1. ABSTRACT

The U.S. National Highway Transportation and Safety Agency's (NHTSA) early estimates of Motor Traffic Fatalities in 2009 in the United States [1] show continuing progress on improving traffic safety on the U.S. roadways. The number of total fatalities and the fatality rate per 100 Million Vehicle Miles (MVM), both show continuing declines. In the 10 year period from 1999 through 2009, the total fatalities have dropped from 41,611 to 33,963 and the fatality rate has dropped from 1.5 fatalities per 100MVM to 1.16 fatalities per 100MVM, a compound annual drop of 2.01% and 2.54% respectively.

The large number of traffic fatalities, and the slowing down of the fatality rate decline, compared to the decade before, continues to remain a cause of concern for regulators. The new Corporate Average Fuel Economy (CAFE) standards requiring vehicle manufacturer to meet a fleet wide fuel economy of 35.5 mpg by 2016, has made it even more challenging to maintain the declining rate of fatalities per 100MVM. Automakers' pursuit of vehicle down-sizing and light-weighting strategies works counter to improving safety, as smaller and lighter vehicles feature lower degree of crashworthiness compared to larger and heavier vehicles (greater track width and wheelbase both have positive impact on vehicle stability and safety).

In Europe, the European Transport Safety Council (ETSC) estimates [2] show that 39,000 people lost their lives in road collisions in 2008 across Europe; 15,400 less than in 2001 but still far from the 27,000 deaths limit which the European Union (EU) set for itself in its 2010 Road Safety Target. The average annual progress since 2001 has been 4.4% instead of the 7.2% needed, which could delay the EU in reaching the 2010 target until 2017. In the EU 79 people are killed per million inhabitants in 2008 compared to 113 in 2001. Disparity in road death rates across Europe has decreased since 2001, and in 2008 there was no longer any EU country with more than 150 road deaths per million inhabitants.

The development of passive safety systems has reached near saturation point and now offers limited potential to reduce fatalities. To reduce fatality rates even further, the focus has shifted to active safety systems and advanced driver assistance systems (ADAS). The recent spate of safety recalls involving electronic malfunctioning is likely to lower consumer confidence in advance safety systems in the short-term and impede the adoption of ADAS systems, as consumers are likely to be less willing to pay extra for ADAS systems.

Even as vehicle makers are finding it hard to meet the stricter and contradictory regulations for safety and fuel efficiency; competitive pressures are forcing them to introduce advanced safety systems to achieve highest safety ratings on their vehicles and to differentiate their products. Such systems include Blind Spot Detection (BSD), Lane Departure Warning (LDW), Adaptive Front Lighting (AFL), Night Vision Systems (NVS), Driver Drowsiness Warning (DDW) and Occupant Monitoring systems.

In today's market environment, where demand is weak and margins tight, it is critical for vehicle manufacturers to offer consumers vehicles with features and functions they value most and avoid costly development and consumer dissatisfaction with implementations.

In this paper, Frost & Sullivan analyzes consumer attitudes towards safety and their preferences and willingness to pay
for safety features. The analysis is discussed under the following categories.

1. Consumer attitude and concerns for safety

2. Consumer perceptions toward current active and passive safety systems and collision vulnerability

3. Buyer behavior and the influence of safety in the vehicle purchasing process

4. Safety content and system feature preferences

5. Willingness to pay for safety and optimal safety packages

The analysis is based on an online survey of a sample of vehicle owners across vehicle segments and demographic attributes. The study was conducted by Frost & Sullivan in 2008, in the U.S., and in Europe in 2009.

2. INTRODUCTION

Frost & Sullivan conducted separate online survey of the U.S. and the European vehicle owners. While 1,152 consumers participated in the U.S. survey [3] conducted in 2008, 1,938 consumers participated in the European survey [4] conducted in 2009. Respondents were selected based on certain parameters such as age of vehicle owned and future vehicle purchase intentions. Safety features were broadly classified into vehicle stability systems, driver warning and vision systems, collision avoidance systems, occupant protection systems and post collision systems.

<table>
<thead>
<tr>
<th>Vehicle Segment Ownership</th>
<th>France</th>
<th>Germany</th>
<th>UK</th>
<th>Spain</th>
<th>Italy</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;B</td>
<td>121</td>
<td>109</td>
<td>102</td>
<td>58</td>
<td>61</td>
<td>451</td>
</tr>
<tr>
<td>C</td>
<td>105</td>
<td>109</td>
<td>103</td>
<td>61</td>
<td>62</td>
<td>440</td>
</tr>
<tr>
<td>D&amp;E</td>
<td>101</td>
<td>116</td>
<td>101</td>
<td>64</td>
<td>58</td>
<td>440</td>
</tr>
<tr>
<td>MPV</td>
<td>87</td>
<td>78</td>
<td>93</td>
<td>39</td>
<td>48</td>
<td>345</td>
</tr>
<tr>
<td>SUV</td>
<td>69</td>
<td>68</td>
<td>81</td>
<td>20</td>
<td>24</td>
<td>262</td>
</tr>
<tr>
<td>Total</td>
<td>483</td>
<td>480</td>
<td>480</td>
<td>242</td>
<td>253</td>
<td>1,938</td>
</tr>
</tbody>
</table>

Source: Frost & Sullivan

Figure 2.b. European Consumer Survey - Respondents Mix by Segments of Vehicle Owned

3. CONSUMER ATTITUDE AND CONCERNS FOR SAFETY

Analysis of U.S. and European consumers’ responses clearly highlights the difference between their awareness, attitudes and concerns for vehicle safety. European consumers seem to be more concerned about vehicle safety; have higher level of awareness of advanced safety systems and are more willing to pay extra for additional safety features. U.S. consumers believe they are good drivers; don’t require additional safety features in their vehicles and are less willing to pay for additional safety features. This difference is the result of the type of vehicle these consumers drive and the road and driving conditions in the two regions. These findings indicate clear differences in perception of vehicle safety and expectation of safety systems in Europe and the U.S.
4. CONSUMER PERCEPTIONS TOWARD CURRENT ACTIVE AND PASSIVE SAFETY SYSTEMS AND COLLISION VULNERABILITY

U.S. consumers perceive passive safety systems such as seatbelts and airbags to play a very important role when it comes to vehicle safety. While U.S. consumer's strongly associate passive safety features to the concept of vehicle safety, analysis of their responses indicate they are informed and are receptive to newer active safety and advanced driver assistance features. The importance U.S. consumers place on features such as alcohol interlock, BSD, LDW and speed warning systems clearly highlight increasing consumer awareness of advanced safety and driver assistance systems and expectations from vehicle manufacturers to offer these advanced systems.

Though European consumers place high importance on features such as BSD, low speed collision avoidance -partial halt and emergency braking assistance (pre-charging); features such as alcohol interlock, semi-autonomous parking, parking assistance - rear view camera, and traffic sign recognition are not seen as very important.
Analysis of consumer responses on vulnerability to collisions highlights that U.S. consumers are more likely to be involved in rear end collisions as compared to other type of collisions. After rear end collisions, it is lateral collisions that U.S. consumers are likely to get involved in. Unlike U.S. consumers, European consumers believe they are more likely to be involved in forward collision, followed by rollover after impact, lateral collision, and then rear end collision.
While U.S. consumers tend to perceive a collision scenario where another vehicle hits their vehicle, European consumers tend to perceive it the other way round. The difference in perception is due to the kind of vehicles consumers drive in the two regions. While U.S. consumers drive large vehicles with powerful engines, Europeans drive small, low powered vehicles. Also the roadway infrastructure in the two regions plays an important part in consumer perceptions. In the U.S. roads in urban, semi urban and rural areas are wider; relatively less congested and high speed driving is possible when compared to the roads in urban, semi urban and rural areas of major European countries. Analysis of the data also indicate that U.S. consumer perception of vehicle safety is highly influenced by number of safety features offered by vehicle manufacturer in the vehicle; if the vehicle has passed necessary certification tests, and if they are able to see more of the traffic ahead and around their vehicle.

5. BUYER BEHAVIOR AND THE INFLUENCE OF THE SAFETY PACKAGE IN THE VEHICLE PURCHASING PROCESS

U.S. consumers who indicated they were willing to buy a car engineered to be safe for pedestrians (even if it costs more) supported their intentions with a higher budget allocation to technologies that protect them while driving (33%) and minimize injuries to others (24%). Also U.S. consumers allocate most of their budget to safety technologies that protect them while driving, followed by pedestrian protection. Crash compatibility and occupant protection are lower on their priority and budget allocation list, with medium/large car drivers most likely to budget and pay for it, and pick-up truck drivers least likely to budget and pay for it. Proven technology and reputation are key attributes that influence the purchase of safety features. Relative influence of factors like automated driver responses and new, sophisticated technology has increased.

Reliability, safety and comfort lead purchase importance among European consumers when it comes to making a decision on new vehicle purchase. While MPV owner's priority is space, comfort and design & style are more important for D&E and SUV segment vehicle owners. Fuel economy is important for A&B segment vehicle owners. C segment owners see safety significantly more important, which is a reflection of the greater time they spend on the road compared to other segments.
When it comes to features that warn driver of potential risks, technologies that take over driver control (Lane Deviation Control and Driver Drowsiness Control) were the least preferred, with about a fifth of respondents indicating they do not want such features. A strong preference for these technologies is yet to emerge, highlighting the reluctance of U.S. consumers for such features. However, a third are willing to purchase the vehicle if these features are offered as standard at no extra cost. When it comes to features that protect occupants, with the tendency of respondents to perceive vehicle safety as passive protection, it is not surprising that U.S. respondents continue to desire front and side airbags.

6. SAFETY CONTENT AND SYSTEM FEATURE PREFERENCES

U.S. respondents are most likely to purchase occupant protection technologies first, followed by braking or steering technologies. Telematics technologies that relay for assistance after a collision were likely to be purchased last.

When it comes to features that enhance braking, Anti-lock Braking Systems (ABS) remains the most preferred option for U.S. consumers followed by Traction Control System (TCS). The desirability of newer features is lower as consumers prefer tested, proven, and reliable systems/technologies.
From the response of European consumers, it is clearly evident that technologies which help prevent accidents are the most desired by vehicle owners. There are no significant differences by age, by gender, by country or by vehicle segment. Clearly low speed collision avoidance - partial halt and braking performance improvement system, lead overall importance for consumers. Interestingly, while they are the most expensive technologies, automatic emergency braking - complete halt and collision warning, are also highly rated by consumers, almost twice more important than speed alert and parking assistance by warning (ultrasonic park assist).

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7. WILLINGNESS TO PAY FOR SAFETY AND OPTIMAL SAFETY PACKAGES

Analysis of respondent's feedback clearly indicates that U.S. consumers consider safety features that protect occupants in a collision and features that enhance braking or steering such as ABS, TCS, ESC, airbags, BSD as important features when it comes to new vehicle purchase. Consumers expect safety features that help maintain safe distances between vehicles, and features that enhance braking or steering such as ACC, Collision Mitigation Braking, Collision Warning System and Rollover Mitigation and Prevention to be offered as standard equipment. U.S. consumers expect other safety features such as LDW, AFL, park assist system, NVS to be offered as optional.

Analysis of European respondent ratings indicate that consumers are willing to spend 33% of their budget on safety technologies that protect while driving as against only 18% for post-crash support systems. European consumers had rated safety second in terms of importance, only after reliability. The importance consumers place on high cost (over €1,000) ADAS features indicate that they are willing to pay more for avoidance systems clearly indicating that ADAS systems are likely to buck the trend and attract European consumers to pay for these features.
Figure 7.b. European Consumers Willingness to Spend on Additional Safety Features on Next Vehicle Purchase

Base, \( n = 1,152 \) \hspace{1cm} Prices are in US Dollars \hspace{1cm} Source: Frost & Sullivan

8. SUMMARY/CONCLUSIONS

Analysis of consumer feedback from the U.S. and European surveys clearly illustrate the difference in perception and awareness of U.S. and European consumers when it comes to vehicle safety. It also highlights the difference in their attitude towards active and passive safety systems and advanced driver assistance systems, and willingness to pay for these systems during their next vehicle purchase.

Type of vehicles (based on size, power and road presence) and road infrastructure play a key role in shaping consumer attitudes and perceptions towards vehicle safety. Majority of U.S. consumers believe they are good drivers, they don't require significant additional safety features, and they are likely to get involved in accidents because of the vehicles around them. Whereas majority of European consumers tend to think the other way round; that they require additional safety features to keep them safe and they are likely to be more involved in accidents caused by frontal impact. The difference in perceptions of the U.S. and European consumers is explained by the vehicles they drive and conditions in which they drive. While U.S. consumers drive larger vehicles, European consumers drive compact vehicles primarily in urban roads. Narrower roads and traffic congestions on average are higher in Europe as compared to the U.S.

U.S. consumers perceive passive safety systems such as seatbelts, airbags and occupant protection systems as most important followed by active safety systems such as ABS and TCS. With ABS, TCS and smart airbags already mandated by NHTSA \[5\]; U.S. consumers perceive BSD, collision warning system, collision mitigation braking and rollover mitigation system as important in order of purchase priority.

European consumers perceive advanced driver assistance systems such as low speed collision avoidance - partial halt, braking performance improvement system, ABS, automatic emergency braking - complete halt, and collision warning as most important. However interesting to note is that both U.S. and European consumers rate occupant protection systems
and braking / collision related systems as most important when it comes to safety.

With a spate of recent vehicle recalls raising number of questions about safety of vehicles, consumer perceptions and attitudes towards advanced safety features is expected to be less positive in the short-term. Recent vehicle recalls have also raised questions about the reliability of electronic and autonomous systems that take control away from the driver. As a result, consumers are expected to be less willing to pay for newer safety features compared to tried and tested safety features. While there is a big opportunity for vehicle manufacturers and suppliers to introduce / offer advanced driver assistance systems in the long-term, it is going to be a major challenge to prove the reliability of these systems and convince consumers to pay for these systems in their next vehicle purchase.

9. REFERENCES


10. CONTACT INFORMATION

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11. DEFINITIONS/ABBREVIATIONS

NHTSA
National Highway Transportation and Safety Administration

EU
European Union

ETSC
European Transport Safety Council

ADAS
Advanced Driver Assistance Systems

ABS
Anti-lock Braking System

LDW
Lane Departure Warning

BSD
Blind Spot Detection

ESC
Electronic Stability Control

AFL
Adaptive Front Lighting

NVS
Night Vision Systems

DDW
Driver Drowsiness Warning