Compact SUV or crossover SUV is a class of smaller SUVs that are commonly built with less cargo and passenger space, and often with smaller engines resulting in better fuel economy.

Mid-size SUV is a class of medium-size SUVs whose size typically falls between that of a full-size and a compact SUV.

Full-size SUVs have greater cargo and passenger space than midsize SUVs. Full Size SUVs are usually given higher safety ratings than their smaller counterparts.

Extended-length SUV also sometimes called a long-wheel based SUV that are similar to a full-size SUV but they have a larger cargo area of around 130 in (3.30 m) and passenger space that can seat up to 8 or 9 people[1].



Fig.5 Larger SUV (left) introduced before 2003 (with frame chassis) and of small SUV (Right) after 2002 (with unibody)

V. GAME CHANGING SUVs

The Maruti's first-ever compact SUV Vitara Brezza has been the game-changing vehicle of the year and it occupies the top of the UV charts. Maruti launched Brezza in July 2016 and the model obtained first position among the top five best selling UVs in the country and crossed the 100,000 units domestic sales in less than a year after launch. The second best SUV is Hyundai Motor Creta which crossed the 150,000 sales milestone in less than two years since launch. The biggest contributor to passenger vehicle sales in 2016-17 are Maruti Suzuki India with 1,443,641 units and 24 percent were utility vehicles [13].

The trend among first time buyers (FTBs) has been changed to prefer compact SUV over sedans or hatchbacks. The compact UV is most appealing among consumers for its monocoque build compared to full scale SUVs which is body on frame construction. The compact UV is easy to drive through urban and congested roads while retaining ruggedness of a conventional SUV[9].

The mid-size vehicle segments sedan & Hatchback have to compete with a compact SUV in the passenger vehicles market. The price ranges of the two segments are same and this will impact the growth of small passenger vehicle segment due to the preference by first time buyers.

The most successful automakers in the UV segment such as Mahindra and Mahindra, Tata and Toyota have experienced a decline in market share owing to the lack of compact UVs in their production. But Maruti Suzuki India Limited (MSIL) and Hyundai have experienced a steady growth in market share with their compact SUV[11].

VI. SUVs SAFETY

The consumers believe that SUVs are safer than cars in crashes because they are generally larger and heavier. They are higher resulting in improved visibility and more rugged so that it can climb mountains and cross streams of water National Highway Traffic Safety Administration (NHTSA, USA) published reports indicating that SUVs are not as safe as they might appear. Medium and large SUVs (Body on Frame) pose a potential threat to occupants of other vehicles in crashes similar to that of heavy vehicle. As the size of the SUV increases, the danger to occupants of the other vehicle increases[1]. The bumper and frame on medium and large SUVs are higher than on cars, the SUV may override the bumpers on a car in a collision, causing more intrusion into the automobile. In a side impact collision when a car is struck

by an SUV, the occupants of the car are 27 times more likely to die[6]. These dangers are brought on by the SUV's added weight, height, and rigid frame design.

The University at Buffalo analyzed the crashes involving cars and sport utility vehicles (SUVs) and found out that the crash ratings are less relevant than vehicle type [4]. In head-on collisions between passenger cars and SUVs, the research found that drivers in passenger cars were nearly 10 times more likely to die if the SUV involved had a better crash rating. Drivers of passenger cars were more than four times more likely to die even if the passenger car had a better crash rating than the SUV. "When two vehicles are involved in a crash, fatalities occur in the smaller and lighter of the two vehicles since in frontal crashes SUVs tend to ride over shorter passenger vehicles.

Mayrose J and Jehle DV[5] compared sports utility vehicle and passenger car crashes in their research work their findings are summarized as follows.

Belted occupants of passenger cars involved in a fatal head-on collision with an SUV had a higher fatality rate (total deaths per vehicle type/total occupants per vehicle type) than belted occupants of the SUV. The difference in fatality rates is marginally reduced when the weight of the passenger car is equivalent to the weight of the SUV. Occupants of passenger cars have a higher risk of fatality than occupants of SUVs in car-versus-SUV head-on crashes. Vehicle differential weight plays an important role in determining the safety of occupants involved in these crashes, along with other factors such as mismatches in vehicle design and structural load path.

According to the Ministry of Road Transport and Highways in 2016, 1.5 lakh people died in road accidents. A total of 5.638 people died in 2016 due to non-usage of seat belts. The pan India made a study across seventeen cities in association with Millward Brown and IMRB The analysis revealed that overall South ranks first in non-usage of seat belts, and female drivers was highest at 81 per cent compared to male drivers at 68 per cent. SUV drivers were the worst defaulters when it came to not wearing seat belts, with 77 percentage [7]. The share of vehicle in road accidents is shown in fig 6.

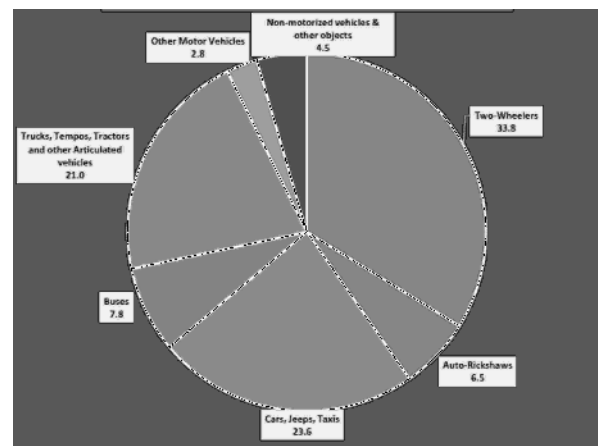


Fig.6 Share in Total Road Accidents by type of motor vehicle involved-2016

VII. TECHNOLOGICAL ADVANCEMENT IN SUVs

SUVs are larger in size than normal cars, safety will be the foremost feature of SUVs. Majority of the vehicles from SUV segment are installed with basic safety features such as ABS and airbags. Curtain airbags is a new trend found in the SUV segment to provide better safety for passengers. Mid and full-size SUVs have additional safety features such as anti-roll system, blind spot detection, rear park assist, electronic stability control and emergency brake assist system. Premium SUVs were equipped with smart safety systems such as front collision warning, active anti-roll assist, road sign recognition, lane departure assist, collapsible steering column and head protection system[13].

SUVs are usually front wheel drive, and all-wheel drive feature (AWD) is optional considering fuel efficiency. But full size and premium SUVs are installed with AWD systems. The SUV is fitted with drive on terrain option, which can be selected electronically. In some advanced SUVs all-wheel drives are now automatic, vehicle judges the terrain and can adjust the suspension height and AWD requirement.

Hill Descent Control (HDC) a driver assistant system holds the vehicle steadily at a predetermined speed with the help of brake control so that the driver has to do steering alone. Dynamic stability control (DSC) a safety system which recognizes the risk of skidding before it occurs and stabilizes the car in milliseconds.

Crash sensors are located in the A pillar, BC pillar and in the doors of the vehicle and helps to deploy airbags during accident within milliseconds. Seatbelt pre-tensioners and the active headrests are used for reducing the impact to occupants. The automakers implemented a safety feature in tyres known as run-flat tyres which remain functional even after a complete loss of pressure. The vehicle can be driven up to a speed of 80 kmph without any significant loss in vehicle stability eliminating the need of spare tyre

Electrification and hybridization of SUVs is the new initiative taken by OEM to meet government’s goals of all electric cars by 2030. The size and weight of the SUVs will demand high battery capacity for electric mode and influence the vehicle range. Tesla X is only available electric SUV model whereas some hybrid variants are also available.

VIII. CONCLUSION

This research paper analyzed the SUVs growth in India and impact of SUVs in passenger car sales, technological development and highway safety. Since 2010, SUVs market have seen an increase in number of models and captured significant position in passenger cars market. This trend of increasing popularity of SUVs is projected to continue after 2017. The main reasons for SUVs popularity in India are summarized as follows:

- Rugged and sporty look of SUVs
- Seating capacity and towing power

- Greater size and visibility

Larger SUVs protect their passengers in crashes but roll over propensity is greater. Smaller SUVs possess low tendency to roll over but lower degree of crash safety to occupants. Generally, SUVs roll over fatalities will be more compared to hatchback/sedan cars. The safety of SUVs can be defined by the perception of the customers. The technological advancements in SUVs may improve its fuel economy, crash safety and roll over safety. SUVs will continue as a significant player in the Indian passenger vehicle segment for its greater utility.

APPENDIX

Table.1 Road Accidents and Fatality in India by type of motor vehicle involved-2016

(Source Ministry of Road Transport and Highways)

Total number of Road Accidents, Persons Killed and Injured based on the involvement of vehicle type during 2016				
	Number of Road Accidents		Number of Persons	
	Fatal	Total	Killed	Injured
A. Motorized Vehicles				
Two- Wheelers	41,608 (30.6)	1,62,280 (33.8)	44,366 (29.4)	1,53,060 (30.9)
Auto- Rickshaws	6,095 (4.5)	31,440 (6.5)	6,767 (4.5)	39,680 (8.0)
Cars,Jeeps,Taxis	28,746 (21.1)	1,13,267 (23.6)	32,599 (21.6)	1,25,773 (25.4)
Buses	10,394 (7.6)	37,487 (7.8)	12,088 (8.0)	50,686 (10.3)
Trucks,Tempo,Tractors and other Articulated Vehicles	36,147 (26.6)	1,01,085 (21.0)	39,504 (26.2)	91,784 (18.6)
Other Motor Vehicles (Including e-Rickshaw)	5,495 (4.0)	13,255 (2.8)	5,886 (3.9)	11,607 (2.3)
Total of (A)	1,28,485 (94.4)	4,58,814 (95.5)	1,41,210 (93.6)	4,72,590 (95.5)
B.Non-motorized vehicles	1446 (1.1)	4255 (0.9)	1728 (1.2)	3799 (0.8)
C.Other Objects (includes pedestrian,animal, tree,level crossings & other fixed objects)	6140 (4.5)	17583 (3.6)	7847 (5.2)	18235 (3.7)
Total (A+B+C)	1,36,071	4,80,652	1,50,785	4,94,624

Note: Two-Wheelers include motor cycles,scoters and mopeds & scooty.
 Non-Motorized Vehicles Include cycles,cycle rickshaws,hand-drawn vehicles,animal drawn vehicle
 Figure in parenthesis are the percentage share

Table.1 Utility Vehicles Declining Passenger Car Market Share in India

(Source Auto Car Professional)

Utility Vehicles Declining Passenger Car Market Share in India						
Fiscal Year	Passenger Cars	Car as % of PVs	SUVs	SUVs as % of PVs	Vans	Vans as % of PVs
2016-17	2,102,996	69.02%	7,61,997	25.01%	1,81,734	5.96%
2015-16	2,025,479	72.60%	5,86,664	21.02%	1,77,535	6.36%
2014-15	1,876,017	72.12%	5,53,669	21.28%	1,71,395	6.58%
2013-14	1,786,899	71.37%	5,25,942	21%	1,90,844	7.62%
2012-13	1,895,471	70.55%	5,53,660	20.60%	2,37,298	8.83%
2011-12	2,016,115	77%	3,67,012	14.01%	2,34,945	8.97%
2010-11	1,982,702	79.25%	3,15,123	12.59%	2,13,507	8.53%

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First Author



Mr P.M.Subramanian ME, MBA is working as an Assistant Professor in Prathyusha Engineering College (Mechanical Engineering Department) affiliated to Anna University. He is having about total thirteen years in teaching, industrial, and research experience. He has also worked as a CAE analyst for three years. He has published papers in international journal and conferences. Email ID:subbu81ster@gmail.com
Mobile no: 9585425124

Second Author



Dr V.Muthu ME, PhD is working as a Professor in Rajalakshmi Engineering College (Automobile Engineering Department) affiliated to Anna University. He has completed his doctorate research in Refrigeration and air conditioning. He has worked as an Assistant Professor in College of Engineering Guindy (CEG) Anna University for thirty two years. He has published various research papers in international journal and conferences. Email ID: vel_muthu@hotmail.com Mobile no: 9994272111