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SMART AUTOMOTIVE

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Automotive Telematics • Connected Vehicles • Fleet Management • Infotainment • ADAS

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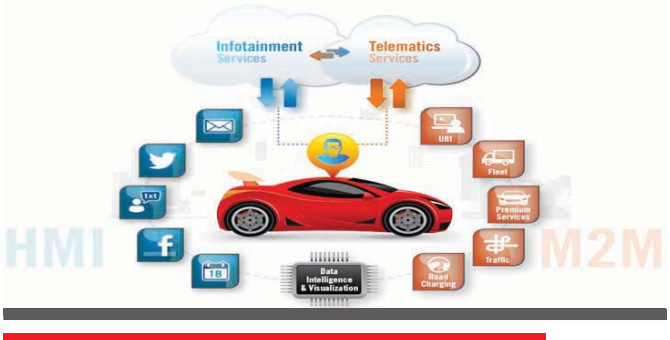

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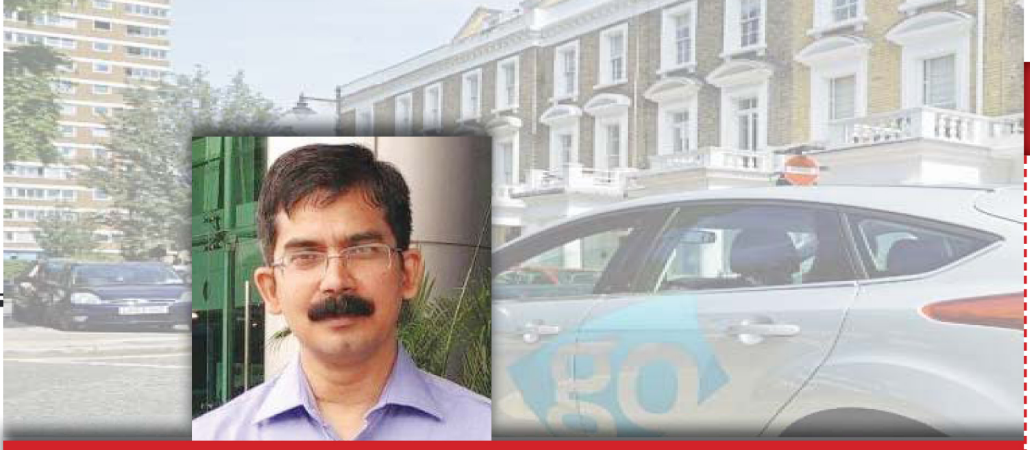

EDITORIAL

Connected vehicle has commercially beneficial applications which will grow with time. The technology push and utility pull will continue to grow the usage cutting across the segments in commercial and passenger vehicles. With excitement of connected vehicle, there is concern about its security, which will not be as easy as demonstrated in experimental projects. In some of the interviews in this issue the concerns are discussed with senior industry leaders.

The likelihood of autonomous vehicles running on road is nearing reality. With tests being approved in various countries, the learnings would make it safer vehicle running in semi or fully autonomous mode. Commercial vehicles could be the early beneficiary of this self driving vehicles and the pilot project to demonstrate 'Driverless platoons' can go a distance in establishing the 'Return on Investment'. We do anticipate the lowering of manpower cost from driverless commercial vehicles, along with other benefits through lower fuel consumption on account of optimal driving, improved vehicle maintenance and more.

Industry people wonder how would different geographies benefit from this? Specifically in a heterogenous road environment like ours in India. Lets consider an example of mines where there is defined route for transport of ore and its 'overburden' from the mines to the stockyard or dumping ground, typically deploying heavy transport vehicles. The heterogeneity of the road condition and the contrast of transport vehicles as evident in our context could be taken care of in such closed environment where the routes have defined condition and objects moving on road are controlled to an extent.

We had driverless car demonstration in India last month, and we are happy to have views of Dr. Roshy John, who championed it, is sharing his views in this issue of Smart Automotive. We will look forward to next iteration of its commercial test, a step away from social commitment, which motivated him earlier.

Moving ahead, for driverless vehicle, roads and highway awareness through maps and sensors will also be required. How relevant is precise 3D navigation data for driverless vehicle is demonstrated in many of the ongoing projects where LiDAR sensors in vehicle scan the surrounding area to help it navigate. Compare this with our scenario where usage of LiDAR scanner mounted on vehicle for scanning of roads and highways for preparing precise 3D maps is restricted by policy and considered a security threat.

@telematicswire

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CONNECTED CARS & CONNECTED SERVICES IN INDIA

Indian market readines to embrace telematics

It's not without a reason that the likes of tech giants like Facebook and Google are looking to invest heavily in India's digitization efforts. The desire for a connected lifestyle has made the Indian audience an attractive market to invest in. We are in an era where macro-economic factors, government regulations, and customer readiness are all coming together at the same time.

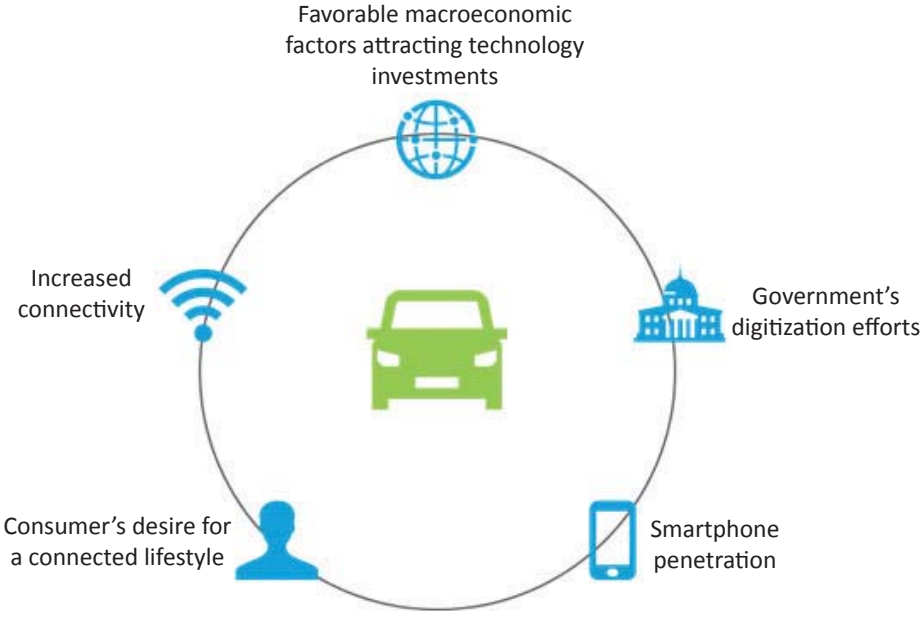
India is the second largest market for smartphones in the world with an estimated 204 million[1] smartphones - thanks to the availability of cheaper smartphones that has driven such penetration levels. With an increasing smartphone penetration, with 4G speeds becoming mainstream in several urban cities, and the government laying the foundations for a digital infrastructure through smart cities and other digital initiatives, we can only expect connected services to leapfrog exponentially in the Indian market, and catch-up with other 'telematically' developed nations in the coming years.

While India has been a silent gold mine for fragmented aftermarket telematics solutions and commercial telematics solutions over the last decade, there has been a renewed focus on OEM fitted telematics solutions, aimed at addressing the passenger telematics market that carves out a huge chunk of the $113M telematics opportunity in India[2].

Customer willingness to pay for telematics solutions

Telematics is becoming a key factor influencing vehicle purchase decision for consumers. In a 2014 consumer survey conducted by Deloitte, over 48% respondents had indicated a willingness to pay for telematics solutions in their vehicle. In terms of absolute rupee value, the respondents ranged around INR 1100 per year for infotainment solutions, and up to INR 2400 per year for advanced telematics solutions including Safety and Convenience features.

- **Infotainment solutions**: Contrary to a popular belief in the Indian market, over 69% of the respondents preferred a one-time premium being added to the cost of the vehicle, specifically for infotainment solutions (e.g., smartphone integration). This aligns with the business model followed in developed nations, where the cost of infotainment is baked into the cost of the vehicle, and the services are provided free of cost for a lifetime. The underlying value proposition is not compelling enough for the Indian consumers to pay on an ongoing basis.
- **Safety & Convenience**: However, when it comes to Safety related features (e.g., automatic collision notification) respondents were willing to pay and try out a subscription model, as the value proposition is more compelling. Also, high operational costs disallow auto-makers from providing these features free of cost to consumers. Such features usually require the inclusion of a DCM (Digital Communication Module) unit in the vehicle which significantly adds to the cost of the vehicle, making it an economically differentiating factor for consumers.



What are the trending factors to look out for?

1. Smartphone integration:

Smartphone integration will definitely be the future of in-vehicle infotainment, given the flexibility and ease with which the smartphone app stores can bring a multitude of applications to your vehicle. Contrast that with a traditional native application being developed by the auto-maker or a tier 1 supplier that would take months to deploy.

However, strictly speaking in the Indian context, building the required app ecosystem to fully utilize the smartphone integration, will be a tricky area. Players like Mahindra are already leading the way by joining the Open Automotive Alliance (OAA), and integrating android phones to their line of premium vehicles. Players like MapMyIndia are already bringing social media integration and a bunch of other applications to your vehicle. Unless we have strong content ag-

gregators like Harman, Nuance or MapMyIndia investing in this app ecosystem, we will not be able to reap the complete benefits of the smartphone integration. Andriod Auto or Apple CarPlay becoming mainstream will be a game changer in this space.

> *Telematics and in-vehicle infotainment have been increasingly influencing the vehicle purchase decision of a very connected Indian urban segment, and you better catch-up...*

One of the major factors holding back content aggregators, is scale. Also, unlike developed markets, content aggregators don't find the Indian market affluent enough to invest, as customer willingness to spend on infotainment is quite minimal. Having said that, telematics
and infotainment are definitely not to be viewed as profit centers, but rather as an enabler to boost vehicle sales. Or, rather an enabler to help you stay competitive.

2. Evolving business models

- **Content providers**: One other key inhibitor in bringing innovative contents to the vehicle is the lack of a standard for content providers. In most cases, auto-makers and content providers do not know the best business model to engage with.

There are certain content providers like Zomato who have shown interest in bringing their content to the vehicle with zero licensing fee[3]. Such players have content readily available but do not necessarily understand their role in bringing the content over to the vehicle. There is a lack of awareness of Content Aggregators and Systems Integrators that can provide the necessary integration.

- **Consumers**: Similar to how auto-makers are trying to figure out viable business models, consumers are also skeptical about how much to pay for these services. We are at a stage where consumers do not know the value proposition of telematics yet. While consumers are open to subscription based models and freemium models, they need more clarity on the value proposition.

3. Differentiating solutions

Telematics in itself is a differentiating factor that influences the purchasing decision for consumers. However, it's only a matter of time where services like navigation, vehicle diagnostics, news alerts etc., become commonplace across all auto-makers. The real differentiating factor would then lie in offering customized products that can eliminate key pain points for the Indian audience.

- **Parking**: On an average, an urban driver spends over 40 mins in a day only trying to find a parking spot. This has been one of the biggest and most frustrating hassles in an Indian urban context. Niche players like Pparke3 have begun beta testing their integration with players like Bosch to bring parking solutions to the vehicle. However, the success of such a solution depends on the supporting ecosystem that can identify and provide parking spaces.
- **Entertainment while commuting**: On an average an urban driver spends over 1.5hrs a day commuting to and from their workplace. This is a large chunk of the consumer mind space, and cracking this pain point will open up a tremendous business opportunity. One way could be to bring more engaging applications (e.g., social media) to the vehicle. One other way could be to bring more data consuming media applications (in a driver-friendly manner), by tying up with telecom providers to setup in-vehicle wi-fi hotspots that can support high data applications.
- **'Indianized' solutions:** Players like Volkswagen and Ford have cashed in on the Indian passion towards cricket, and have made efforts to bring in live commentary and scores to the vehicle especially during major events like the IPL and the Cricket World Cup. Such features can be provided through simple integrations with APIs that content providers like ESPN CricInfo might open up. Catering such custom solutions to the Indian market would be a game-changer.

Overall, this is a very exciting phase for the Indian telematics market, with all major players already in action. There is also a tremendous opportunity for Consulting partners to apply their learnings from more matured markets like the US, and develop standards for the Indian context. Stay tuned and keep watching this space for more action in the coming years!

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The views expressed are solely of the author and Deloitte does not necessarily subscribe to it.

Smartphone integration with in-vehicle infotainment system

Evolving business models on both the providers and consumers side

Differentiating solutions that make the auto-maker stand out from the rest

Reference:

1. *Investment and Technology Promotion Division, Ministry of External Affairs, Govt. of India*
2. *Estimated market opportunity by 2018, according to a report by 6Wresearch*
3. *Based on interactions with respective content providers in early 2015*

Damodar Sahu
Director–After Market Service Transformation & IoT Solutions
Wipro Technologies
He has over 18 years of rich experience in the field of Service Transformation, Supply Chain Management and IoT. He is B.Tech in Electronics & Telecom with MBA in CRM & Operational Management

The world is getting hyper-connected. Many factors are fueling this, such as the Internet, wired and wireless network connectivity and quality reaching far corners of the world, ubiquity of smartphones, as well as the emergence of Internet of Things. With such breakthrough advancements in technology along with societal demand, transportation is on the verge of a major transformation. Major technology players along with auto manufacturers are taking note. In a recent interview with the Wall Street Journal, Apple CEO Tim Cook stated that the auto industry is in for a "massive change" with software becoming "an increasingly important part of the car of the future." Connected cars are a key result of this industry [1] disruption, and will become mainstream globally by 2025.

Connected Car Solutions will become one of the major Business Drivers for the Automotive Industry in future.

Automotive Aftersales – The Business Case

The situation

- Globally there are app. 1,2 billion vehicles on the road today.
- In 2016 the annual global turnover in aftersales will exceed $ 740 billion.
- The automotive manufacturers initially have a 50% market share in the aftersales business.
- The automotive manufacturer are loosing 80% of their "customers" within the first 3 years after the warranty period.
- Today, less than 25% of all new cars sold are connected ==> app. 49 million "unconnected" new cars
- In Europe alone, 60% of all new cars are sold with a loss !!!!

The objective

- Be connected with the automobile throughout its lifecycle.
- Create the best customer experience by predicting technical issues / failures before that occurs.
- Retain customers and improve customer loyalty.
- Regain market share and increase revenue and profitability.

Connected car solutions already have a significant impact on existing vehicle development and aftermarket sales. This is one of the results of a comprehensive survey across the European automotive sector that PAC conducted in 2014/2015. The market for connected car solutions has already reached a 'second wave' of maturity, with a first generation of connected car solutions, such as infotainment and environmental information services, already rolled out and operated by manufacturers and services providers, and a second generation of services, such as security, after-sales and driving assistance, currently being

***CVP** - A customer value proposition is a promise of potential value that a business delivers to its customers and in essence is the reason why a customer would choose to engage with the business. It is a concise statement that highlights the relevance of a product offering by explaining how it solves a problem or improves the customer's situation, the specific value against the customer's needs and the difference to competitors.*

***Importance of CVPs** - A good customer value proposition will provide convincing reasons why a customer should buy a product, and also differentiate your product from competitors. Gaining a customer's attention and approval will help build sales faster and more profitably, as well as work to increase market share. Understanding customer needs is important because it helps promote the product. A brand is the perception of a product, service or company that is designed to stay in the minds of targeted consumers.*

Customer Value Proposition for Connected Car is Important

Car Owners are just not customers…They also are…

Needs are different, different value to exploit…Apart from savings, the value aspirations are …

	Convenience/ Technology	Vehicle Feedback	Safety	Utlilty	Preventive Maintenance
Long Distance Driver			High		High
Chauffeur Owner		High		High	
Women	High	High			
Seniors		High		High	
New Drivers/Learners			High		High
Gen Y	High			High	

Multiple sources – cars.com, auto news, surveys

Differentiated Engagement…Beyond other features we offer, some could be catered to do …

Segmentation	Feature/ Engagement
New Drivers/Learners	**DL Coach** Unique Feature where M&M cars can help a new driver pass a driving license test- DL milestones/Levels, Daily Improvement Report, Constant Feedback - Reports on Impact of Bad Driving on Engine, Safety
Chauffeur Owner	**Chauffer Scorecard** Feature where in monthly reports on Driver driving habits particularly impact to Car's engine, expense report **Engine Report** - True Insights on the engine status to verify chauffer claims on car health. Theft protection using Geofence
Women	Frost & Sullivan Reports suggest women prefer longer warranty periods, pay as your drive insurance, auto assist features & green footprint **Auto Assist -** Provide guidance that provider in a lucid way insights on vehicle, much like intuitive assistant that works like a digitized car hand book **Green Me -** Provide reports on impact to environment as Trees saved count due to driving pattern
Long Distance Drivers	**Contextual Trips -** Reports on similar trips that others have made & insights from it, relevant POIs nearby

in development and testing phases.

Automotive manufacturers and suppliers consider connected car solutions as a strategic long-term topic for their business development with customers identifying these technologies as a mandatory requirement for future vehicle acquisitions and manufacturers aiming to use their technological edge as a main differentiator. In future the core competencies of many companies in this industry will focus on connectivity and embedded software development.

> The connected car market in India is expected to grow at a CAGR of 60.4% from 2015-2020
>
> Ref: Research and Market

OEMs and Suppliers must bundle services and deliver a seamless user experience to lead the next wave of Connected Car.

Indian Auto Market – Key Trends

- **Untapped Market, but Tepid Growth** - Penetration of just 18 vehicles per 1,000 compared to 400-800 globally.
- **The Changing Auto Shopper-** Auto shoppers do more research than ever before car purchase, about 24 research touch points on an average.
- **Dealership Experience is Pivotal to Closing Sales-** 72% of Auto shoppers are more likely to visit another dealership on the same day.
- **Low Aftermarket Retention-** More than 60% of Indian customers visit unofficial dealerships instead of authorized ones after 2-3 years, 80% after 5 years.
- **Emergence of Certified Pre Owned (CPO) Market-** Auto Trader study revealed, 84% auto shoppers considered buying used cars when exposed to CPO definition.
- **Rising importance of Data-** OEMs are interested in exploring potential of data from cars to improve efficiencies, offer value to stakeholders and

potential monetization strategies.

What value does a Connected Car provide to Customers ?

1. Monetary Impact > Focus

- → Savings
- → Loss Prevention
- → Lower TCO
- → Incentives

2. Convenience & Values > Equally Important

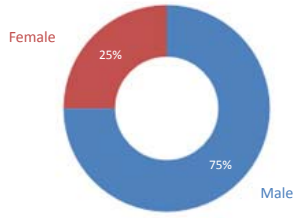
- → Safety
- → Value of Location
- → Contribution to Environment
- → Extended Car Life
- → Ownership Experience

Price to Customer – Is Customer willing to pay?

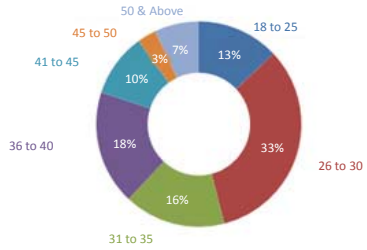
- **How much is a Consumer willing to pay?**
- **How often does a Consumer want to pay?**

Indian Customer Survey - Wipro Conducted a Survey on "Car Connectivity Feature Preference" in the Indian Car Market

Demographics of Survey Respondents



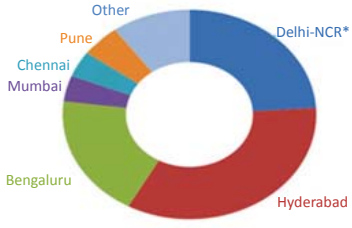
Gender



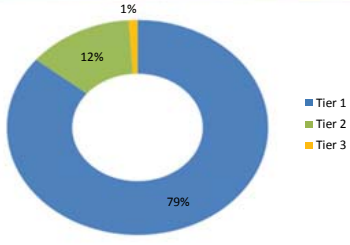
Age-Group

- The total number of respondents covered in our analysis is around 100
- They primarily comprised of male respondents (75%) and had good representation of female respondents as well (25%)
- Maximum respondents were from the younger age group of 26 to 30 (33%)
- Overall 49% of the responses were recevied from the age-group of 26-35

Demographics of Survey Respondents



Respondent's City



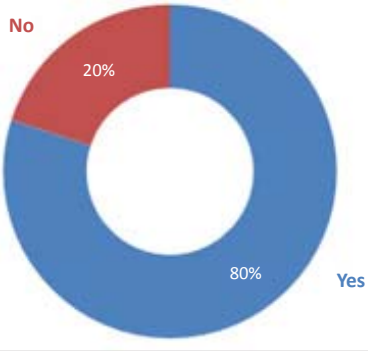
City Tiers

- Major respondents were from Tier 1 cities - 79%
- Tier 1 cities include - Delhi, Mumbai, Chennai, Kolkata, Hyderabad, Bangalore
- 77% of the respondents were from major cities like Delhi-NCR, Hyderabad, Bengaluru.

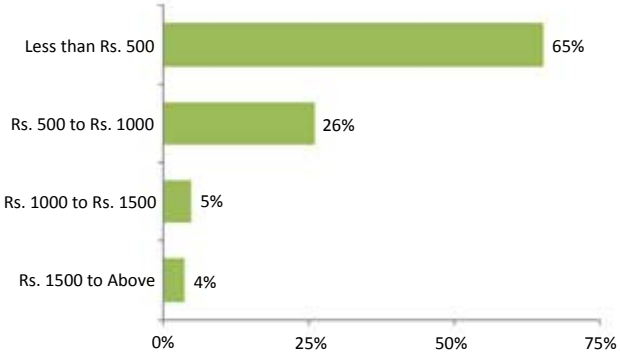
Delhi-NCR (Delhi - National Capital Region includes Delhi, Gurgaon, Faridabad, Noida, Ghaziabad)
***Others Include- Jaipur, Jorhat, Kanpur, Mysore, Vadodara, Vishakhapatnam*

Car Connectivity Services - Willingness to Pay

Willingness to pay subscription fee for Connectivity Features



Monthly subscription fee preference for availing connectivity Services



- 80% of the respondents are willing to pay the subscription fees for Car Connectivity Services
- 20% of the respondents want the Car Connectivity Services without any subssription fee
- However, 65% are willing to pay less than Rs. 500 per month for availing the connectivity services
- 26% of the respondents are willing to pay between Rs. 500 to Rs. 1000 as monthly subscription fee
- Only 9% of the respondents are willing to pay Rs. 1000 & above as monthly subscription fee
- Consumers seem to be price sensitive as majority perfer to pay below Rs. 500/month
- Consumers should be given an option to choose from the list of features available, so that they pay only for the features which they are interested in.

The future of automotive industry is digital…

Q Can you share your industry journey so far?

A I've come full circle. My graduate studies were in computer engineering that blended computer science and VLSI. After spending 20 years in the software arena—we now see the hardware/software bluring full force. Wearables, augmented reality and everything—litterally everything will have a chip inside. It's an exciting future.

Q How digital intelligent services have disrupted the traditional automotive industry in the recent few years?

A Automotive manufacturers are entering the unknown. According to a survey by Frog (an Aricent's global product and design unit) 30% of car owners would give up their car before their smart phone. App-based car services are using data to optimize traffic flow, save riders' money and save lives. In-car digital experiences are forcing OEM's to rethink who they are. Connectivity in cars allows drivers to get more information about maintenance and diagnostics.

For example Frog has partnered with Voyo a connected-car platform that centers on an On-Board Diagnostics (OBD) controller to give drivers greater insights into driving behaviors. Frog Design has been working with many of the tier-1 auto manufacturers to completely re-imagine the user experience for both the driver and the passenger. This gives Aricent unique insight into the future requirements that drive the most innovative technology platform capabilities. This deep understanding of the choreography between human experience and technology clearly differentiates Aricent among other engineering firms.

Q How would you define the role of Aricent in the automotive value chain?

A We are a global engineering company for the digital era. We are unique that we bring the building blocks to choreograph solutions from the chip, connectivity and to a seamless customer experience. In the automotive industry we help automotive OEM's and service providers with experience design & strategy, technology solutions, development engineering and test & operations. For example we worked with a supplier to develop their in-vehicle infotainment hardware – complete circuit design, PCB layout, thermal and mechanical design. We worked with a European Tier 1 to test their head unit display panels – diagnosing the embedded applications and helping reduce the time to test peripherals from 10 days to 1 hour. Our design unit, Frog helps Tier 1 OEM's re-imagine the entire relationship of the car, products and services.

Q Can you tell us some of the recent initiatives at Aricent in the automotive sector?

A Aricent has a strategic Connected Vehicle Services offering for the automotive industry. Our focus is on product engineering from the chip to cloud services—keeping in mind the human-element. We have capabilities in infotainment, telematics, ADAS, connectivity and safety. Another area of interest is in Ethernet connectivity which is getting into the car as a primary mode of communication.

Nowadays, both automotive OEMs and Tier -1 auto suppliers are heavily investing in software oriented solutions.

Q Why is software increasingly becoming important for OEM?

A OEMs must conquer digital. At the heart of this transformation is the value creation possibilities found in software. The slow development of the car, must meet the innovation cycle of software and digital experiences. Tesla is able to release dozens of on-board software updates to its Model S. Over The Air (OTA) updates are becoming more mainstream. Finally, when cars become autonomous – that will likely mean more Siri-like interactions with a car that has a personality – a car that will not only park itself, but else pay the bills and help you buy groceries.

Q What is your view on autonomous vehicles?

A Autonomous cars are becoming a reality—and it will be sooner than we expect. Although there are safety, security and liability concerns in letting a car drive itself—the trend is unstoppable. There will be a day when autonomous vehicles become the norm rather than the exception.

Walid Negm
Chief Technology Officer
Aricent

He is currently overseeing Aricent's technology strategy and innovation practices globally.

Q Do you see autonomous driving to be commercially viable by 2020?

A Things are moving fast. I would add some more years, but we are within striking distance. We do need to see government policy and the law must catch up to the technology. It maybe be safer without a human at the wheel, but some of us may still want to be in the loop. Viability is dependent on data communication, vehicle to vehicle communication and road infrastructure.

Q How big is automotive cybersecurity risk?

A The risk is small, but growing. The more conventional electronics of a car are safe because of strict certifications, firewalls and component isolation schemes that keep critical systems out of reach of intruders. Critical functions will always be cordoned off. In addition OEM's are actively working with industry, Tier 1 suppliers and software vendors to strengthen the defense in depth strategies. However, we have seen hacking incidents and nothing can be completely air-gaped. Its likely that a breach will happen by determined adversary and that would be a game changer.

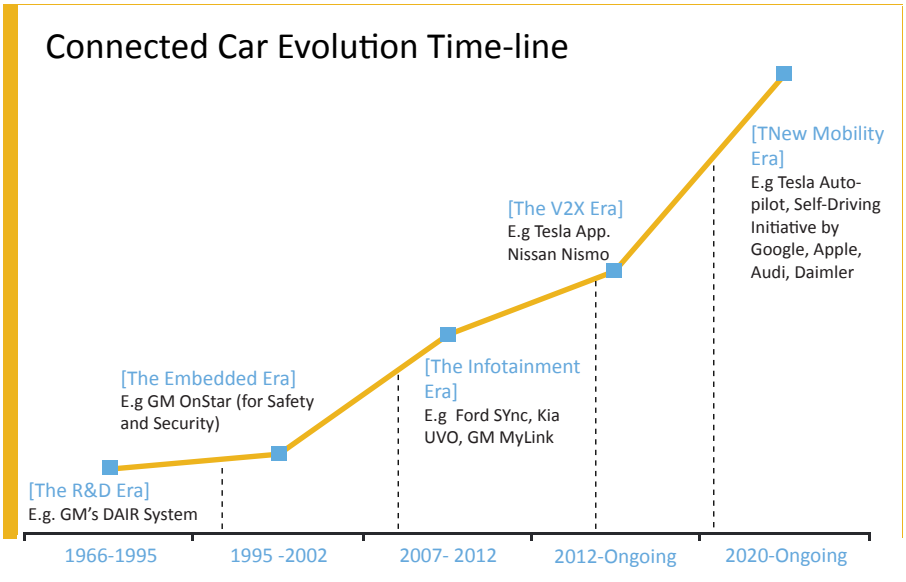
Enabling Connected Vehicles

Technology Evolution toward Connected Vehicles of Today and the Future

Cars are evolving from mostly mechanical, metal-based vehicles to a connected set of component platforms, plastics, and next-generation materials. They are essentially becoming a rolling data-center providing safety and entertainment while serving the primary function of going from Point-A to Point-B.

Today's car has the computing power of 20 modern PCs, features about 100 million lines of code, and processes up to 25 gigabytes of data per hour. Social acceptance of a fully autonomous vehicle and the regulatory environment supporting it is likely 5-to-10 years away based on current forecasts. However, a connected vehicle is here today, in terms of in-car services, data-collection on vehicle-performance and driver-behavior and pushing out value-added services. This convergence of device, data and cloud is being driven by powerful software at the back-end, bridging the gap between the user and their gadgets. As the computing capacity of cars develops further, not only is programming becoming more complex and processing speeds becoming faster, but the entire nature of the technology is shifting. While automotive digital technology once focused on optimizing the vehicle's internal functions, the computing evolution is now developing the car's ability to digitally connect with the outside world and enhance the in-car experience. This is the connected car – a vehicle able to optimize its own operation and maintenance as well as the convenience and comfort of its passengers using onboard sensors and Internet connectivity.

The demand for connected cars is growing rapidly. Global connected car market revenues are likely to increase 6-fold by 2020 (McKinsey estimate). Driving-centric apps and services are becoming as important as infotainment content in the consumer purchasing process. The current automotive manufacturers focus on providing infotainment delivery (streaming music, social media channels etc.) reflects their desire to meet the expectations of digital lifestyle consumers who are heavy users of smartphones and want to use their favorite apps and services inside their cars. This is a logical first-step, but these consumers will increasingly value apps that are useful and relative to the driving experience.



Traditional Value-chains are Evolving to Make Vehicles Smarter for Digital Consumers

Cars are increasingly being fitted with sensors to capture more and more information and cloud-based connected car service delivery platforms will play a central role by continuously connecting the car and driver to the outside world and managing the data and analytics to power driving-centric apps.

For example, vehicle and driver data can be dynamically stored, updated, and analyzed in the cloud to determine when a vehicle service offer should be presented to the consumer by a local dealer including a promotional incentive for taking immediate action—a true "win-win" for all involved.

The availability of data due to the connected nature of vehicles during operations is leading to disruptions in automotive business-models. The human-machine interface, car condition data, and dynamic real-time geo-information will become the key control-points in the redistribution of profits in the industry value-chain.

In India, the evolution of the vehicle telematics market is being driven by the following needs:

- Monitoring & routing applications for taxi operators
- Order-delivery tracking
- Call-centers to receive emergency-calls during off-road incidents and accidents
- Fleet Management for vehicle geo-spatial tracking
- Remote management of LCD-displays in public transport buses and bus-stops

> *The consumers' world is fast becoming a connected one – from phones to cars all the way to smart-devices in smart-homes. As every device is virtually turning into a smart device, the future of the car is changing as well.*

SAP Technology is Scalable and Ready to Enable Smarter, Connected Vehicles

Vehicle On-Board Units (OBU), the critical hardware component enabling telematics, are becoming increasingly sophisticated with increasing data-transmission frequency. Data generated by telematics system is the very definition of BIG DATA – putting in place a ready and scalable technology platform is equally important to gain projected business benefits.

IT-imperatives to enable connected vehicles and deliver business-value are as follows:

1. **Remote Data Storage Repository**: Road, scrub, normalize high volume of data.
2. **Data Analytics and Visualization**: Turn telemetry and connected-vehicle BIG-DATA into analytics to support business decisions.
3. **Predict & Trigger Business**: Processes New business models, continuous improvements.

SAP is deeply engaged with early-adopter, innovative customers to enable the connected vehicle vision. Highlighted below are selected high-impact connected-vehicle business-scenarios that SAP has delivered for customers:

1. **Vehicle & Driver Diagnostics for individual owners and fleet operators**

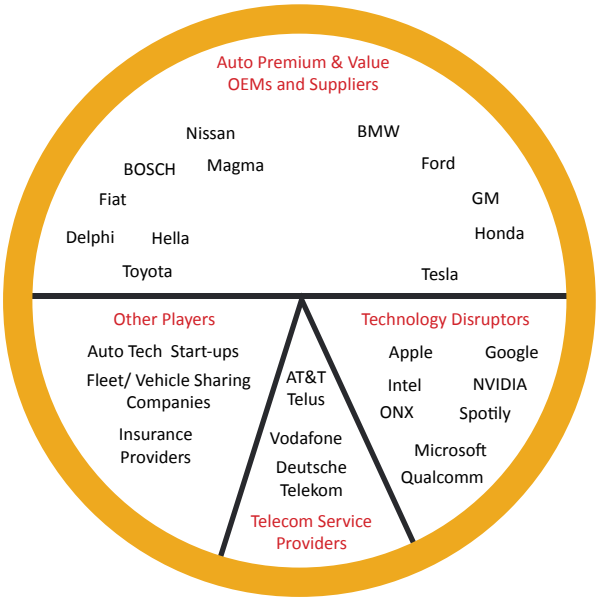
SAP's real-time data-platform powered by SAP HANA, the best-in-class in-memory data-base with a rich applications portfolio helps gain visibility into the asset and drill-down into vehicle and driver-level analytics:

- **Fleet Owner Dashboard**: Geospatial (lat/long) position of vehicles on route, vehicle start & stop times, miles driven, route congestion levels, route fuel consumption trend, route/ trip profitability.
- **View historical route operations**: Characteristics e.g. driving conditions and break-down trends.
- **Vehicle Stats from sensor-data monitoring**: Engine performance/ diagnostics, tyre health, battery %, oil-levels, avg. speed, driver metrics.
- **Operating Trend at 8/ 10/ 24 hour intervals**:
- **Immediate detection of anomalies and faults**: (across transport network).
- **Drill-down to root-cause**: (e.g. engine oil pressure – low coolant – gasket issue) to identify right components to be serviced.
- **Trigger Accident/ Vehicle Off-Road Response**: Through process-level integration with call-center operations and service-center proximity/ readiness (technician skill-sets, spares availability).

2. **Enable Predictive Maintenance through Early Detection and Timely Maintenance**

SAP can significantly increase vehicle up-time by delivering reliable and early diagnosis of issues and trigger business-transactions that can rectify them by:

- **Predicting time-to-failure and work-order execution time**: (economic cost of down-time based on route-revenue, customer/ load



Sudakshina Ghosh
Automotive Industry Director
SAP India

She has over 13-years of experience in process-consulting and engaging with SAP customers to drive IT-strategy and technology-adoption road-maps. She works with customers in shaping and executing technology-enabled Digital Transformation.

priority).

- **Routing work-order**: To nearest/ best-equipped service center as per route.
- **Handling re-calls proactively:** Return knowledge to product devel -opment and quality processes.

3. Optimize Loads and Manage Routes for Higher Operating Efficiency:

SAP technology can help determine route-costs based on operational constraints, consolidate loads and optimize fleet-schedule across routes. Ability to predict traffic-density dynamically on the basis of aggregated vehicle routes can enhance route profitability by optimizing time-taken and fuel-consumption.

> *The opportunity to inno vate based on data and powerful software capabilities is immense as the connected cars of today evolve into autonomous self-driven vehicles leading to minimal accidents, low emissions while delivering better experience for consumers.*

Deliveries can be scheduled to minimize fleet idle-time and optimize capacity utilization (e.g. empty return loads, less-than-truck-load deliveries) and last-minute orders can be accommodated to balance fleet-capacity to location.

SAP HANA Automotive Cloud Vision: Connecting Vehicles to Eco-system

As vehicles become more connected and operating data is managed digitally, OEMs can be better-positioned to introduce innovative pay-as-you-drive insurance and customized AMC/ maintenance offers based on their access to sensor-data, ability to analyze this data and simualte future operating patterns.

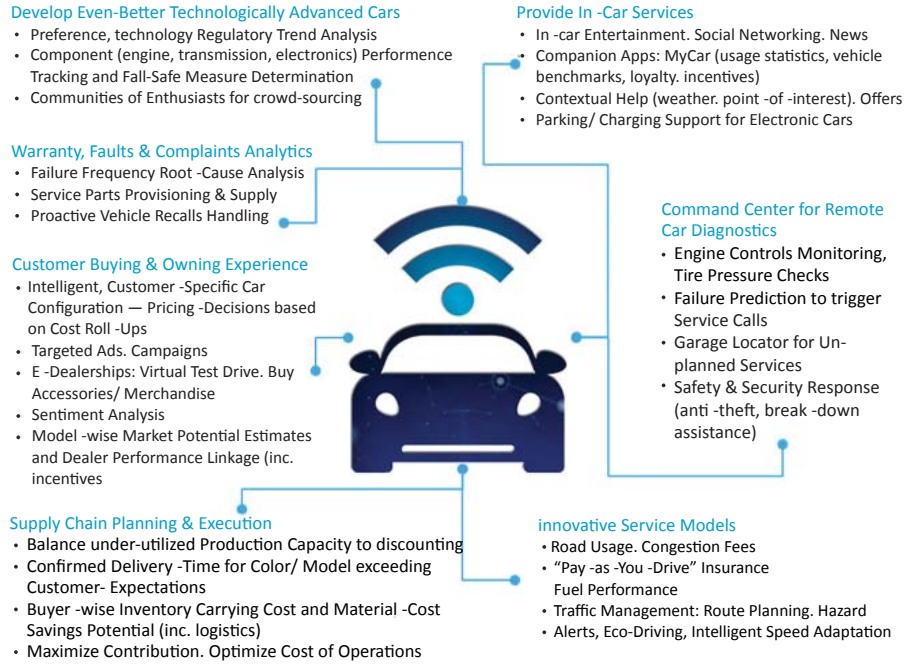
As connectivity becomes an integral part of an automobile's value, companies from industries that may have seemed unrelated to the automotive industry just a few years ago will likely become key players. Today's in-vehicle user computing is dominated by smartphones and applications because embedded connectivity is only present in a small minority of vehicles. SAP's future vision for the industry is to enable the Connected Car through SAP HANA Automotive Cloud Platform: using cloud technology to transfer information to a car keeping diagnostics and sending to a dealership for accurate repairs.

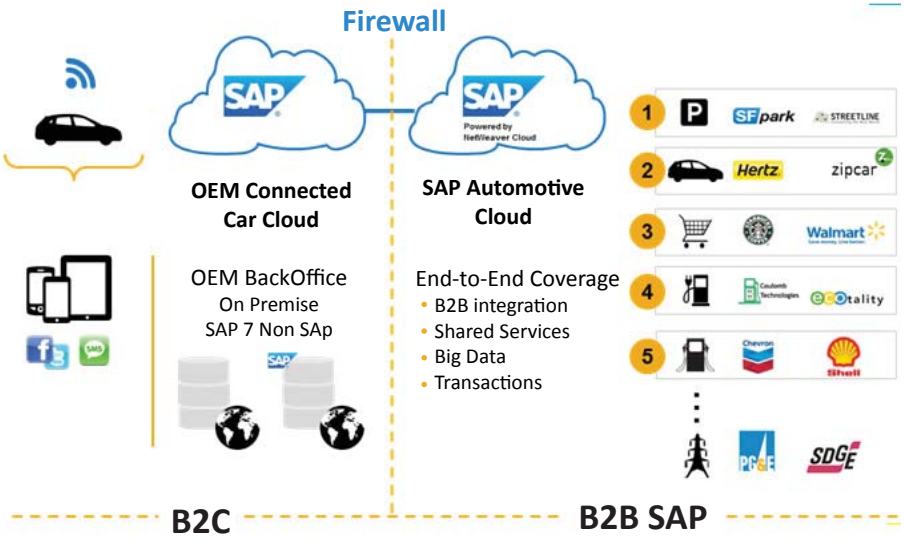
New business-models will evolve to provide personalized services to drivers based on their location and route.

Sap is co-innovating with leading automotive manufacturers such as BMW and Toyota to bring location-based offers and simplified fueling-experience to customers.

The opportunity to innovate based on data and powerful software capabilities is immense as the connected cars of today evolve into autonomous self-driven vehicles leading to minimal accidents, low emissions while delivering better experience for consumers.

Customer & Vehicle Cetricity
Enabled by SAP Technology





Future-proofed vehicle

Artur Seidel
Vice President-Automotive Software
Elektrobit Automotive

Q We have seen automotive players acquiring more software arms in their business.

A Software is becoming an increasingly critical part of vehicle development as the industry moves towards a world of fully autonomous driving. As a result, we are seeing automotive OEMs investing more of their time and resources in software and software development.

For example, there are more than 100 million lines of code in a car – that's more than a 737 jet! And, the complexity of software will continue to evolve with every new model. Automotive OEMs need to master the complexity, by changing the way they develop features and vehicles.

EB Automotive is involved with every crucial step of the car's technology development – from initial software architecture, development and integration to the managing and testing of applications. We are an extension of the automotive OEM's team. For example, for Mercedes, we have created the so-called "software factory", where we manage and test all driver assistance features for its entire carline, worldwide. For Ford, we are the global software integrator, combining, testing all the software components. We also help Ford localize AppLink in all the regions they are present.

Q Do you think the entry of likes of Apple & Google will disrupt the connected car value chain?

A Google and Apple complement the technology innovation we are seeing in the automotive industry today, especially with regards to infotainment. That being said, the Human Machine Interface (HMI) which enables a more enjoyable technology experience for the driver and passenger will likely remain a huge differentiator with Google and Apple complementing but not replacing the HMI. HMI development requires expertise from companies like EB Automotive and the industry must work together to satisfy and meet the demands of the automotive OEM and consumer.

Q How best can car makers future-proof their connected car services to stay competitive with the pace of CE industry?

A The best way that automotive OEMs can future-proof their connected car services is by providing safe and secure over-the-air (OTA) updates and a solid HMI that can be updated over time as well. We believe that the ability to safely deliver wireless updates will impact every part of the car – from infotainment to powertrain – and is especially critical now as automakers integrate advanced driver-assist and self-driving capabilities in their vehicles.

Having a solid HMI, as mentioned previously, is absolutely critical in providing a good experience and interaction with the vehicle, similar to how consumers interact with CE devices.

Q Can you share your thoughts about OTA updates for vehicles?

A OTA software updates will be commonplace in new cars over the next few years, and delivering those updates securely is most important. Our software products, including EB GUIDE, are ready today for secure OTA updates. In addition, our navigation product EB street director is capable of being updated over the air with new map and POI information to help the driver stay up-to-date with the latest information. Regarding OTA updates, carmakers also need to consider the amount of data they are sending to the car, the time when they are performing the update (is it peak time? Will it affect the driver in terms of cost?) and the security behind the update. Every week we hear about hacking and various industries being vulnerable to cyber-attacks. For that, the OTA needs to be extremely well thought through and carmakers need to work with companies that understand the entire automotive infrastructure, not just one part, like networking, or connectivity.

Q Who do you think will have the ownership of connected car data? OEMs, 3rd parties or consumers?

A The integrity of connected car data is an important asset. We think that automotive OEMs will have ultimately ownership of the data because they need to access it in order to provide further services to their customers like updates or after sales. On the other hand, the drivers need to maintain their privacy and their own content.

Q The legislatures have raised potential concerns around remote hacking of vehicles (consider the famous Ed Markey's report). Do you think that OEMs have not done their part on securing the vehicle?

A Automotive cybersecurity is something all automotive OEMs (and suppliers) are very concerned about and working hard to implement solutions. Automotive OEMs and their suppliers are already using modern security practices from the mobile and IT world. Threat modelling and analysis, encryption with the latest algorithms, digital certificates, secure communication protocols like Secure Sockets Layer (SSL), and other approaches are becoming standard practice today. Additionally, most automotive OEMs are working on improving their ability to deliver software updates to the car (such as OTA) to improve the ability to respond to critical issues.

There are common standards for Functional Safety, such as IEC 61508 (intended to be a basic functional safety standard for a variety of applications) and its adaptation for the automotive industry: ISO 26262.

Elektrobit achieved its Functional Safety

certification by the assessment agency exida Certification SA for the EB tresos Safety OS. Elektrobit security solutions are based on AUTOSAR and HIS (http://portal.automotive-his.de/index.php?lang=english) and offer support for cryptographic hardware such as Secure Hardware Extension (SHE) and Hardware Security Module (HSM).

We believe than an open and standards-based approach to security implementations (e.g. peer reviews outside of individual OEMs) will prevail over the more secretive and closed implementations that we have seen in the past.

In general, techniques for securing our systems and software go well beyond just the automotive industry. There is already collaboration happening among carmakers around safety and security, but we also have to look outside our industry at the successful technologies and solutions used else where that can be applied to automotive.

Q What is the role of after market in telematics value chain?

A The aftermarket ecosystem will still be very important especially as we see Apple CarPlay and Google's Android Auto gaining traction. In some regions, like South America and Asia for example, carmakers are developing vehicles that don't have high-end telematics systems, making the aftermarket ecosystems very important.

Q How sustainable do you feel are the new telematics & connectivity-based business models like car-sharing, smart mobility?

A I think they're very sustainable. Many carmakers including Ford, GM, Daimler and Audi are exploring these new business models and are invested in expanding their offerings – especially in urban areas. There is a great opportunity for the mobile apps ecosystem to deliver unique applications to the auto industry around parking and safety, in addition to other areas. Everything is becoming more and more connected and the carmakers are smart to invest in such business models.

Automotive Cyber-Security: Separating fear from the fact

Franz Tschimben
Business Development
Savari Inc.

Sridhar Reddy
Savari Networks

Cyber security has been a big issue for the fast evolving automotive market ever since electronics became a crucial part of the vehicle, but only made it into mainstream media in July 2015. Miller and Valasek[1] exposed the weak points of regular cars on the streets by wirelessly and remotely hacking into a Jeep Cherokee for demonstration purposes. Testing was conducted on a total of 20 car models released from 2014 to 2015 from different manufacturers – the problem is universal and involves the whole industry.

The hacking demonstration of the car happened through the center piece of today's connected cars: the infotainment system and its cellular connection. As cars will get more connected and autonomous in the years to come, more entry options will be given to software specialists with malicious intentions. Research of the Automotive Security Review Board[2], led by Intel, shows that 15 exposed attack surfaces exist in the next generation smart car.

One of the biggest and most widely regarded benefits of the connection and automation of cars – reducing total fatal car accidents – is at stake. According to Miller and Valasek[3], a successful hack depends on remote attack surfaces, cyber physical features and in-vehicle network architectures were the identified.

The industry has given priority to the threat and works towards creating a system that reduces hacking threats by closing down entry points. Importance is given to solutions with software that can be continuously updated and therefore strengthened.

OEM's, suppliers and specialized automotive cybersecurity companies like Argus and Towersec, are developing and marketing solutions. Furthermore, the Auto Information Sharing and Analysis Center (ISAC) has been established for major automakers in July 2015. Its chairman, Tom Stricker from Toyota, explained that the group will act as a central hub for gathering intelligence that allows to analyze, share and track cyber threats and spot potential weaknesses in vehicle electronics".[4]

As the industry is intended to decrease the threat of cybersecurity by bundling forces, so does legislation by working on a new draft bill – titled "Security and Privacy in your (SPY) car act of 2015"[5] that aims at establishing cyber-

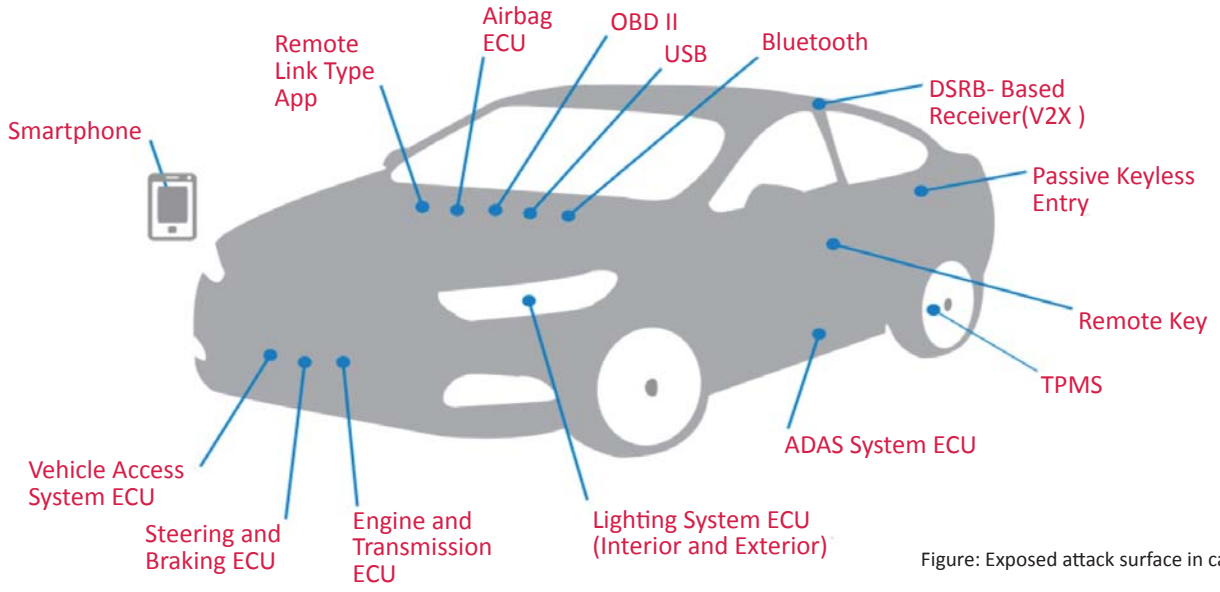


Figure: Exposed attack surface in car

security standards for car companies and penalties for hackers.

It is crucial to ensure that standards keep getting better over time and evolve just as smart cars are improving and becoming more dependent on electronics hardware and software and hackers are improving their skill-set.

Security risks exist not only in terms of a hacker taking control of the vehicle but also with the aim of negatively impacting the application or service. Savari is working at the forefront of IEEE 1609.x V2X technology, which relies on periodic broadcast of over the air messages between vehicles to vehicles and between vehicles and infrastructure. As a result, V2X provides yet another gateway in and out of the vehicle. We, at Savari believe that it is crucial for Tier I/II automotive suppliers to also take an active role in ensuring that solutions are secure. Threats such as "man in the middle", vehicle spoofing, etc., could all have a detrimental effect on the final user application. It is critical to prevent rogue users from accessing the security certificates. In this regard, on the technology side, incorporating secure technologies like hardware security module (HSM), trusted platform, secure boot and secure updates should be a mandatory minimum. Furthermore, it is vital that security solutions build in features such as reporting, certificate revocation mechanisms, etc.

The V2X solution also incorporates access to the CAN bus. In the future a V2X sensor may not only be used for determining the situational awareness for a vehicle but also for actuation of the vehicle. One way to ensure more security at the CAN level is to create different priority levels to system IO access. This way, even if the system is compromised, the hacker cannot gain control to such vital ports. This approach is likely to require a combination of both Hardware and Software. The OEMs are also looking at making the car more secure by having a secured CAN bus by using authenticated CAN messages, multiple independent CAN buses in order to reduce the attack surface.

Much of the above mechanisms require engineering implementation of these solutions and safety features. Sufficient learnings were gained from the vulnerability of computers, especially from the earlier days of Linux. Crippling Linux servers in the past (and even today) took the form of Denial-of-service (DOS) attacks, source spoofing to email programs that in turn allowed hackers to take control over the systems. Many of these not only require specific implementation of features but also require specific process of development and quality assurance. Across the industry well defined engineering practices are being adopted to follow safety and security standards and best practice guidelines. This includes compliance to MISRA C, automotive SPICE and ISO 26262 The guidelines and certification. This enables security to be considered early on in the lifecycle, software requirement, architecture & design, and testing. Errors or hacking mechanisms that can cause buffer overflows or similar can now be prevented by incorporation of design and development practices. There are many such tools, components and products available which can be leveraged. Operating system vendors for example, e.g. Greenhills and QNX, are providing OS with hypervisor and virtualization support to run safe execution of trusted and critical software side-by-side with untrusted application.

> *The combined efforts of industry and legislation will raise the bar and make it more difficult for programmers to hack the car.*

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Dr. Roshy John
Practice Head
Tata Consultancy Service

Building India's Driverless Car

Q When did you start working on driverless car?

A I started working on this project more than five years ago, as a hobby, after having a near death experience in a taxi cab with an overtired and sleepy driver.

Q Is this project funded by any research institute or industry?

A The whole project is funded by my savings and the money I pooled in from my patents. I took up this project more as a social commitment as I aspire to do my part by coming up with a technology to reduce road accidents.

Q What were the guidelines in selecting the team of engineers to work with you on this driverless car project?

A The concept of autonomous vehicles is largely based on mobile robots, where we use software algorithms on digital filters, probability theory and advanced mathematics. Apart from these, one should have deep knowledge in advanced electronics. When I started my career, one of the most important things I did was to groom up team members to gain experience in the above said domains.

A robot typically has 20% of hardware and 80% of software, irrespective of its mechanical complexity. I have years of working experience in developing robots for numerous industries starting from factory automation to consumer electronics robots. My PhD was in the same domain on multi-mobile robot interaction. This helped me in grooming up my team members to reach a competency on some of the niche areas in Robotics.

On top of these, the entire crew was passionate enough to develop a prototype at least to this scale.

Q What were the hurdles faced during the years of leading this project?

A The major problems we faced are:

- The rapid rate of battery consumption of the driverless car computer
- Actuator latency and backlash for the pedal robots
- Hardware failure when tested for extreme test cases
- Inability of radars and LIDAR identifying certain dynamic obstacles, viz. other moving vehicles or pedestrians
- Developing the AI algorithms on decision making to react during an emergency scenario
- Finding the probability of pedestrians, two-wheelers and autorikshaws taking unpredictable lane changes

Q Having successfully demonstrated the driverless car, what is the next step?

A We have made a small leap towards driverless car. There are numerous issues which have to be addressed, such as making cheaper and energy efficient hardware and smarter software which could handle Indian road scenarios. If the driverless car technology can successfully work in Indian roads, it will work in any part of the world!

Q What according to you is the future of driverless car or say assisted driving?

A There would be tremendous development in this domain since the price of electronic components and sensors are coming down drastically. Almost all the car manufacturers are going to adopt ADAS and limited self driving as a feature within the next 5 years. Apart from these, the infrastructure to support these technologies is getting developed in an exponential rate. For instance, faster mobile networks, more precise GPS, etc.

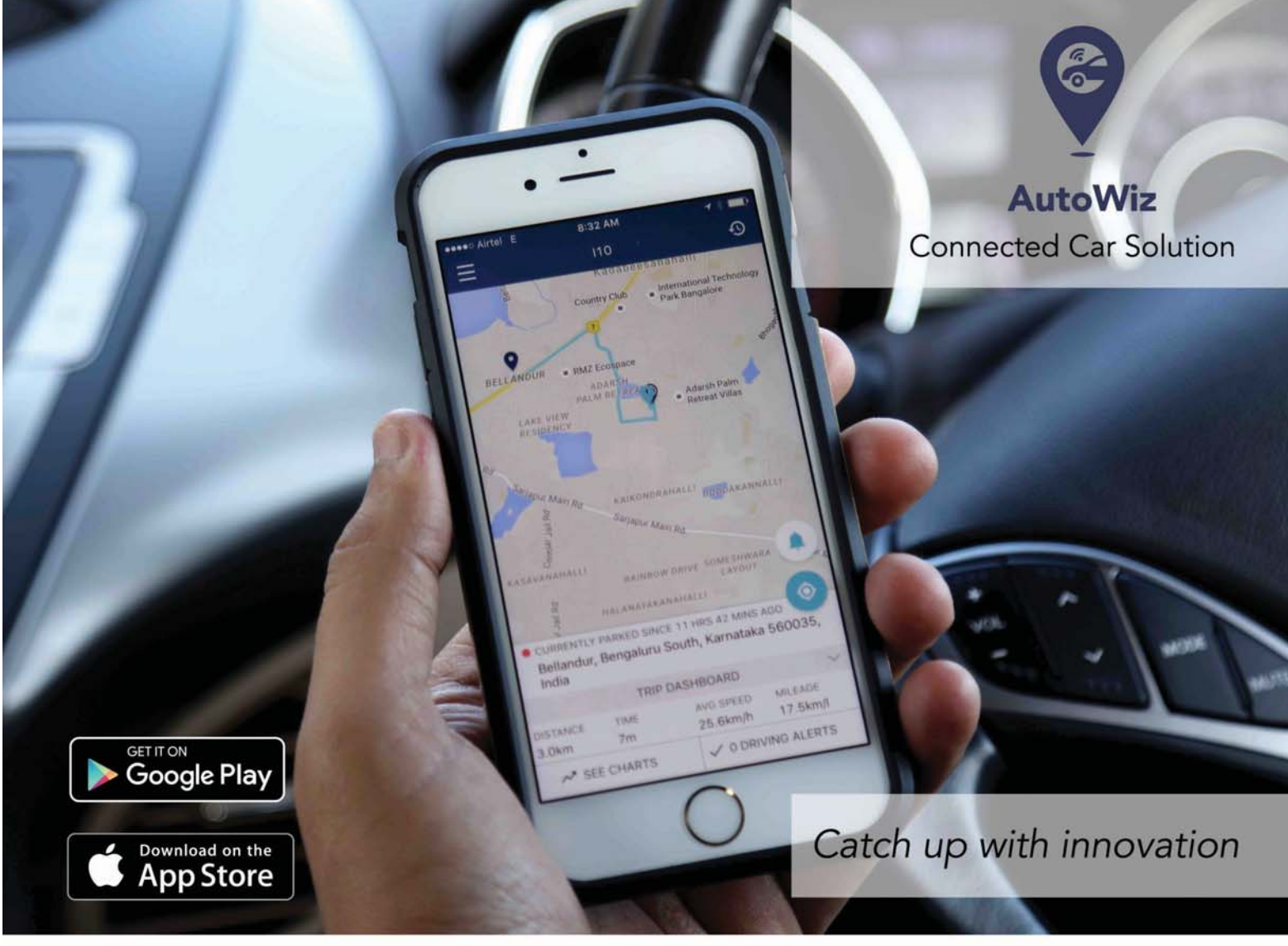
> *"This project is funded by my savings and the money I pooled in from my patents.*

Q In our regional context of India, what is the utility you see for driverless car or semi-autonomous cars/assisted driving?

A There are tremendous opportunities in India and there are two ways to look at it. One is for catering the local market - here the growth is exponential where every manufacturer is releasing newer versions/variants of vehicles every year. The second aspect is bringing more jobs to India. Throughout my career, I have focused on bringing these types of high-tech jobs to India. We can develop all these advanced technologies for supporting the foreign manufacturers or OEM suppliers to do this at a fraction of the cost.

Q Would you like to comment on the ecosystem in India for such projects?

A We need to scale up our capabilities, resources and investments to execute projects like these which have a lot of potential in the international market. If my small team can contribute this much by making a driverless car, imagine what the bigger research groups in India are capable of!



AutoWiz App on your mobile combines with AutoWiz OBD device in your car to make your car a smart car and you a smarter driver!

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Future of Mobility and Personal Transportation

In the early 20th century, Henry Ford said, "Any customer can have a car painted any color that he wants so long as it is black." Not only did he limit the choice of color, but also the choice of model. Ford wanted to produce only the Model T. His goal was to expand car ownership. To do that, he needed to make the car both affordable and reliable. And he did this by limiting variation in the production of cars. In 1908 his 1,900 workers produced over 6,000 cars. In 1911 his 4,100 workers produced almost 35,000 cars. By nearly tripling productivity, Henry Ford opened car ownership to the working class. His vision was to literally put every American household on wheels.

Almost a century after the Model T, the world continues to display a voracious appetite for the automobile—as an emblem of social status, an icon of blazing independence. Smart, sleek, elegant cars of today combine technology, luxury and class and that has fuelled this insatiable demand.

According to Statista, the world is likely to hit 100 million cars in 2017[1]. That's a lot of cars. But here's an interesting statistic - the utilization rate of automobiles in the U.S. is about 5%[2]. So a hundred years later, when Sherly Connelly, resident futurist at Ford Motor Co says, why buy the car when you can rent it, borrow it, loan it, lease it?[3]; she's echoing the sentiments of many young consumers who are perfectly comfortable sharing or leasing something, unlike earlier generations who had a mental roadblock towards buying something second hand, renting or borrowing it. Owning a car is almost passé. Automobile finance and low interest rates have ensured that most cars today are financed through attractive leasing and buyback schemes.

Globally we are moving towards a "Shared Economy". The race is to share resources as opposed to owning them. So you don't pay for the car. You pay for the usage or the miles. It's a paradigm shift in the way the world has viewed mobility. Rates of motor-vehicle licensure have already dropped among young Americans. And the obligations and costs of transportation—which is an estimated average 17% of household budgets[4]—are probably added incentives to share rather than buy. And it's not just the USA, even traditionally car-ownership-driven markets like Italy now boast of car sharing facilities being available in over 15 cities.

Also, according to a Frost and Sullivan study, the average speed at which people travel around the world in cars is about 25 miles per hour[3]. So if you are riding in your car for a couple of hours every day, maybe you don't just want to stare at the traffic, maybe you have better things to do with your time. You could watch a video or chat with friends or family or check work mails.

Automotive OEMs are not viewing this new consumer behaviour as a threat, but more as an opportunity to expand the automotive value chain and diversify. They are transforming themselves into service providers who offer integrated mobility solutions. Recent proof of that was when earlier in 2016, General Motors invested $500 million in ridesharing company and Uber competitor Lyft. And GM's president, Daniel Ammann commented that they think there's going to be more change in the world of mobility in the next five years than there has been in the last 50.

Before the passing of this generation automobiles will be built with what's known as Level 4 autonomy—full self-driving artificial intelligence for cars. Autonomy will make it possible for unmanned automobiles (of your choice) to be called, via app, to your location –cleaned and fuelled. The technology that goes into matching the rides to passengers is evolving rapidly, incorporating information about observed behaviours to improve rider experience. Not only will death and major injury from traffic accidents drop drastically, autonomous cars could contribute $1.3 trillion in annual savings to the U.S. economy alone, according to Morgan Stanley[5]. And global savings are in the range of an incredible $5.6 trillion. Level 4 AV technology, when the vehicle does not require a human driver, offers the promise of enabling transportation for millions on the margins including the disabled, the elderly, the working poor or those too young to drive. The benefits for these groups would include independence, and access to essential services.

2016 is not just the year in which GM invested money in a partnership with the express directive of killing the idea of car ownership. 2016 is also the year where fossil fuels are expected to enter their terminal decline. Earlier in 2015, when Toyota announced their plan to transition to hybrid and fuel cell vehicles by 2050, to radically reduce emissions, it wasn't exactly a shock. And though Toyota may be sceptical about electric vehicles, because they take too long to recharge, today the bestselling car in Norway is not made by any of the top auto OEMs of the world. It's the Tesla Model S, the world's first premium electric sedan. One driver even proved it's possible to drive all the way from Oslo to Kirkenes (over 1100 miles) at an electricity cost of just NOK 400 (less than $50). But in Norway, the vast majority of the country's electricity is generated through hydropower. For other countries that generate electricity from coal, it's possible that electric cars might put more pressure on an already overloaded energy grid.

The next generation of cars will not be isolated pieces of metal moving independently but smart hardware which would be connected with other

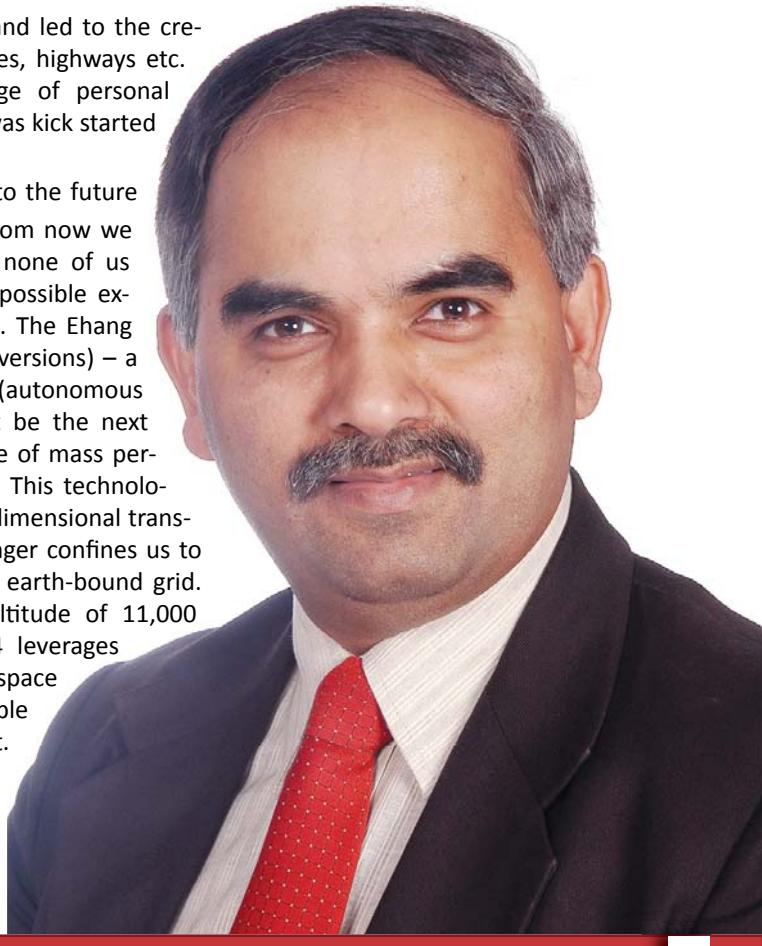
cars as well as the larger ecosystem - a move which is essential to the concept of "Smart Cities" to manage traffic and road infrastructure intelligently. Technology firms are driving much of the change. These firms are the disrupters, who believe that the system's key source of value could be in creating and managing the vehicle's system and commuting experience as well as in mining the data generated. KPMG in their Annual Automotive Survey 2016[6] commented "Automotive OEMs of today will be the contract manufacturers of technology companies tomorrow.'' Almost every OEM today has already tied up or is in the process of tying up with small start-ups or large tech players to get a handle on the next gen technology in their automobiles.

Coming to mining the data generated - twenty-five gigabytes: that's how much data a connected car will upload to the cloud every hour. Connected Cars are morphing into mobile data centres. They are creating and using data, while communicating with their environment. This data is about everything - route, speed, the wear and tear on its components, and even road conditions. Vehicles today have multiple microprocessors and dozens of sensors that collect telematics and driver behaviour data, and that data can be analyzed in real-time to ensure the vehicle's performance, efficiency, and safety. It also provides vital feedback about traffic volume and roadway design. Other than the safety aspect, there's also the quality of life component – infotainment and entertainment - passengers can log onto social media, view vehicle info, and connect other apps to their car. But who owns all this data? The ownership is being keenly contested – from OEM to dealers and 3rd parties who are getting into this game. We seem to be in for some exciting days ahead as this contest unfolds but I am sure ultimately it will be the consumer who will still rule as the king and have the last laugh.

As much as the world focuses on Uber and Lyft, electric vehicles, hybrids and autonomous vehicles, these technologies are incremental, not disruptive. The last truly disruptive mass personal transportation technology was the Ford Model T. Ford's innovation redefined automobile culture and led to the creation of cities, bridges, highways etc. designed for the age of personal transportation that was kick started by the Model T.

A peek ahead into the future – a hundred years from now we may see something none of us could have thought possible except in Sci-Fi movies. The Ehang 184 (or its next gen versions) – a human-sized AAV (autonomous aerial vehicle) might be the next truly disruptive mode of mass personal transportation. This technology introduces three-dimensional transportation that no longer confines us to moving about on an earth-bound grid. With a maximum altitude of 11,000 feet, the Ehang 184 leverages a great deal more space to transport people from point to point. Also the Ehang 184 makes use of rapidly increasing advances in drone tracking and sensing technologies. Each Ehang 184 is able to use GPS technology to accurately pinpoint its own whereabouts, and to keep track of everything else flying in its periphery. Able to compute, set its optimal flight path, and be flexible enough to adjust in emergencies, the Ehang 184 can become a failsafe personal transportation technology. It is perhaps a vision today but it is a vision of a safe, autonomous quadcopter drone for human point-to-point flight.

Ever since mankind has invented the wheel, the concept of transportation has changed over successive generations. Today we are on the cusp of another revolution in mobility and transportation which will undoubtedly build a smarter, greener and safer planet,and take humanity forward in their journey to explore new frontiers.



Aloke Palsikar

Sr. Vice President & Global Head of the Manufacturing Vertical

Tech Mahindra

A Digital Transformation Leader and a growth driver having over 28 years of experience in IT, Software Services & the Engineering Industry, he is currently focused on driving Digital Transformation (DT) in the manufacturing sector, immersed in technologies around IoT, Mobility, Connected Products and Industry 4.0, with an ecosystem of technology partners and start-ups alike.

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Building robust security framework for connected car

Q How has your role changed after the acquisition of Symphony Teleca by HARMAN?

A After the acquisition of Symphony Teleca by HARMAN in 2015, I was appointed the Country Manager for HARMAN India, responsible for the overall development and execution of HARMAN's strategic intent and plans for India.

My priorities include enhancing HARMAN's mind and market share across four business units: Connected Car, Lifestyle Audio, Professional Solutions and Connected Services in India. In addition, I'm responsible for building a strong engineering and development team in the country, which drives advanced technology work for both domestic and international customers. I also continue to serve as the CFO of HARMAN Connected Services division.

Q How do you think the recent acquisitions by HARMAN strengthens its hold in the connected car market?

A All of our recent acquisitions including Symphony Teleca, Red Bend and TowerSec have been strategic milestones in enabling a seamless, secure, and connected lifestyle from work and home to car and mobile.
The acquisition of Symphony Teleca was a transformative step for HARMAN that gave us immediate scale in software services. With the addition of cloud, mobility and analytics competencies, we are poised to accelerate solutions for the connected car and for a broader set of industries and markets.

RedBend's software management solutions and hypervisor-based virtualization technologies for cyber security are widely adopted in mobile devices and ideally suited to meet the rising demands of the connected car. Importantly, RedBend solutions also serve as critical prerequisites for autonomous driving. By bringing RedBend under the HARMAN umbrella and driving broad industry usage, HARMAN's combined technology portfolio will seamlessly enable safe, secure OTA updates for a variety of on-board HARMAN and non-HARMAN automotive systems – whether embedded or downloaded -- speeding the pace of innovation to automakers and the industry.

TowerSec's technology will be integrated into HARMAN's 5+1 security architecture aimed at protecting the critical points of vulnerability in the connected and autonomous car, including hardware, network and Over the Air (OTA) updates.

Q Can you share your views on connected and autonomous car demand?

A The demand for connected, and eventually autonomous cars is accelerating quickly and it is expected that more than 90 percent of vehicles on the road will be connected by 2020 (Frost and Sullivan). Automakers are under increasing pressure to provide consumers with all the high-end connectivity features that they want, but in a manner that does not compromise on safety and security.

Q Why are Tier 1 suppliers acquiring software capabilities into their business?

A The Internet of Things (IoT) is ushering in a rapid convergence of experiences, content and commerce and advancing technology from digital to connected to intelligent systems. Software is driving this evolution and as a result, software solutions and services will be key to the success of Tier 1 suppliers like HARMAN.

Q Recently, few white-hat security researchers have mentioned infotainment head units as the most vulnerable part for cyber attacks. How is HARMAN coping with this?

A Cyber security is definitely one of the biggest challenges the automotive industry faces at the moment. As cars become increasingly connected to the outside world, the threat of potentially lethal cyber attacks is becoming a very real possibility. At HARMAN, finding solutions to this problem is a key priority for us.

Over the last two years we've made massive inroads by way of acquisition as well as organic innovation. We have been working on building a robust 5+1 security framework which has been very well received by industry stakeholders. HARMAN 5+1 Security Framework is the industry's most robust and in-depth security framework for connected cars. The multi layered architecture provides a "defense-in-depth" model with each layer acting as a defensive perimeter that an attacker has to surmount to launch an attack successfully.

Q Does HARMAN have any plan to increase investment/manufacture under the 'Make in India' initiative?

A With more than 7,500 employees, India is home to HARMAN's largest concentration of software engineers and designers, focused on developing innovative systems and solutions that leverage cloud, data and analytics to advance the connected car, connected enterprise and connected lifestyle.

We have offices and R&D centers across seven cities in India, as well as a state-of-the-art manufacturing facility and acoustics lab. Located in Pune, the plant has the advantage of being close to a large base of automotive OEMs and has a production capacity of 400, 000 car sets per annum. The acoustic lab which is also located in Pune, is home to state-of-the-art fabrication, tuning and listening rooms and features an array of proprietary hardware / software tools to cater to existing and emerging demands in the realm of automotive audio & acoustics.

HARMAN places a large emphasis on localization, which allows it not only to customize solutions exclusively for the Indian market, but also optimize costs to meet the market requirements.

Q Could you tell us about HARMAN's recent /upcoming innovations?

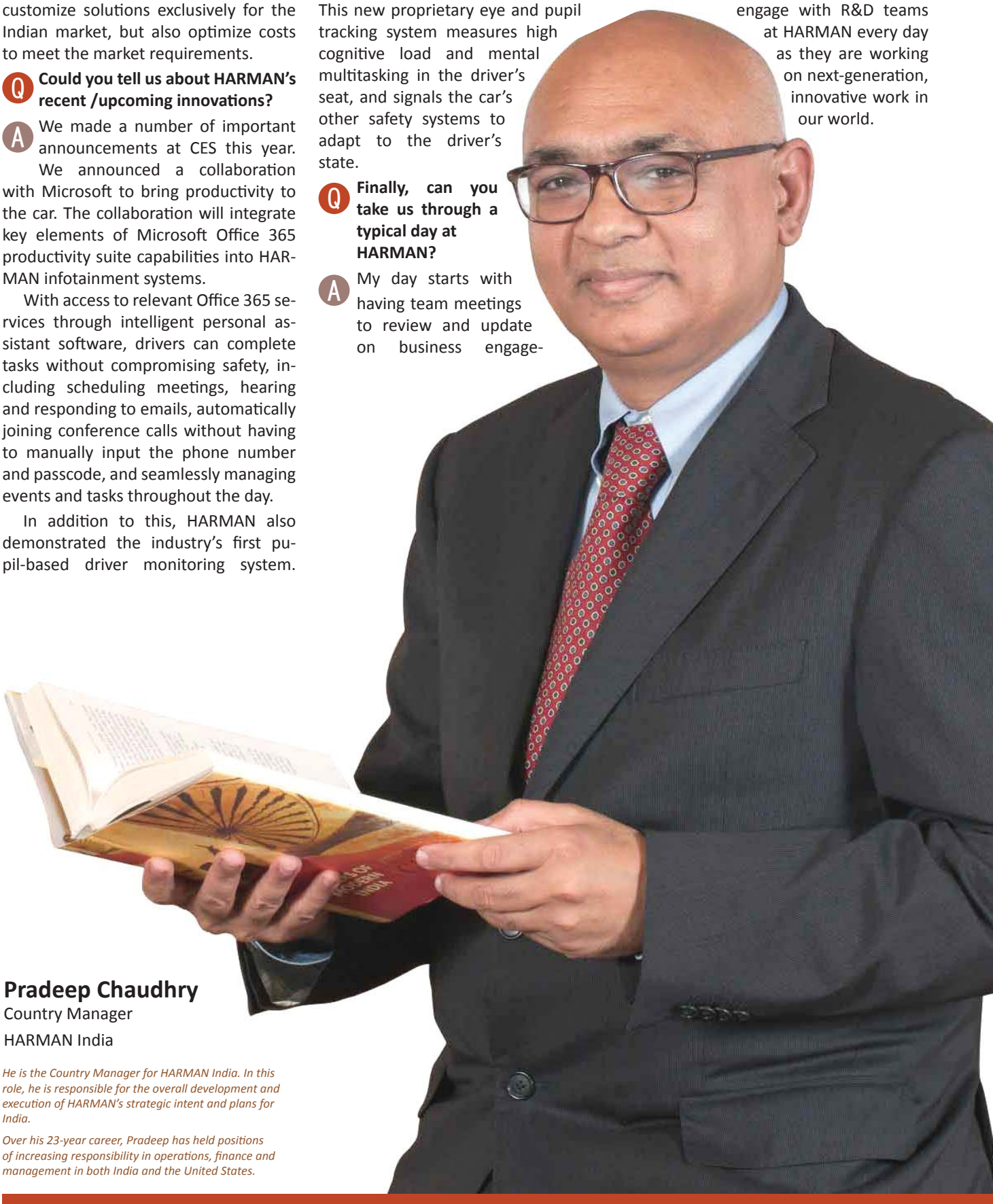
A We made a number of important announcements at CES this year. We announced a collaboration with Microsoft to bring productivity to the car. The collaboration will integrate key elements of Microsoft Office 365 productivity suite capabilities into HARMAN infotainment systems.

With access to relevant Office 365 services through intelligent personal assistant software, drivers can complete tasks without compromising safety, including scheduling meetings, hearing and responding to emails, automatically joining conference calls without having to manually input the phone number and passcode, and seamlessly managing events and tasks throughout the day.

In addition to this, HARMAN also demonstrated the industry's first pupil-based driver monitoring system. This technology keeps drivers safe by continuously monitoring cognitive load. This new proprietary eye and pupil tracking system measures high cognitive load and mental multitasking in the driver's seat, and signals the car's other safety systems to adapt to the driver's state.

Q Finally, can you take us through a typical day at HARMAN?

A My day starts with having team meetings to review and update on business engagements. I travel to meet our partners and customers very often. Finally, I like to engage with R&D teams at HARMAN every day as they are working on next-generation, innovative work in our world.



Pradeep Chaudhry
Country Manager
HARMAN India

He is the Country Manager for HARMAN India. In this role, he is responsible for the overall development and execution of HARMAN's strategic intent and plans for India.

Over his 23-year career, Pradeep has held positions of increasing responsibility in operations, finance and management in both India and the United States.

VEHICLE BECOMES A PART OF THE INTERNET OF THINGS(IoT)

Anupam Sharma
General Manager & Industry Leader-Automotive & Electronics
IBM

Ever since the first Ford Model T rolled off the production line, mankind has been obsessed about what the "car of the future" might look like. The car of the future will be increasingly intelligent, inter-connected and instrumented, in another word- Smarter. Cars will ultimately communicate, socialize and collaborate with other things, including other vehicles, traffic lights, parking bays and retailers, thereby becoming a participant in a wider "system of systems".

From a pure data point of view, the car itself is another 'thing' in the grand scheme of the Internet of Things (IoT) – just a node on a network. In the IoT, the car is literally a big data in motion problem. The connected car is likely to become the poster child of the IoT revolution because it is part of a wider system of systems (encompassing not only cars but also cities, physical infrastructure, retail, insurance and many others) and leverages key IoT enabling technologies, such as sensors, analytics, big data, natural language processing and cloud computing.

Connected cars will also bring forth an array of digital services created out of the vast amounts of data this connectivity will unleash. These digital services, many of which yet to be imagined, are likely to be highly disruptive to the auto industry. They will reinvent existing business models, create new models, change the auto ecosystem and redesign customer engagement and expectations. Along this journey, control points and profit pools will change, and economic value within the auto industry and across adjacent markets will alter.

The portfolio of connected of connected vehicles is enormous as indicated in **figure 1** – Customer Profiling, Digital Marketing, Connected Navigation, Infotainment, Personal Health Monitoring, Concierge Services, Safety & Security, B2B Services, Smarter Cities, Fleet Man-

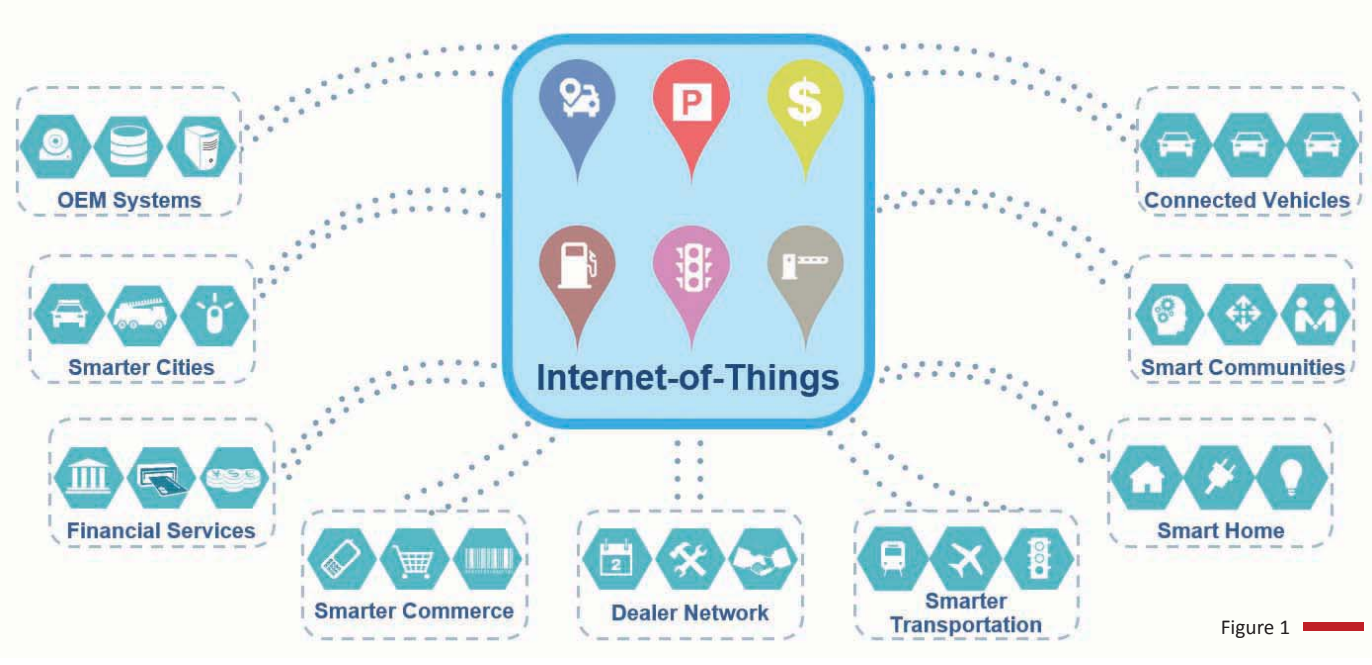


Figure 1

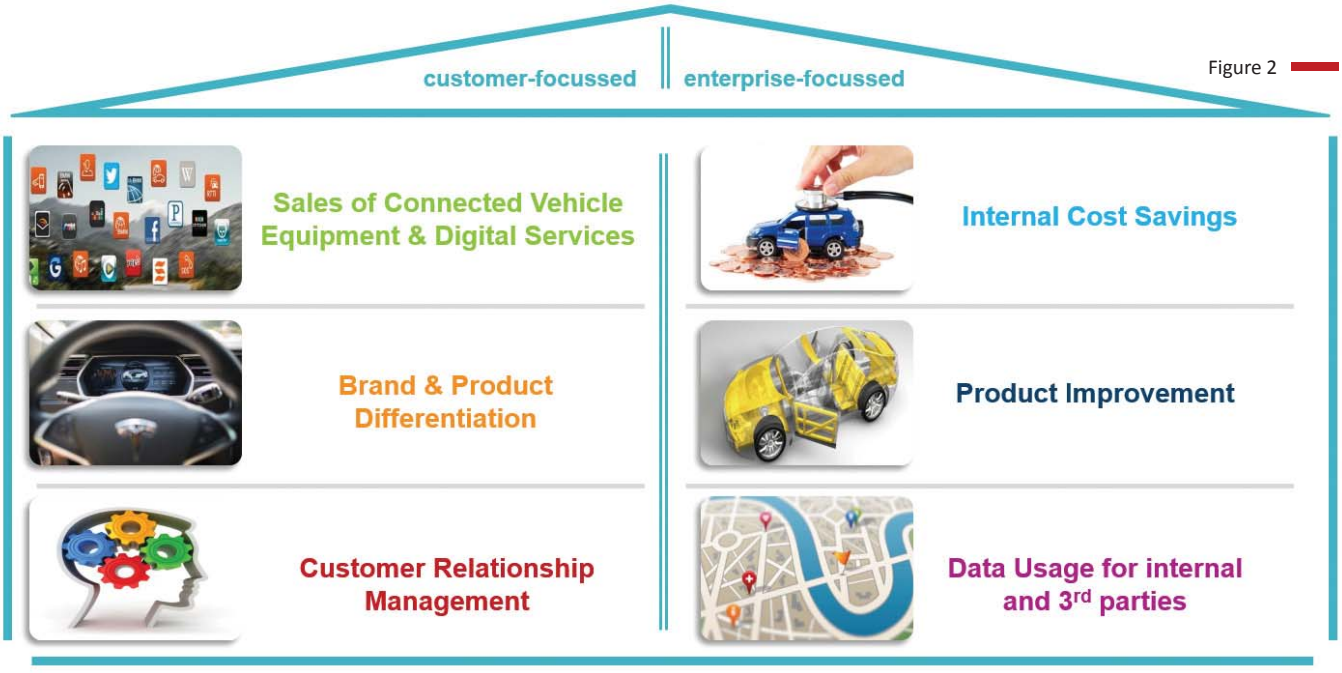


Figure 2

agement, Remote Access, Vehicle Care and Financial Services amongst others. Such services will create different benefits for automotive manufacturers as well as for their customers as indicated in **Figure 2.**

Today, IT platforms have matured with capability to securely capture vast amount of data and analyze in real time. It will assist automakers in turning driver and vehicle data into something tangible and useful in the modern business realm. This large quantum of data, now also termed as Big data is characterized by the tremendous volume, variety, velocity and veracity of data generated by a wide array of sources including vehicle sensor data, warranty claims and consumer sentiment data from multiple sources. Big data and analytics platforms are able to capture and integrate data-in-motion and data-at-rest for a single, integrated view of the vehicle.

Data collected from individual sensors - including environment insights, driving patterns and vehicle condition - as well as third-party information, such as traffic conditions and accident alerts, will be sent to the cloud and analyzed for the benefit of drivers and companies. One example is- provide automakers with real-time insight into how the various vehicle systems are performing under specific driving patterns and environmental conditions.

Data is fast becoming the world's new natural resource. Those in the automotive industry that recognize this and seek ways to tap into the new natural resource will have an edge. Future control points in the auto industry will be defined by who can best leverage data to adapt and improvise business models, identify ways to engage old and new partners and materially enhance the customer experience.

However, the challenges for OEMs to successfully deliver Connected Vehicle Offerings are substantial and manifold - Compelling Services, Customer Experience, Monetization, Security & Privacy, Legal & Regulations, Multiple Markets, New Entrants and Traditional Competitors. A layered approach to address the challenges from an integrated perspective is recommended, combining both business & technical aspects.

Personalization and Contextualization drive the Connected Car of tomorrow

Raj Paul
Vice President | Automotive & Emerging Technologies
Lochbridge

Q With reference to Connected Cars how does the regions of Europe and North America Compare?

A There are OEMs in both regions that have blazed the trail for vehicle connectivity and some that have lagged. Given the pent up consumer demand to integrate their digital lifestyles with their vehicles, acceptance has been high. Where many of the forerunners have tried to recreate the mobile experience in the vehicle, we are seeing a new era emerge in which digital content and apps are being extended into the vehicle in a much more contextual manner. Given the advancements in bandwidth, IHU display and processing capability, OEMs on both regions have the ingredients to truly innovate and differentiate. And, while regulatory differences exist between regions, the challenges are fundamentally similar.

Q In your opinion, what in-car apps and connected services are beyond the hype and make sense to a consumer?

A Lochbridge commissioned a survey recently that shows consumers are willing to share their data provided they know how it will get used and how they get to benefit from it. From this research, we see consumer acceptance double in many cases where the benefits are fully explained. So connected car use cases that make sense to the consumer like usage-based insurance, productivity-enhancers, driver behavior feedback, personalization, vehicle health, in-vehicle commerce, proactive-diagnostics and service scheduling could easily be accepted if the industry clearly communicates benefits. In addition, specific applications that are adapted for the vehicle context, such as social media apps that render in the IHU (in-car), will go beyond the hype while also delivering a safer driving experience.

Q In what ways the "personalization" of connected car services will influence the purchase decision of a new vehicle buyer in the near foreseeable future? Can it become a "brand differentiator" for an OEM as well?

A Infotainment and Telematics are already sales accelerators and have become brand differentiators. According to a the Lochbridge survey, consumers are very much interested in vehicle personalization. Half of consumers indicated that they are willing to provide their personal data, such as their location and driving behavior, to tailor their vehicle experience to their preferences. So, this is a big opportunity for the OEMs to capitalize on. As such, we will see the next wave of automotive innovation bring more opportunities for a richer, more contextual and more personal experience in the vehicle.

Q Do you think the entry of tech-giants like Apple & Google will disrupt (or even threaten) the connected car value chain?

A Tech-giants will definitely disrupt and threaten the connected car eco-system. This is good for the consumer since this will accelerate innovation and product launches, and adoption of new business models and technologies. In another study we commissioned last year, we saw a huge gap in the consumer needs versus industry offerings. Nearly half of the respondents, including two-thirds of the Millennials, want to access the same apps on their phones. Unless the automotive industry satisfies this need, the door will be open for technology players, such as Apple and Google, to capitalize on the opportunity.

Q It seems the automotive dealerships are missing from the connected car equation. What is going to be their role in this space?

A Automotive dealerships appear missing from the connected car equation due to the fear/perception that connected car adoption will impact the dealership sales and service model. While efficiency gained by over-the-air (OTA) updates could be perceived as an impact, the pro-active prognostics could drive more traffic to the dealerships since not all problems will be solved by OTA. There is a big opportunity for OEMs and their dealer networks to create differentiate by harnessing the power of vehicle data to provide a better ownership experience for their mutual customers.

Q Who do you think will have the ultimate ownership of connect-

ed car data? OEMs, 3rd parties or consumers?

A The consumer will always own the data. Having said that, if the OEM is transparent about using the consumer's data and the value it brings to the consumer, ownership should not be an issue.

Q How sustainable do you find the new business models enabled by connected cars?

A These new business models enabled by connectivity will be sustainable as strained city infrastructure struggle to support the population growth.

Q What would be the impact of government legislations and mandates in driving large scale adoption of telematics?

A OnStar offering its services for the past 18 years is testimony that government legislations do not impact telematics. Some of the privacy concerns could draw government attention, but technology companies, like Apple and Google, have shown how privacy concerns can be overcome and by letting the consumer decide what to share or what services to opt into. On a related front, mandates like EU eCall and Brazil's Stolen Vehicle Tracking have been a blessing for telematics adoption.

> *"Dealerships appear missing from the connected car equation due to the fear/perception that connected car adoption will impact their sales and service model.*

Q How will start-ups find their market share in an ecosystem full of giants?

A Though the connected car ecosystem has behemoths, there is still room for start-ups. The Auto industry needs an "innovation boost" and needs to behave and operate as a lean startup. Start-ups (not just from Silicon Valley) can provide that.

Telematics solution for Indian masses..a solution provider's perspective

Kamal Aggarwal
Co-Founder & CEO
SenSight Technologies

He is an IIT Delhi and IIM Ahmedabad graduate having extensive experience in semiconductor and high end software, R&D services sector. He was previously with SoftJin Technologies, Cadence Design Systems and Sasken Communication Technologies.

Telematics, as a solution, is still considered a niche market in India, especially when it comes to personal car owners or small businesses. However, with a steady increasing role of IoT (Internet of Things) in various aspects of life, a slow but very apparent shift in the way we use technology can be seen, creating opportunities for Connected Car solution.

Our view is that there are several value drivers that shall drive the demand of Telematics in the Indian market. However, from a solution provider's perspective there are certain Indian market specific challenges that need to be tackled to really take Telematics adoption to masses, which includes personal car owners, small businesses and small fleet operators. Broadly, the Telematics solution for such segments of customers needs to combine the various elements of technology including the Telematics Device, Cloud based server software and the User Interface in a seamless and user friendly manner so that the user perceives the solution as an easy to use consumer electronic device.

Value Drivers for Telematics In India

In our view, some of the value drivers and use cases that shall drive need for Telematics for masses in India are:

- **Tracking:** Using telematics to track the location of the car is the most basic use case and shall continue to remain the key driver. Since many personal car owners still employ drivers in India, a dedicated telematics hardware is required to know where the car is at all times and prevent unauthorized usage or route deviation.
- **Safety and Security:** Drivers on Indian roads tend to be more aggressive than defensive. With the help of telematics, driving behaviour can be analysed to know where exactly the driver may have faltered in terms of over-speeding, over-revving, hard-braking etc. Quantifying driving behaviour can help in gradually improving driving practices and keep the roads safer.
- **Theft prevention:** A Telematics hardware in the car at all times can double up as a supplementary anti-theft, helping reduce the risk of theft via ignition start/tow notifications on mobile.
- **Fuel Saving:** Indian public tends to

look at the fuel mileage of a car when they buy it more than any other feature. Being fuel conscious, telematics can help determine when and where the excess fuel has been consumed and correlate that to the driver's driving behaviour. Take, for example, a car owner has used up more fuel on the same trip than he did before. After reviewing his trip, he notices that he has over-sped and hard-braked at certain instances. This leads to loss of fuel every time the car engine is over-worked. Hence, telematics can go a long way in helping both individual and fleet owners reduce the amount of money spent on fuel.

Adoption Challenges and Potential Solutions

Here we discuss certain specific issues and challenges involved in adoption of Telematics in India and possible solutions to address those from a solution providers' perspective.

- **Dedicated Telematics Hardware:** Given the upfront cost involved in using dedicated telematics hardware, one needs to explore the option of using pure Smartphone based App approach to Telematics. While having the benefit of taking away the upfront cost, a pure Smartphone based App approach is dependent upon Driver being co-operative and having the Smartphone with the App running, charged and connected to Internet at all times. For commercial car owners and personal car owners with driver driven cars, this is a major limitation. In fact, in our discussion with several owners, ideally they would not like the drivers to be aware of the presence of Tracking device at all. Also, this approach cannot give detailed descriptions of the car's health and the driver's driving behaviour.

From taxi fleet owners perspective, while some of the App based taxi platforms use Smartphone based App approach to match demand with supply as well as track drivers during the time driver is using their App, it leaves out the owners of the fleet (many times different from the driver). A dedicated Telematics device in the car is hence needed that helps the owners easily monitor the usage, driving behaviour and efficiency of their cabs.

- **Cellular Data Connectivity:** Ideally, 3G network coverage in all parts of India would make the telematics experience more seamless, both from the point of view of data connectivity between the Telematics device to cloud server as well as between the Cloud Server and App. But the reality is that most parts of India are covered by 2G network more than 3G. So for the telematics hardware in a car has to work across the length and breadth of the country, relevant data should be sent to the cloud server and to user's phone even under 2G network coverage. Also, to account for GPRS blind zones or areas where coverage is still spotty, local storage of data in the device and upload upon reconnection of the coverage is a must.

- **Mobile First:** The use of an App on the smartphone rather than a PC based monitoring platform increasingly makes sense in the Indian market as consumers tend to have more smartphones than personal computers. For majority of personal car owners and small businesses, they need to be able to get all the information on their mobile devices with appropriate push notifications. Here a native App approach targetting key platforms like Android/iOS or even a light weight, responsive web app (that works fast enough on a mobile browser) should be the UI of choice.

- **Deriving insights from data:** Irrespective of the class of users, be it individual car owners or commercial car owners, the key is to continuously add value to the user by deriving meaningful information and insights from the deluge of raw data generated by the Telematics devices. Analyzed and actionable driving behaviour can go a long way in helping the user become a smarter and safer driver. Predictive maintenance suggestions can help in preventing sudden and costly breakdowns. Ideally analysis should be mindful of the user context. For example, speed alerts should be different within city limits than it should be for highway driving. Taking the natural limit of over-speeding within city limits to about 60kph, long distance driving exceeds this limit at regular intervals. Hence, the app should be smart enough in determining when and where the user is to be notified with relevant data.

- **Cost:** One of the biggest challenges telematics faces in the Indian market is controlling costs. From a solution provider perspective, there is need to explore multiple business models that could be attractive to various segments of users. The common model is the one-off payment where you can pay for the hardware at the beginning and then pay for the on-going subscriptions thereafter. This has the upfront device cost hurdle that can leave out a large segment of potential users who may not be convinced of the solution benefits at the outset. As a solution provider, one needs to explore alternative models such as device rental model where the payment for the hardware can be done in increments so long as the customer is satisfied with the product.

Irrespective of the business model, Solution provider needs to work a lot oncustomer education on using Telematics and multi-channel pre-sales/post-sales support (via phone call, chat or Email) to help the customers derive the promised benefits.

Infotainment and connect begin to gain traction in India

Vivek Beriwal
Senior Analyst
IHS Automotive

There is certainly a palpable excitement around infotainment and connectivity in the Indian automotive industry with an unmistakable presence of touchscreen audio or even audio, video, navigation (AVN) systems in nearly all newly introduced vehicles. While most infotainment systems offer basic phone pairing features like SMS readouts and phonebook viewing as well as GPS-based navigation, some also offer smartphone-integration platforms like MirrorLink and CarPlay.

Analysis of the main production models showcased specifically for the local market, from an infotainment/connectivity perspective:

In-vehicle infotainment begins to spread...

Maruti Suzuki, the undisputed leader of India's passenger vehicle market (with a 47% share), and Tata Motors, the leader in the commercial vehicle market, are the two most proactive players when it comes to introducing infotainment technologies to their cars. If the Maruti Suzuki Baleno introduced CarPlay to India in 2015, another Maruti Suzuki vehicle, the Ciaz sedan, marked the debut of MirrorLink, back in 2014. Maruti Suzuki has been liberal in expanding the rollout of its SmartPlay infotainment technology, which it co-developed with Bosch. Tata Motors, which has long been struggling in India's passenger car market, launched in early 2015 the Bolt hatchback, arguably is the first vehicle in India's entry-level car market to offer factory-fitted infotainment in any form. The Bolt, obviously, proved to be a precursor to the new breed of Tata vehicles with all of them incorporating iterations of its infotainment system developed by Harman.

Mahindra & Mahindra, meanwhile, has already become the first Indian OEM to join the Open Automotive Alliance (OAA), a global alliance of automakers committed to bring the Android platform to cars. It plans to offer Android Auto in flagship models such as the XUV 500 and Scorpio before extending the technology to all future platforms.

...but is it influencing buying decision yet?

The trend certainly strengthens the belief that Indian consumers do not mind a touchscreen-based entertainment system in their otherwise bland car dashboards but are these influencing buying decisions? To answer this, we decided to analyze sales of the Maruti Suzuki Baleno, which marked the debut of Apple CarPlay in India. According to Mohit Prabhakar, manager of a Maruti Suzuki NEXA outlet in New Delhi's Dwarka area, over 70% of Baleno bookings since the car's launch last October have been for the Delta variant, the one without touchscreen infotainment. However, interestingly, the remaining 30% of the bookings were indeed for the top Alpha

Figure 1

OEM	Nameplate	Touchscreen Infotainment	Navigation	Smartphone Integration	In-built Apps
Muruti Suzuki	Vitara Brezza	✓	✓	Apple CarPlay	×
	Ignis	✓	✓	×	×
Tata Motors	Zica	✓	✓	×	✓
	Hexa	✓	✓	×	✓
	Nexon	✓	✓	×	✓
	Kite 5	✓	✓	×	✓
Volkswagen	Ameo	✓	✓	MirrorLink	×
	Polo GTI	-	-	×	×
Toyota	Innova Crysta	✓	✓	×	×
Honda	BR-V	✓	✓	×	×
Fiat	Linea 125s	✓	✓	×	×

variant, which offers touchscreen navigation and Siri voice control among other features over the Delta trim. It is difficult to perceive what persuaded buyers to go for the Alpha trim – the touchscreen infotainment with navigation and CarPlay, or simply other attractions like 16'' alloy wheels, LED daytime running lights, a decent spattering of chrome, or something else.

Toyota Connect launch

Recently Toyota launched its cloud-based telematics services for India under the brand name of Toyota Connect. Toyota Connect is supported by a new dedicated premium call centre and also integrated with Toyota's dealer network and service providers. Toyota car owners will be able to access Toyota Connect through a smartphone application. Services will commence from mid-2016. Toyota Connect offers a host of services like 24x7 Assisted Navigation and Live Traffic Information, 24x7 GPS Location based Road Side Assistance, Online Maintenance Appointment Booking, Live Check of Service Progress, e-Payment, etc.

Bosch's iTraMS

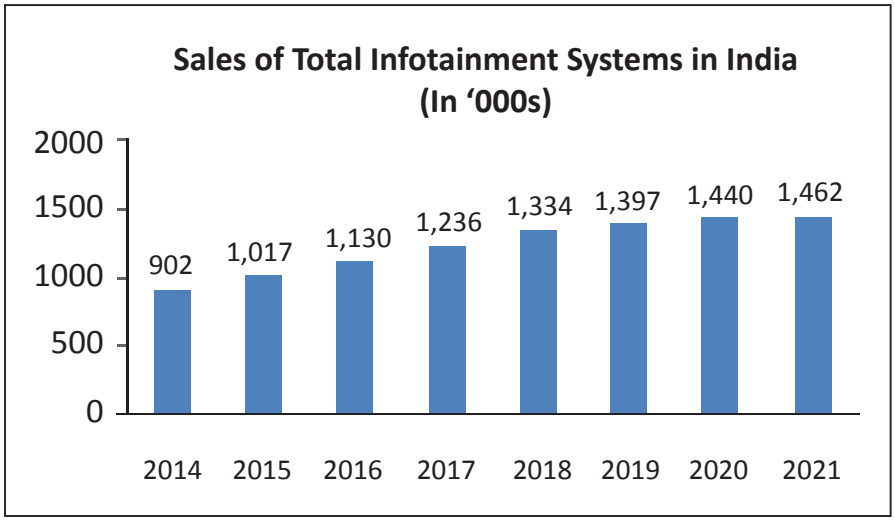
Bosch presented what it calls the Intelligent Transport Management System (iTraMS) at the Bosch Technology Exposition. It is a comprehensive connectivity platform solution that can reduce a vehicle's fuel consumption, foresee when maintenance is needed, and display everything on the car owner's smartphone. Its features include tracking of vehicle location, condition monitoring, and performance analysis. The flexible solution works in passenger cars, commercial vehicles, off-highway vehicles and is available for newly produced cars as well as a retrofit solution. The key benefits of this platform also include fleet management, essential and emergency services, off-road applications, and intelligent transport solutions as part of smart-city solutions.

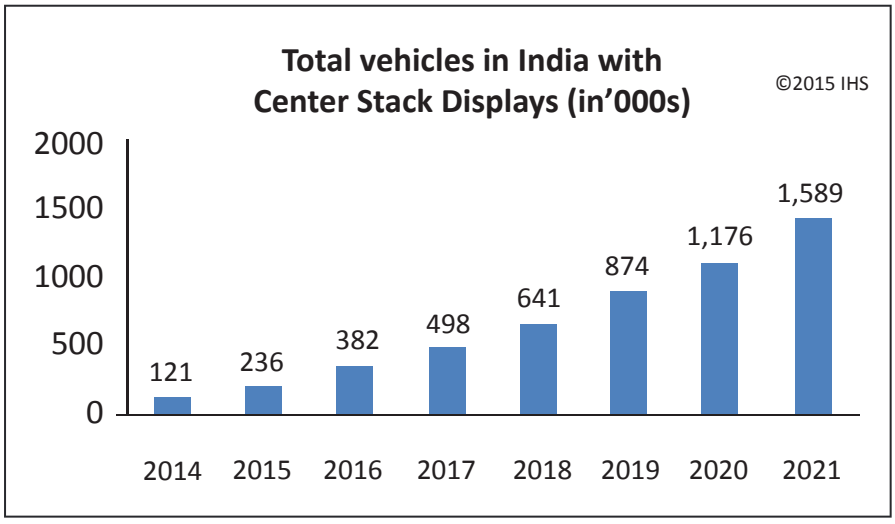
IHS Automotive's Perspective

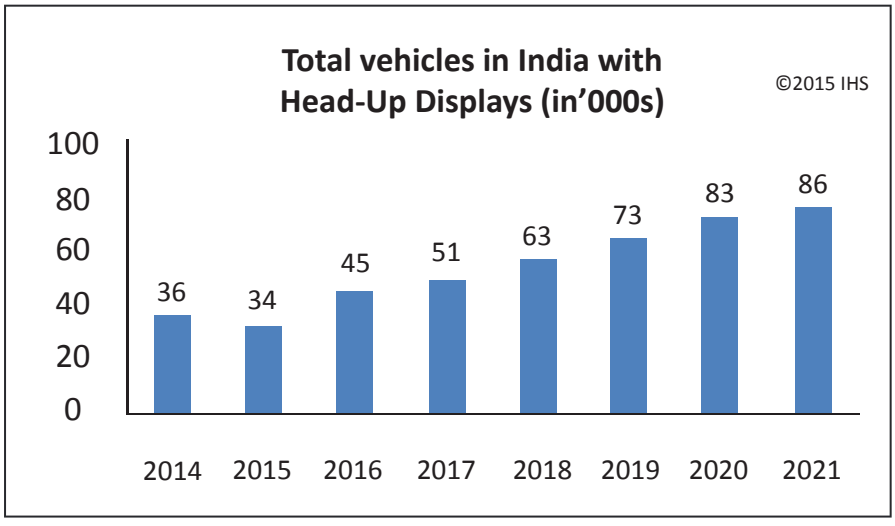
IHS Automotive has a fairly optimistic view on spread of automotive interface technologies in the Indian market until 2021, with the number of vehicles featuring any form of center stack display expected to breach the million-unit mark in 2020. Sales of total infotainment systems in India are expected to grow at a CAGR of 7.1%, from 2014 to 2021.

Driver assistance/safety gaining relevance

While active safety and advanced driver-assistance systems (ADAS) have largely been confined to high-end cars in India, automakers are slowly but surely making basic traction and stability control systems like Anti-lock Braking System (ABS) and Electronic Brake force Distribution (EBD) more mainstream. Most automakers looked committed to bring at least the basic passive safety systems to the buyer, like passenger and/or co-passenger airbags. While these basic safety features were not available to car buyers not so long ago, they have now become standard or optional fitment in







most newly introduced cars. Two particular technologies are being seen - Cruise Control and Hill-Start Assist – both having potentially widespread applications in India. The Maruti-Suzuki Vitara Brezza and the Volkswagen Ameo are the first industry products in the subcompact (sub-four-meter) vehicle segment to offer Cruise Control. It is only a matter of time when the mass market vehicles in India will have their first active safety or driver-assistance systems. Some ADAS technologies have high relevance in the traffic scenario in India, which has the dubious distinction of having the maximum number of annual road fatalities in the world. Although infrastructural bottlen ecks will prevent some technologies to gain traction, some like Automatic High Beam/Adaptive Head lamps, Blind Spot Monitor/Lane Change Assist and Rear Cross-Traffic Alertare fairly relevant in the Indian context.

Conclusion

One cannot deny that the Indian automotive market is in relatively early stages of adoption of in-car technologies, and its proliferating faster than predicted. The automotive industry in India is witnessing a new wave of technological revolution, which is boosting the idea of connected cars. As the car buyers get ever-more addicted to their smartphones, spread of internet accessibilitybecomes imminent to bring an array of real-time services to the car. Consumer awareness about connectivity in cars is rising quickly and the current government is focused on promoting digitization – both potentially crucial factors in the spread of in-car infotainment and connectivity technologies. India's connected car ecosystem, however, needs more time to evolve into a robust convergence of players, including automotive OEMs, telecom operators, solution providers, software vendors and service industries such as insurance.

Connected

Q How do you see the market of Connected Cars in India as compared to relatively developed markets ?

A Are the North America, EU market more developed or simply larger? I think when it comes to IoT and connected cars, the playing field is pretty even. We are talking about convenience that every car owner will find attractive irrespective of the geography. While America and EU are large markets, Asia is not small, I would say that's a sizable population.

Q Is there a sustainable business model for connected cars in India?

A We at CarIQ believe that connected cars is an ecosystem play. It cannot be seen in isolation. Someone like CarIQ can build a platform that can connect OEM, owners, and utility providers in a seamless and meaningful way. It is a Win-Win situation for everyone. OEM's are genuinely interested in promoting communications with their customers and what better way than using a connected car platform.

Q Do you think the 'aftermarket' telematics devices can serve as an interim solution?

A Most cars do not have embedded telematics device and an 'aftermarket' device is the way to go. For OEM's to come up with a pre-market solution, a clear ROI will have to be set and established. Aftermarket devices and solutions can help bring in that clarity.

Q What will be the role of tech start-ups in the connected vehicle value chain?

A Tech startups are going to be super vital in this value chain. While it has been established that each ecosystem partner stands to gain in the value chain, the primary leader for establishing this is unclear. A tech startup can play that valuable role of the links to form this value chain. Big data, storage

Car an Ecosystem Play

and security will be primary concerns. Tech startups are in the best position to help build these solutions.

Q Drivers are not comfortable being "tracked". How they can be educated about the benefits of connected cars?

A We believe that drivers are uncomfortable being 'monitored'. CarIQ allows the end car owner to stop location tracking. I think only about 25% of the value added benefits need location. This location can be picked up 'only' during usage of the feature thus completely side stepping monitoring.

Q Experts have raised privacy concerns with the OBD-II dongles. Do you think it will deter customers?

A Yes, anyone who will fuel sci-fi scenarios will deter the adoption of such systems. But then aren't all technologies required to pass the deterrents test? The car ECU system is intended for specific data to help car driving become safer. There are many ways to ensure privacy and address security systems. Are systems vulnerable? Yes but then isn't online banking vulnerable too. The sheer advantage and value that connected cars bring, will out weigh the associated risks. I think we are still away from scenarios where someone can remotely start driving a car and create havoc. Intrusion detection system can be built and any technology can be fire walled.

Q How do you think telematics and connectivity can change the OEM-dealer-driver equation?

A Absolutely. I think that OEM-Dealer-Driver relationship can be based on a more open and truthful exchange of data. OEM's can build thought leadership and build lifetime loyalists by understanding what is needed and build custom solutions targetted towards it.

Q What potential does connected car hold in terms of attracting tech enthusiasts and entrepreneurs?

A We believe in it. A team of 26 has taken salary hits, given up lucrative corporate jobs to pursue this dream of building India's first connected car platform. We have around 10 Million supported cars and adding another 3 Million every year. This is India alone, add the Asia market and it becomes seriously big.

Q What CarIQ is doing in the motor insurance sector?

A CarIQ can add value to enterprises and specifically insurance. Insurance companies are looking up to start offering UBI in India. However the connected car market has moved ahead and insurance companies will have to offer customers that will give them value every month, every day. Insurance buyers won't wait for a year for rewards. In this age of immediate gratification, where are the rewards? CarIQ helps address this by making driving an engaging experience and connect the car user to avenues beyond insurance.

> *"Tech startups are going to be super vital in connected car value chain. While it has been established that each ecosystem partner stands to gain in the value chain, the primary leader for establishing this is unclear.*

Q How has been the response of your OBD-II dongle?

A It has been encouraging. We have a steady growth of users on our platform. Customers are becoming aware and want to understand and learn.

Q How do you think the connected car market in India will shape in days to come?

A That's a tough one. Connected car in my opinion is just the technology. A generic name for getting, interpreting, storing, and making car access available on the Internet. The play will be in the services and 'usage' of the connected car platform that will matter. Will workshops use them to connect to customers? Will insurance companies use them to offer better value? There are hundreds of pain areas that can be addressed through such technology. Everyone will need it and adopt it. Think of it like an email. We use it for communicating. Purposes are innumerable.

Sagar Apte
Co Founder & CEO
CarIQ

He started CarIQ in 2012 to build connected car platform. Sagar has over 16 years of experience in product management, sales, support, operations and marketing.

Q What can the industry expect from CarIQ in the near foreseeable future?

A CarIQ believes connected cars are the future and true value can be derived only through adoption of this platform by various service providers. You will soon see multiple car service providers on our platform offering services to end customers. We see this world pretty much connected and would not like to see cars left out of it.

Connnected Car - A New Era of Automotive Industry

The car is well on its way to become the most sophisticated mobile device in the Internet of Things (IoT). Linked to the cloud by way of wireless technologies, smart chips, onboard computers and mobile apps, connected vehicles are driving new business models and disrupting old ones. By 2020, there will be a quarter billion connected vehicles on the road, enabling new in-vehicle services and automated driving capabilities, according to Gartner, Inc.

Over the coming years, social and behavioral changes will continue to redefine the basis on which people decide to buy a car, with vehicle technology becoming relatively less important, and in-car digital services—and the convenience of the selection process— playing a growing role in consumers' choice of vehicle. Accenture's connected vehicle study shows technology options trump vehicle performance. It is found that majority of buyers are no longer prepared to even consider a new vehicle without Internet access, and prioritize connectivity over features such as engine power and fuel efficiency. Detailed findings include:

→ **65%** would like to use an in-car feature that enabled them to read and dictate emails while driving

→ **50%** of drivers are already using connected traffic information—and only 6 percent are not interested in it

→ **70%** are interested for in-car e-learning or educational services

→ **86%** are already using in-car search and point-of-interest (PoI) services, or are interested in doing so

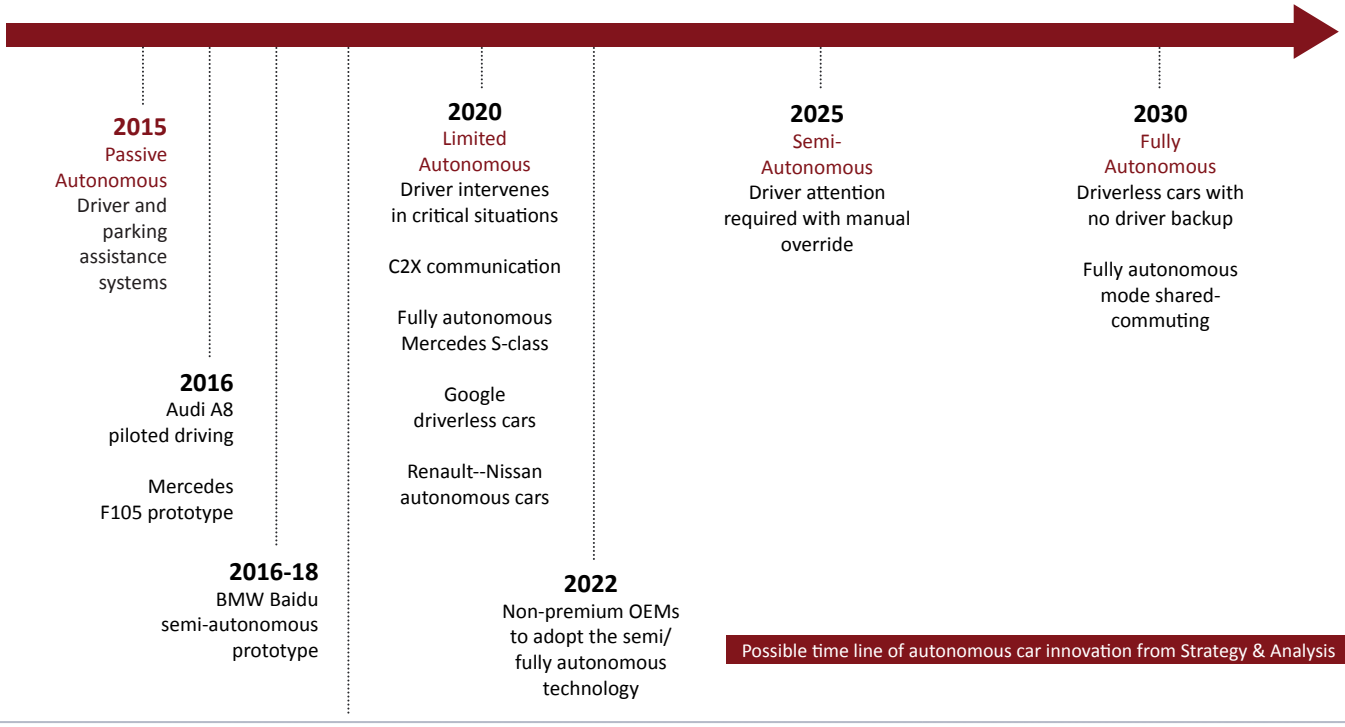
→ **95%** are using or would like to use a recovery tracker for stolen vehicles

As connected vehicle capabilities continue to evolve and roll out, the connected car developments continue to center on seven functional areas:

1. Telematics: Vehicle telematics encompass a wide range of computing and communication services located within a car. They focus on safety, security and convenience, and include features as varied as stolen vehicle recovery, emergency calls, concierge services, remote door unlocking and remote diagnostics. Most in-car telematics solutions are managed by service providers through call centers.

2. Advanced Driver Assistance Systems (ADAS): These services focus primarily on accident avoidance and driving efficiency, and do not always require internet connectivity. However, more recent ADAS innovations are increasingly leveraging cloud connectivity to augment the information gathered from embedded onboard systems. Falling prices are boosting adoption, and future services will focus on autonomous driving capabilities.

3. Mobility services: These solutions collect vehicle-specific data through various technologies—positioning technology, wireless communication modules, vehicle sensors and mobile device integration—and then leverage it by linking it to an internet-based application via mobile connectivity. Mobile services include vehicle access as a service, and usage and mileage-based services. The



Possible time line of autonomous car innovation from Strategy & Analysis

most current mobility services are operated by non-automotive vendors, but this may change as OEMs extend their offerings.

4. Infotainment: This category includes information services— like navigation, traffic services, weather, mobile apps, email—and also entertainment. Infotainment features can be offered either via technology embedded in the vehicle or via device-to-vehicle integration, using consumers' separate mobile devices as a hub for accessing internet based content. These offerings focus strongly on ease of use and safety-related services. To offer infotainment services, OEMs generally collaborate with non-automotive vendors.

5. Well-being: Optimization of the driver's health and competence. The growing group of affluent older drivers will pay for technologies that monitor their well-being while driving. There is a significant potential to prevent accidents and save lives with systems, which detect conditions that impair driving abilities. Examples include electronic alerts that detect or mitigate fatigue, and other forms of individual assistance.

6. Home integration: Links to homes offices, and other buildings. As the Internet of Things connects more household appliances and systems to the Web, consumers are embracing home automation, which in turn will drive demand for integration of these systems with the car. Examples include the integration of the automobile into home alarms or energy monitoring systems.

7. Autonomous driving: Operation of the vehicle without a human driver at the controls, existing only on a partial basis. Examples include self-parking cars, motorway assistance, and the transportation of goods by trucks on well-delineated routes.

Autonomous driving is the fastest-growing connected car feature. Many technologies are developing faster than expected. There is a strong demand in China. Automakers and tech firms are researching Self-Driving Cars. It is a great oppotunity for auto makers and also a long journey for fully automation since it faces the challenges of unclear legal and regulatory frameworks and liability issues.

Today, as modern automobiles have evolved to moving machines bristling with sensors, software, processors and networks, future predictions are all about technology, cars will be much more personalized in 2016, thanks to algorithms and context-aware software. But today, as modern automobiles have evolved to moving machines bristling with sensors, software, processors and networks, future predictions are all about technology and cars will be much more personalized in 2016, thanks to algorithms and context-aware software.

8. The Birth of Algorithm-based Everything: Intelligent technology is the driver of personalization, but this is just one aspect of how smart software will move into the vehicle world. Year 2016 will see the start of algorithm-driven businesses in which companies will focus on offering flexibility and personalization in all aspects of their services.

In automotive insurance, as an example, machine learning algorithms will predict insurance premium based on an individual's driving abilities and behavior as well as the driving conditions for the area.

9. Ethernet Reaches The Car: Having a single network — the Ethernet — in the car will be a big disruptor. To begin with, it will be applied in areas like infotainment audio and video, highly impacting the content available in the car. But the real significance is down the road.

> ***"Social and behavioral changes will redefine the basis for buying car, with vehicle technology becoming relatively less important and in-car digital services—playing a growing role.***

Imagine the benefits of moving from one megabit to gigabits of network speed in the vehicle. Cars need speed to handle capabilities like automatic braking in case of hazards and other features, and looking further, this is a must-have technology for the semi-autonomous and autonomous vehicles that will collect and process data from a large array of radars, cameras and other sensors.

10. Over The Air Updates : In 2016, not only will car receive software updates Over The Air (OTA) like mobile phone in order to e.g. improve fuel efficiency through the latest and greatest releases, it will also be able to share information about user patterns and driving. This data will start going back to the cloud and give car manufacturers and app makers a world of information and the drivers a superior driving and owning experience.

Dinesh Patkar
Director - India
Quectel Wireless Solution

He has 24 years in Indian Semiconductor Industry. He has been instrumental in setting up India operation for Quectel wireless solutions in 2012.

Connected cars are the leading edge of disruptive technology that changing not only the automobile, but the nature of the automotive industry. As connectivity paves the way for autonomous driving, digital content and services have become the industry's primary source of growth. These services not only create new opportunities for auto makers, but also for technology companies such as Google and Apple. To succeed, auto makers must not only shift more investments to digital content, but also change their business models, build new capabilities, and drive cultural change through their organizations. More fundamentally, OEMs oriented to their traditional role as product manufacturers must embrace a new identity as service providers. Those that can make this shift — while providing the security assurances consumers demand — will flourish in the digital era.

M2M/ IoT in Automotive Sector

As per projection by GSMA (GSM Association) and Machina Research (World's leading advisor on M2M, Internet of Things and Big Data), there may be around 24 billion connected devices in the world around 2020, with a business impact of around US $ 4.3 trillion. Later on CISCO / Ericsson / ITU projected this to be around 50 billion. Such projections entice the industry to explore and tap a wide range of opportunities that the M2M (Machine to Machine) communication / Internet of Things (IoT) concept offers, enabling novel business cases, enhanced workflow, efficiency and improved quality of life. These devices may be in various verticals such as Power, Health care, Automotive, Safety & Surveillance, Intelligent buildings, Smart Water distribution, Waste management, Smart homes, Environment monitoring and Pollution control etc. These verticals will work as a pillar in the smart cities. India may have around 2.6 billion connected devices by 2020. Power sector and Automotive Sector will have major deployment of M2M devices.

M2M communication / IoT will make the verticals smart by providing the data in real time and will enable to take the decision for planning, operation and other related activities.

Automotive sector is the back bone of any country. In India due to rapid rise in number of vehicles with respect to existing infrastructure and slow rate of development in infrastructure sector recent studies show that India faces:

An average Indian spends about 90 minutes a day travelling in major cities, with an average speed of 10km/hr on some major roads,

In India, around 5 lakhs road accidents happen, causing a loss of around $20 billion, with 6 lakhs people injured and 1.5 lakhs killed,

A loss of approx. Rs. 600bn ($10.8bn) a year due to congestion, slow speed of freight and waiting time at toll plazas,

Every year, nearly 36,000 vehicles are stolen, which amount to Rs. 115 crore with only about 14,500 getting traced, often in un-roadworthy conditions, with many components missing,

The rapidly increasing vehicle population in India puts a heavy demand on traffic management in metropolitan cities and other towns. Intelligent Transportation System is an established route to address this and minimize traffic problems.

Traffic jams cost huge loss in terms of time, money & pollution. More lanes is not the long term solution. Use of M2M / IoT technology along with ICT infrastructure can help / solve the jams occurring to a large extent. With limitation for growth infrastructure there is a strong need to depend on technology (IoT/M2M) to address challenges, currently faced by the industry. M2M enabled transportation system include telematics and all types of communications in vehicles, between vehicle and citizens/Authorities (car to application), between vehicles (e.g. car-to-car), and between vehicles and fixed locations (e.g. car-to-infrastructure).

M2M Communication can leverage sensor ecosystem, communication modules, network channel, real-time processing, big data and cloud computing to optimize emergency services and save lives, reduce congestion on roads and generate revenue, provide road safety to commuters and to monitor and regulate driving behaviour, manage traffic by optimizing route.

Furthermore, M2M adoption results in enhancing convenience to use public transport, connecting para transit and mass transit modes, monitoring and managing personal car, enabling vehicle manufacturers to provide VAS to consumers, creating Vehicle to Vehicle and Vehicle to Infrastructure communication systems, monitoring and reducing traffic violations, enabling parking assistance and road tolling.

Enabling technologies for M2M

Sensor networks, Radio frequency Identification (RFID), Global Positioning System (GPS), Location-Based Services (LBS), etc.

- WLAN (IEEE 802.11), Bluetooth Low Energy (BLE), Near Field communication (NFC), Dedicated Short range communication (DSRC) for short range communication.
- Cellular 2G/ 3G/ LTE / Satellite for Long range communication depending upon the applications.
- Wire line BB / Lease line to connect infrastructure
- Low Power RF for LAN / FAN such as 6LowPAN, Zigbee, Zwave etc and Low power RF for WAN: LoRa, Sigfox.

→ **Embedded SIM**: The normal SIM card is not suitable for harsh conditions of vehicles like vibrations, temperature, and humidity. GSMA has created specifications for embedded M2M SIM, with Over-the-Air (OTA) provisioning. Temperature variation range is from -40 degree to +125 degree Celsius. Embedded SIM technology offers big opportunities for auto manufacturers as the life cycle of an eSIM is, around 10-15 years. International standards for eSIM have evolved. Embedded SIM will be quite useful for vehicles.

- ICT infrastructure, public and private clouds for storing and sharing data, Big data analytics.
- Static IP for the devices / Gateways to be connected directly to PSTN / PLMN switches:- IPv4 addresses are going to exhaust. Standardization and adoption of IPv6 in telecom and ICT organizations will provide an opportunity of having billions of devices which can be IP enabled and seamlessly addressable through mobile or wired broadband connections.
- RFID based Electronic Toll Collection devices have been deployed in India on Delhi- Mumbai National Highway, in the sub Ghz band 865 MHz – 867 MHz band.
- DSRC (Dedicated Short Range Communication):- This technology is based on IEEE 802.11p WLAN standards, called as Wireless Access in Vehicular Environment (WAVE). It is working in the frequency range 5.850 -5.925 GHz. FCC has allocated 75 MHz spectrum in the 5.9 GHz band and European Telecom-

munications Standards Institute (ETSI) has identified 30 MHz spectrum in the 5.9 GHz band for ITS. It also supports low latency, Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication.

Main uses of V2V and V2I communication services are to transmit information for:

- Road side beacons
- Traffic signals
- Toll collections
- Petrol pumps and charging centers (for electric vehicles)
- Digital signage
- Safety applications like red light
- violation, overloading or crossing speed limit
- eCall (911 in USA and 112 in Europe)
- Maintenance
- Navigation

Its main uses are Vehicle Safety service, Commercial transaction via cars, Toll collection, Traffic management etc.

This technology is being used in USA, Europe, Japan, Korea and Singapore etc.

→ **LTE Technology**: 3GPP release 12 which talks about LTE direct / LTE MTC (machine type communication)/ LTE D2D (device to device) and further improvements have been proposed in 3GPP Rel 13 and 14.

5G will bring: Ultra-high reliability, ultra-low latency, high security network. Combination of ultra-low latency and high reliability is not achievable with current wireless technologies. However 5G will be the ultimate solution.

The standards for 5G will be frozen in 2020 and may take further 5 years for implementation.

In future there may be more technological development and LTE may work in multiple bands to communicate with DSRC equipment.

High end vehicles are using a no. of sensors for different applications such as motion sensors, weather sensors, parking sensors, tyre pressure sensor, road status, temperature sensors, fuel sensors, temperature sensors and door sensors etc.

→ **Geographic Information System (GIS):** GIS plays an important role in creating maps, model, query, and analyse large quantities of data within a single database according to their location. It is a powerful tool to create maps, integrate information, visualize scenarios, present powerful ideas, and develop effective solutions.

→ **Various use cases in Automotive sector:** There may be a large no. of use cases depending upon the local requirements. Important use cases are Vehicle tracking, e-call (911 in USA and 112 in Europe), V2V and V2I applications, Traffic control, Navigation, Infotainment, Fleet management, Asset tracking, Manufacturing and logistics, Intelligent transport System, Waste management, Water distribution, Smart parking etc.

A no. of use cases have been described in detail in the Technical Report on M2M enablement in Intelligent Transport System, (www.tec.gov.in/technical-reports/).

→ **Government initiative**: Government of India has already mandated to install GPS/GRPS devices with video camera and panic button in all public transport with cellular connectivity to police stations for woman safety in public transports.

→ **KYC:** KYC process should be linked to the RTO formalities, which will ensure that the ownership transfer is in Sync both for vehicle and connection.

→ **Aadhar based Driver Identification:** Aadhar based Driver Identification system should be implemented.

→ **Challenges:** Due to lack of standardization and interoperable technologies, Industries are working in silos and on proprietary solutions. There should be interoperability at device, network and application levels.

There is need to create standards for sharing of data being generated by various ITS initiatives. The authorities can share this data and this can be available to multiple users/applications and also for planning and optimizing the transport infrastructure. A framework needs to be created for developers to use this data for various applications like congestion maps, accident hotspots etc.

Sushil Kumar
Dy. Director General (IoT)
Telecommunication Engineering Center
Department of Telecommunications

Technologies for sustainability / long life batteries is required for sensors. Sensors operates on DC batteries of very small size. Most of the sensors are unmanned and can not be charged using electricity. A lot of research is being done for charging the batteries using solar cells, vibration and also to bring the sensors in sleep mode when not transmitting the data.

There is a need to generate indigenous IPR for creation of standards and further contribution in global SDOs.

Slow deployment of IPv6.

→ **Standardization at Global level**: ETSI(Europe), TTC, ARIB (Japan), ATIS, TIA (USA), TTA (Korea) CCSA (China) had come together and created a partnership project OneM2M, to avoid creation of competing M2M standards. They are working to create standards for the common service layer. From India, TSDSI is the member of OneM2M.

3GPP, WHO, Continua, ISO, IEEE, W3C, cen etc are also contributing in OneM2M.

At present there are around 250 members in OneM2M.

OneM2M has released first set of specifications in Jan 2015.

International Telecommunication Union (ITU) : ITU is having around 190 member states and 700 industries as members. Any standard approved by ITU is accepted globally. ITU has created Study Group-20 to work on IoT and its applications including Smart Cities and communities in June 2015. First meeting was held in October 2015 in Geneva and the IInd meeting in Singapore in Jan 2016.

Standardization work in Telecommunication Engineering Center (TEC): TEC had created multi stake holder working groups in various verticals of M2M/ IoT domain such as Power, Automotive, Health, Safety & Surveillance and M2M Gateway & Architecture. First set of Technical Reports were released in May 2015 by Hon'ble MoC&IT and then in Nov 2015. These are available on www.tec.gov.in/technical-reports/

Technical report on M2M Enablement in Intelligent Transport System covers the Indian scenario, challenges, use cases, available standards and further course of action. Technical Report on V2V/ V2I Radio Spectrum and Embedded SIM has given detail of related technologies in V2V/ V2I communication and the spectrum requirement. Embedded SIM is the innovation in SIM technology and it is based on GSMA guidelines.

These technical reports may be quite useful in preparing eco system for the Smart Cities.

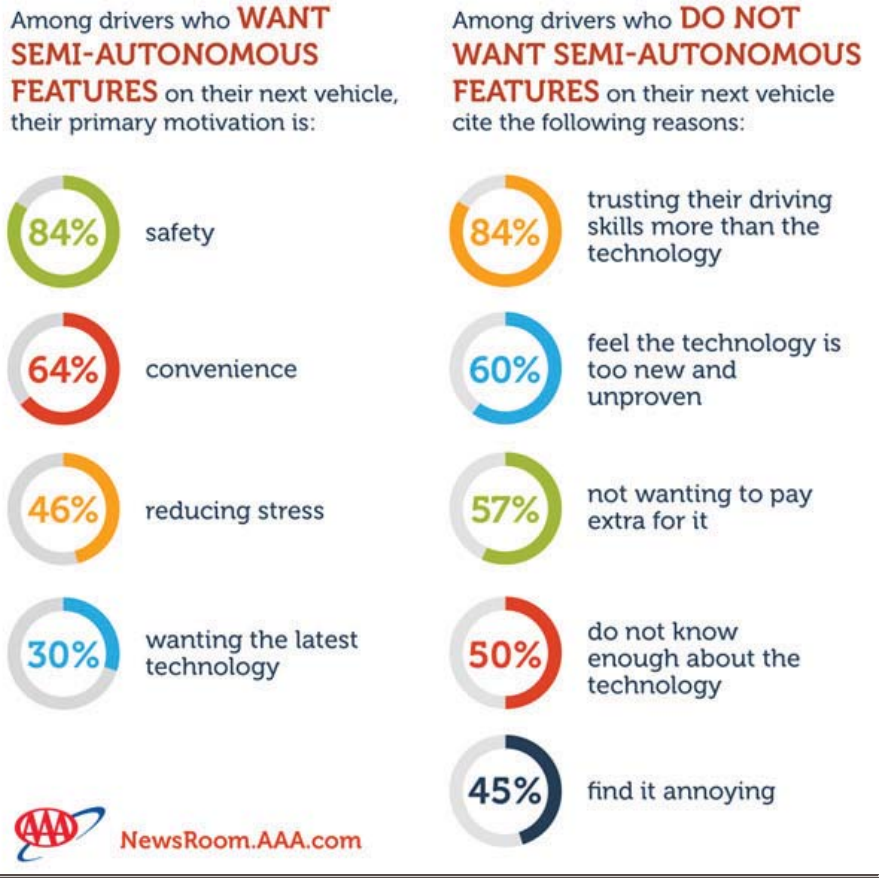
Conclusion: Some applications in Vehicle tracking are being used from the last so many years but the standardization of data semantics is required. All stakeholders should join the larger ecosystem, and work towards single national objective. This will ensure wide acceptability of the technology and economies of scale.

ITS technologies for India cannot be entirely modelled on the existing successful ITS deployment of other countries as the ecosystem in India is different. Therefore further R&D activities work in this direction is required.

75% Americans are "afraid" of getting driven by autonomous cars: AAA

Three out of four U.S. drivers report feeling "afraid" to ride in a self-driving car, according to a new survey from AAA. Despite this significant fear, AAA also found that drivers who own vehicles equipped with semi-autonomous features are, on average, 75 percent more likely to trust the technology than those that do not own it, suggesting that gradual experience with these advanced features can ease consumer fears.

While only one-in-five Americans say they would trust an autonomous vehicle to drive itself, AAA's survey revealed that consumer demand for semi-autonomous vehicle technology is high. Nearly two-thirds (61 percent) of American drivers report pitching for at least one of the following technologies on their next vehicle: automatic emergency braking, adaptive cruise control, self-parking technology or lane-keeping assist.

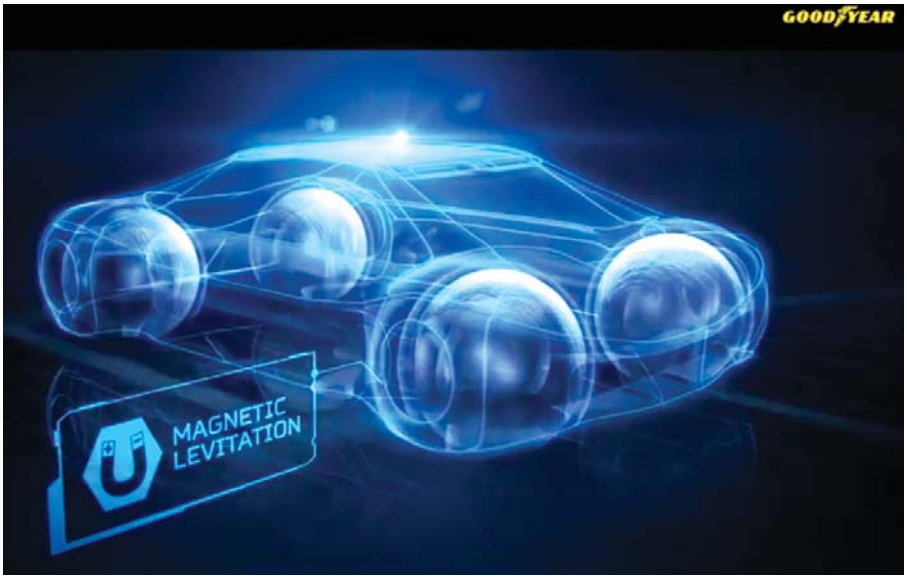


UN adopts new regulation on Quiet Road Transport Vehicles (QRTV)

A new regulation adopted by the UN-ECE World Forum for Harmonization of Vehicle Regulations (WP.29) requires acoustic warning devices on hybrid and electric cars. It aims to minimize the risk posed by silent cars, without creating a disturbing level of traffic noise. According to the new Regulation, quiet cars should be equipped with an Acoustic Vehicle Alerting System (AVAS) to create artificial noise in the speed range from 0 to 20 km/h. Above 20 km/h the noise of tires on the road and the wind noise are audible even from a fully electric car thereby negating the need for a warning system.

The Regulation introduces the minimum AVAS sound levels, spectrum and frequency shift, depending on the vehicle's speed forward or backwards speed. It also specifies the maximum overall sound limit

Magnetically levitated "Eagle-360" tire for self-driving vehicles



The unique shape of the Goodyear Eagle-360 could contribute to safety and maneuverability to match the demands of autonomous mobility. First, sensors inside the Eagle-360 concept tire register the road conditions, including weather and road surface conditions, and communicate this information to the car as well as to other vehicles to enhance safety. Secondly, leveraging Goodyear's tread wear and pressure monitoring technology, sensors in the Eagle-360 register and regulate the wear of the tire to extend mileage.

The spherical shape of the tire is key to delivering maneuverability. The multi-orientation tires move in all directions, contributing to passenger safety. To connect with the body of the car, the Goodyear Eagle-360 concept tire relies on magnetic levitation. The tire is suspended from the car by magnetic fields, similar to magnetic levitation trains, the spherical shape of the Goodyear Eagle-360 provides a smooth ride by creating a fluid, lateral movement. This helps the car to overtake an obstacle without changing its driving direction. Finally, because 360 degree turns are possible with this tire, it could tackle anticipated parking constrictions of the future, as less space will be needed for cars fitted with spherical tires to pull into parking spots. Assuming public parking areas play the same role, this could significantly increase the capacity of public parking areas without increasing their size. The tire also absorbs water on the road and ejects water from the tire footprint through centrifugal force to reduce the risk of aquaplaning.

Samsung Connect Auto

Samsung Connect Auto (the OBD-II dongle) plugs directly into the OBD II port it uses real-time alerts to help users improve their driving behavior, including increased fuel efficiency, while offering a Wi-Fi connection to keep passengers online while on-the-go.

HARMAN eye and pupils tracking for driver monitoring system

It measures increase in pupil dilation as an indication of a driver's mental workload. Eye and pupil tracking system recognizes high cognitive load and mental multitasking in the driver's seat, and signals the car's other safety systems to adapt to the driver's state. Driver's pupil dilation is analysed through proprietary algorithm which monitors the pupil reflex using filtering and signal processing. The filter isolates and identifies responses triggered by cognitive load. The calculated outputs are used to adjust user interfaces, like placing mobile devices in do-not-disturb mode or adjusting ADAS system intervention thresholds to minimize physical and mental distraction to the driver.

BMW Vision Next 100- the futuristic connected car

BMW VISION NEXT 100 Concept designed to anticipate and respond to people's future mobility needs.
Companion: The intelligent digital partner connects driver and car.
It plays an important role in driver-vehicle communications when the car transitions from Boost to Ease mode. While the driver concentrates on the road in Boost mode, the Companion remains flat in the dashboard. But when the BMW VISION NEXT 100 takes control in Ease, it rises up to create an interface with the windscreen. A signal light tells the driver that the car is ready for fully autonomous driving. For other road users, the Companion has a similar function, signalling through its own light as well as that of the vehicle that the car is operating in automated mode. In certain traffic situations, the Companion is in visual contact with other road users, helping pedestrians to cross the road by means of the green light gradient on the front of the vehicle.
In Boost mode, the entire vehicle focuses on the driver, offering intelligent support to maximize the driving experience. The seat and steering wheel change position, and the center console moves to become more strongly oriented toward the driver. As the journey proceeds, the driver can interact with the vehicle via gesture control.
The contact analogue BMW Head-Up Display of the future uses the entire windscreen to communicate with the driver. In Boost mode, it focuses exclusively on what really matters to the driver: information such as the ideal line, turning point and speed. In addition, full connectivity, intelligent sensors and permanent data exchange allow the Head-Up Display to generate a digital image of the vehicle's surroundings.

Hyundai Motors gets a "go-ahead" to test autonomous vehicles in Korea

Hyundai Motor has received license from the government of Korea for testing its autonomous-driving car on local roads, a move to facilitate the automaker's plan to commercialize driverless vehicles by 2020. The vehicle is equipped with features including traffic jam assist, highway driving assist and narrow passage assist. It can easily be switched to manual mode when needed, meaning that a person holding the license has to sit in the driver's seat while it is on the road. The Genesis sedan is also required to carry a visible sign so that other drivers can be aware of what it is.

Driverless "platoons" to be road tested in UK next year

Automated lorry convoys will take to British motorways. UK Chancellor George Osborne pledged last year to invest millions in automated car technology as a way of improved efficiency and reducing traffic congestion.
A stretch of the M6 near Carlisle have been earmarked for testing the system, which could result in "platoons" of up to ten computer-controlled lorries being driven just metres apart. And the seed of those plans could come to fruition as early as 2017, with a "platoon" of driverless Heavy Goods Vehicles (HGVs) set to be tried out along an unidentified UK motorway.
The vehicles have a "highway pilot" – which can be activated at the press of a button – that helps them avoid other road users via a radar and camera sensing system.

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India Update

- **Continental to start manufacturing ABS and ESC units in India**
  Continental's Chassis & Safety Division will start production of ABS and ESC units in India later this year and will be set up in the existing Continental Automotive Brake Systems plant in Gurgaon, Haryana.
- **Royace Eye to invest Rs 600 crore in vehicle security market in India**
  Royace Eye Industries India, a UK-based security solutions provider, recently said that it will invest Rs 600 crore in Indian automobile security market.
- **Coal India set to spend Rs 200 crore on upgrading its existing GPS tracking system**
  On a technical overhaul drive, CIL will spend Rs 200 crore initially on various areas including electronic fencing of mines on the lines of best industry practices.
- **Zendrive develops machine learning system to monitor driver's performance**
  Zendrive, which has a tech development facility in Bengaluru and has recently raised $13.5 million from Sherpa Capital, developed a machine learning system that uses sensors in smartphones to monitor driving.
- **PeopleNet (Trimble) Video Intelligence Solution combines video-monitoring with telematics data**
  PeopleNet is going to launch a new Video Intelligence Solution, a platform that brings forward-facing camera technology and PeopleNet's Onboard Event Recording (OER) into an integrated system.
- **HCL Technologies acquires Volvo Group's external IT business**
  HCL Technologies (HCL) has signed a significant IT outsourcing deal with the Volvo Group. The company has also acquired Volvo's external IT business, adding 40 new customers from the Nordics and France to its portfolio.
- **KSRTC expands its Vehicle Tracking & Monitoring System (VTMS) for fleet modernisation**
  The state transporter of Karnataka State Road Transport Corporation (KSRTC) has embarked on an expansion mode of its VTMS.
- **IIT Kharagpur students win first prize for driverless bicycle at KPIT Sparkle 2016**
  Few students of IIT Kharagpur have developed a driverless bicycle named "i-bike", which also won the first prize in KPIT Sparkle 2016.
- **Tata Motors & IIT Bombay sign MoU for research in automotive industry**
  IIT Bombay and Tata Motors have recently signed a five-year MoU to create technological partnership with an objective to ensure the future engineering needs of the automotive industry.

Acquistions & Alliances

→ HERE and Nuance collaborate to enhance in-car connectivity powered by voice
→ HARMAN and NXP to cooperate on secure v2x communication
→ LG and Intel collaborate to develop vehicle telematics technology
→ General Motors will invest $500M in Lyft for on-demand autonomous vehicles in the US
→ Samsung, SEAT and SAP SE collaborate to develop connected car technology
→ Volvo and Ericsson collaborate to bring streaming content for autonomous cars
→ Nissan to use Mobileye's autonomous driving system
→ CalAmp buys LoJack stolen vehicle recovery business for $134 million
→ Geely to use Ericsson's connected vehicle cloud for entry level digital service
→ Moovit's partnership with BMW offers DriveNow car sharing services
→ INRIX buys OpenCar to provide standardized in-vehicle app platform
→ RAC acquires Nebula systems to boost telematics offering
→ Octo Telematics joins TSR coalition for road safety
→ ZTE and Telia Sonera sign agreement on IoT and telematics
→ Aston Martin partners with LeEco to develop electric cars
→ ST microelectronics and ARCCORE team up for automotive embedded-processing development
→ Smartwitness teams up with Corcra to offer integrated telematics and camera technology solution for fleets
→ AppCarousel and Mobica join hands to enhance connected car app experience
→ Pivotal partners with Ford for software platform for FordPass for cloud-based mobility
→ Check Point Software partners with Argus for connected car cyber-security
→ BMW MINI teams up with US based hardware start-up incubator for connected cities
→ MSIG Insurance initiates a UBI pilot in Singapore in collaboration with CSE Telematics
→ HERE and Colorado DOT join hands for I-70 Mountain Pilot project on connected vehicle & C-ITS
→ KT Telecom works with Samsung and CarVI for connected car & ADAS
→ CVTA partners with MusiComm to deliver music to connected vehicles
→ Intelematics partners with local European automotive clubs to expands its presence beyond ANZ

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