The Connected Car is one of the most exciting innovations we have seen in over a century of automotive development. Bringing the power of connectivity to the car offers incredible opportunities for the consumer, the automotive industry and the mobile industry alike.

Building this industry will not be straightforward, however, as there are a number of challenges ahead and we want to play our part in helping to overcome them.

By bringing together some of the leading players in this market, we wanted to identify these opportunities and challenges to help stimulate the thinking and cross-industry collaboration that will be needed to build this industry and deliver on its enormous potential.

Telefónica Digital plays a leading role as an enabler in the Connected Car market, which forms part of the company’s overall support of and investment in the global Machine-to-Machine (M2M) market. From smart cities to smart grids and smart homes, we believe M2M communications will transform society and business. Above all this will herald the development of a more efficient and sustainable world.

In the M2M market, Telefónica currently provides millions of connections globally. We have deals with several major consumer electronics manufacturers and automotive OEMs. We are also the programme leader for SmartSanter, one of the world’s largest wireless sensor networks for smart city M2M experimentation.

We know that global scale is key for customers so we have taken the lead in forming a global M2M alliance which to date comprises eight leading mobile operators; KPN, NTT DOCOMO, Rogers Communications, SingTel, Telefónica, Telstra, VimpelCom and Etisalat. This alliance was formed to bring the technology to market that will simplify the process of global M2M deployments.

We are also at the forefront of developments in services like fleet management, for instance partnering with Sascar to develop fleet management solutions for light vehicles in Brazil.

In addition, Telefónica has invested in the insurance telematics market, launching a pioneering motor insurance policy with European insurance company Generali Seguros, which calculates the premium according to driving habits.

Through all of this, we can deliver the unique global insight and experience needed to help build the Connected Car market.
However, we understand that Telefónica Digital is operating in a relatively new market. That is why we have brought in experts from the automotive industries who fully understand the automotive OEM’s end customer. Pavan Mathew, our global head of automotive telematics, spent eight years at OnStar and prior to that, ten years at General Motors. So we are developing our strategy based on how automotive OEMs look at the market, with the end consumer at the centre.

This report, compiled in association with our partner Machina Research, is the first stage in the creation of The Connected Car Leadership Network. The Network will bring together the leading players in the Connected Car industry, through online and offline networking, to enable knowledge sharing, and the true collaboration needed to help this new market flourish.

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“By bringing together some of the leading players in this market, we wanted to identify these opportunities and challenges to help stimulate the thinking and cross-industry collaboration that will be needed to build this industry and deliver on its enormous potential.”
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Carlos Morales Paulin - Global M2M Director, Telefónica

Carlos Morales Paulín is Global Managing Director for Machine-to-Machine (M2M) Telefónica. He is a Civil Engineer and holds a MBA degree from Carnegie Mellon University in Pittsburgh, Pennsylvania, USA. Carlos joined Telefónica in 2003, and has been responsible for different businesses and operational areas within the Group, including acting as Consumer Vice-President and Operations Vice-President in Brazil, and Marketing Director and Business Development Director in Spain. Prior to Telefónica, he worked for Procter & Gamble, McKinsey & Company, and a number of engineering companies at the beginning of his career. Having lived in 7 different countries, he likes to think of his family as “international but with a strong sense of belonging.” He is married with three children.
Matt Hatton - Director, Machina Research
Matt Hatton is a widely respected wireless industry expert with 15 years’ experience in the mobile sector. Prior to establishing Machina Research, Matt worked at 3 UK, Yankee Group and Analysys Mason. Matt’s current focus at Machina Research is squarely on the emerging opportunity for machine-to-machine communication. He is considered one of the foremost industry experts on M2M. He also speaks frequently at conferences, and acts as a judge for a number of prestigious awards.

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As an M2M industry analyst, Emil Berthelsen brings to us more than two decades of experience with management, strategic and research consulting for a number of leading and international consultancies. Emil has chaired and spoken at several leading conferences on M2M in Europe and Asia, and contributes to articles in specific industry areas on these topics. Emil holds an MPhil in International Relations from Cambridge University.

Anupam Malhotra - Manager of Connected Vehicles, Audi of America
Anupam Malhotra joined Audi initially from his role as Head of Enterprise Quality for Location-Based Services for General Motors’ pioneering OnStar brand. Malhotra left OnStar to launch Audi connect® in the US market and put in place the foundation for a long-term connected services strategy for the company.
Henry Bzeih, Chief Technology Strategist, Kia Motors

Henry Bzeih is responsible for leading Kia’s North American Infotainment Technology & Business planning organisation and is also responsible for the end-to-end Connected Car organisation. Prior to joining Kia, he led the Multimedia and Infotainment Applications Organisation at Ford Motor Company where he launched critical projects such as SYNC GEN 1, and Next Generation Navigation. Henry Bzeih's technical and business experiences cover all facets of global vehicle development in EE commodity, architecture, applications and business planning.

Dr. Michael Würtenberger, Vice President of Connected Drive, BMW

Dr Michael Würtenberger started working at BMW in 1995 as Project Manager of Telematics and has since held various positions including Team Leader Multimedia and Speech Recognition, Head of Department Architecture Infotainment Systems and Vice President Ergonomics and Integration Interior. Before joining BMW, Dr Würtenberger worked at GM Europe, BTS Broadcast Technical Systems and R&V Insurance.

Don Butler, Vice President of Marketing for Cadillac – General Motors Corporation

Don Butler joined GM in 1981 as a co-op student. He progressed to become Marketing Director at Pontiac, and later Chevrolet Truck. Don was Managing Director of GM Egypt from 2005-2007. Previous roles include Vice President of OnStar, directing its international expansion. In 2009, Don joined the leadership team of a technology start-up called INRIX. He returned to the automotive industry the following year to lead Cadillac.

Matt Jones - Senior Technical Specialist – Infotainment & Vice President GENIVI, Jaguar Land Rover

Matt Jones began his career in professional audio, before joining the automotive sector with Jaguar Land Rover in 2002. He led the deployment of rear seat entertainment and televisions across the range of vehicles, and was responsible for the relationship and launches of premium audio systems with Bowers & Wilkins, and most recently Meridian Audio. He has taken the lead on the Next Generation of Infotainment project, managing the System Architecture teams and off-shore development centres.

Henry Bzeih, Chief Technology Strategist, Kia Motors

Henry Bzeih is responsible for leading Kia’s North American Infotainment Technology & Business planning organisation and is also responsible for the end-to-end Connected Car organisation. Prior to joining Kia, he led the Multimedia and Infotainment Applications Organisation at Ford Motor Company where he launched critical projects such as SYNC GEN 1, and Next Generation Navigation. Henry Bzeih’s technical and business experiences cover all facets of global vehicle development in EE commodity, architecture, applications and business planning.
Ian Pearson - General Manager, Europe Cross Carline Product Planning, Nissan
Ian Pearson has worked in the automotive industry for 18 years. Through his career, spanning Nissan and Ford, he has held many product management and planning roles across various car segments in Europe and Asia. Originating from the north of England, he was educated as an automotive engineer at Loughborough University, UK and received an Executive MBA from Duke University, USA.

Nicolas Nollet - After-Sales Strategy Director, Renault
Nicolas Nollet has been with Renault since 2000, occupying positions in Purchasing, Product Cost Control and the management of Cross Company Teams reporting to the CEO. Since 2010, he has been in charge of the company’s after-sales strategy. His scope includes the upstream management of services including connected services.

Robert Jagler - Director Connectivity, Marketing Sales & Customer Services, Volvo Car Group
Robert Jagler has held many senior management positions within the marketing, sales and customer service departments at Volvo Cars Group. Previous roles have included: Director, Digital Excellence & CRM; Marketing Development & Asset Management; and Senior Manager, Marketing Services. He also holds an MBA degree in general management from the Gothenburg School of Economics and Law.

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Ian Pearson is a full time futurologist, tracking and predicting developments across a wide range of technology, business, society, politics, and the environment. He is a Maths and Physics graduate, with a Doctor of Science degree. He has worked in numerous branches of engineering, from aeronautics to cybernetics, sustainable transport to electronic cosmetics. His inventions include text messaging and the active contact lens. He was BT’s full-time futurologist from 1991 to 2007 and now works for Futurizon, a small futures institute. He writes, lectures and consults globally on all aspects of the technology-driven future. He has written several books in several languages, including ‘You Tomorrow’, and made over 500 TV and radio appearances. He is a Chartered Fellow of the British Computer Society and a Fellow of the World Academy of Art and Science, the World Innovation Foundation, and the Royal Society of Arts.
The automotive and mobile industries have been drawn together by the unstoppable rise of the Connected Car. As with any partnership, there will inevitably be teething problems but both sides are aware of the importance of making the relationship work as the demand for connectivity in cars grows.

Industry forecasts are impossible to ignore. By 2022 there will be 1.8 billion automotive M2M connections. This will comprise 700 million Connected Cars and 1.1 billion aftermarket devices for services such as navigation, usage-based insurance, stolen vehicle recovery (SVR) and infotainment.

The next ten years will see connectivity become the norm in vehicles. Today, this market comprises primarily aftermarket devices. However, the next few years will see a significant market shift, as the number of cars with built-in connectivity platforms increases significantly. In fact, Machina Research predicts that by 2020, 90% of new cars will feature such a platform, growing from less than 10% today.

Overall, the M2M market in the automotive sector will generate a staggering $422 billion in 2022, up from $22 billion in 2012. Today, 59% of this revenue is accounted for by services, including both the connectivity and the applications supported by it. By 2022 that will grow to 88%.

Figure 1: Machine-to-machine connections and revenue in the automotive sector, 2011-22 [Source: Machina Research, 2013]
To date it has been challenging for automotive OEMs to generate much revenue from the Connected Car. Many customers are eager to sign up for trial phases, which can last for up to a year, but converting these into paying customers has been a difficult task. In the best case scenario, a little over 55% of customers will be converted into paying customers, although the reality has been between 20-40%. Placed in the context of the significant cost of including the connectivity in the vehicle, the low financial return represents a significant challenge.

However, the overall revenue opportunity is only a small part of the equation for automotive OEMs. The Connected Car can also fulfil a number of other important purposes: creating a better user experience; building an ongoing relationship with customers; developing new models of mobility; data gathering on vehicle usage; and meeting regulatory demands.
The success of the Connected Car requires mobile network operators (MNOs), and automotive OEMs to work in harmony. However, the two have radically different heritages and different approaches.

The structures of the sectors are very different. The auto industry is basically global in nature with virtually all automotive OEMs selling in almost every country. There is some variation, but it is, broadly speaking, a global industry. The mobile industry, by contrast, is still evolving from a national focus (often based on issued licenses) to a more global approach. To truly meet automotive OEMs' needs, MNOs need to shift to become more global (see below).

Contrasting yet complimentary heritages

The connected Car

Figure 2: MNO and OEM - different heritage[Source: Machina Research, 2013]
Meeting global demands

Over the last twelve months, MNOs’ M2M teams have become sharply focused on meeting the requirements (particularly from automotive OEMs) for global coverage.

All MNOs can nominally serve any device in any country in the world through roaming or the slightly more sophisticated MCC-901 global SIM. This was acceptable for roaming handset users, but is not sufficient for the demands of the Connected Car.

Existing roaming rates are simply incompatible with the high-bandwidth applications envisaged for the Connected Car. Furthermore, in some countries (Brazil, China, India and much of the Middle East) the use of permanent roaming SIMs is prohibited for a variety of reasons.

MNOs have had to evolve their approach to addressing the global opportunity. Rather than being an adjunct to a national or regional offering, they have had to rethink their approach and consider how their solution can be applied and delivered on a global scale.

The first thing they have done is to establish global alliances. There are now essentially four of these; GMA (DT, Orange, and Telia), Vodafone and Partners, AT&T and partners, and the alliance between Telefónica, DoCoMo and partners. These alliances will form the frameworks for commercial negotiations to offer potential clients a much more appropriate rate based on local pricing.

In most cases this also goes hand-in-hand with the second element they have introduced; remote OTA (over the air) provisioning. This will facilitate connection to a local network and IMSI swapping (for multiple MNO accounts) where necessary.

MNOs are moving to create the commercial and technical solutions that are demanded by automotive OEMs. Perhaps they aren’t moving quite as fast as the automotive OEMs might like, but they are moving.

Coping with network technology upgrades

One of the major challenges with built-in connectivity in cars is future-proofing the radio access network (RAN) technology.

Firstly, automotive OEMs want to be up to date and upgrade cycles are rapid for RANs. In the last 10 years developed markets have typically seen upgrades from 2G (GPRS/EDGE) to W-CDMA, HSDPA, HSUPA, HSPA+ and LTE. Given that vehicles will typically be used for 10-20 years, they risk rapid redundancy.

Secondly, automotive OEMs do not want to rely on a technology that may be switched off. MNOs are increasingly indulging in ‘refarming’, for instance switching spectrum to a higher bandwidth technology (typically moving from 2G or 3G to LTE). So far, few have announced full switch off, with AT&T being an exception. However this will become inevitable as they seek to increase efficiency. Switch off has serious implications for customer service, as some OEMs found when the D-AMPS service, upon which their customers relied, was switched off in North America in 2007-8.

So what are the solutions to this problem of redundancy? There is no simple cure but a blend of tactics can help automotive OEMs: adopting multi-mode techniques and using a range of technologies; ensuring devices are OTA provision-able and will switch; or adopting LTE early to future proof for 5-10 years.
Another possibility is upgradeable licensing. Licence fees for W-CDMA, LTE and other technologies in M2M devices do not come cheap. There are numerous applications where it is uncertain which technologies might ultimately be required. Big decisions will need to be made about network technologies that the customer will have to live with for 15-20 years. Furthermore, customers will have to pay the full licensing cost of all embedded technology at the point of installation. This might seriously inhibit the growth of the M2M market.

A significant proportion of the cost of adding 3G and even LTE into a device is licensing costs, for example, payment to intellectual property rights (IPR) holders such as Qualcomm. If these rights holders agree to waive their licensing fees until the associated technology was actually used, there would be fewer concerns among customers in including multi-mode devices. This would increase confidence in affordable long-term support for M2M and should help to grow the overall M2M market.

The Connected Car market has arrived and has an incredibly bright future. Connectivity in vehicles will soon become the de-facto standard and the industry must increase its efforts to deliver a truly compelling service to consumers whose expectations are rising daily.

**QUICK TAKE**

01 By 2022 there will be 1.8 billion automotive M2M connections, comprising 700 million Connected Cars and 1.1 billion aftermarket devices, for instance for navigation, usage-based insurance, or stolen vehicle recovery (SVR).

02 It has been challenging for automotive OEMs to generate much revenue from the Connected Car to date, with a best case scenario of 70% conversion from the trial phase of a service.

03 The opportunity for automotive OEMs is at least as much about building a stronger relationship with the customer as it is about generating cash from the Connected Car.

04 Automotive OEMs have development cycles that are measured in years compared to MNOs' much more rapid evolution: devices have a lifespan of a couple of years, and new technologies and upgrades are introduced every 2-3 years.

05 The mobile sector brings many positive traits to the Connected Car, especially the ability to build an ongoing relationship with the customer.

06 MNOs have formed global alliances for network coverage: GMA (DT, Orange, and Telia), Vodafone and Partners, AT&T and partners, and the alliance between Telefónica, DoCoMo and partners.
03 EXECUTIVE SUMMARY

Connected Car 2013: Building a New Industry

The opportunity for the Connected Car market is huge both in terms of revenue and benefits such as customer loyalty. The market is close to the tipping point where connectivity in cars will become a mass market. To build this new market, the mobile and the automotive industry will need to work in collaboration to surmount its challenges and deliver its promise.

To drill down into exactly what these challenges are and to understand how this vital collaboration can be delivered, this report has gathered the views of the representatives of Connected Car at leading automotive OEMs.

The resulting interviews are the first time the collective thoughts of those leading the development of the Connected Car industry have been collated in one place, providing an industry-wide picture of the next steps needed to build the Connected Car industry.

The 10 key challenges
There was remarkable consistency among the interviewees on the Connected Car industry’s biggest themes and challenges. Here we outline these ten themes and highlight some of the interviewees’ thoughts around them.

There is a disconnect between mobile and automotive industry lifecycles

The difference in lifecycles in the automotive and the mobile industry is a serious challenge for the Connected Car industry. New features, such as operating system upgrades and new applications, are provided almost constantly for the smartphone, whereas automotive OEM manufacturers work on five-year cycles.

Some manufacturers, such as Audi, have taken a modular approach to technologies in its vehicles to take into consideration the fast-moving technologies from those with longer cycle times. However, the difference between lifecycles remains a serious issue. “The smartphone business model depends on regular upgrades, which is a fairly new step for the automotive industry, and plans for how to manage payments for upgrades or recognise this revenue and/or cost in financial models will need to be implemented,” says Don Butler, Vice President of Marketing for Cadillac at General Motors.

One of the most positive developments from the growth of the Connected Car though, according to BMW, is that it has moved the M2M debate away from pure automation to become more about the internet of things. This raises a debate about whether the Connected Car is an M2M or consumer business.
Automotive OEMs fully prepared for connectivity regulation

Another factor driving the Connected Car is that connectivity will be necessitated by regulatory mandates such as the European Commission’s initiative eCall, which calls for a system to be fitted to all new vehicles by 2015, meaning emergency services will automatically be contacted and given the vehicle location in the event of a serious accident. Automotive OEM manufacturers across the board are fully prepared for the eCall legislation, although to what extent it will finally be implemented, and when, is still unclear.

There is no doubt throughout the industry that the connected vehicle will provide significant advantages in terms of life saving solutions and stolen vehicle tracking.

Built-in versus brought-in connectivity

Debates about how to connect the car continue. Whether enabled by a dedicated connection (‘built-in’, as implemented in Renault and Nissan vehicles), smart phone tethering (‘brought-in’, as favoured by KIA), or a combination of both solutions (as favoured by BMW, Audi and Volvo), there are advantages and challenges to each. A built-in option will certainly be required for mandated solutions such as eCall. It also has inherent advantages such as antenna strength, compared to a handset or similar device, located within the vehicle.

The brought-in option tethers a smartphone to the car via Bluetooth or USB cable, allowing customers to utilise their own mobile phones and subscriptions, and make full use of personal playlists and contacts.

A hybrid option is that of the personal SIM. While the connectivity itself is built-in, the subscription is brought-in on the SIM, providing customers with full control of the operator choice and management of any subscription charges in the same way as the brought-in option.

Brought-in options, such as fleet management systems or SatNav solutions, have addressed the after sales automotive industry for many years. With the emergence of the Connected Car with built-in connectivity, the after sales device market is set to change, and as Nicolas Nollet, After-Sales Strategy Director at Renault, points out, “embedded solutions will deliver return on investment advantages to after-market solutions such as fleet management systems where device purchasing costs may have been prohibitive factors in the past.”
Collaborative business models must be developed between operators and OEMs

In all of the above cases, mobile operators will have an important role to play in supporting automotive OEMs with suitable connectivity solutions for the markets in which they operate. Opportunities to share industry insights on both sides, and develop new innovative business models, are welcomed by all automotive OEMs. Matt Jones, Senior Technical Specialist – Infotainment at Jaguar Land Rover and Vice President of GENIVI Alliance, goes further and says that “the automotive industry is fairly archaic, working (broadly speaking) around the process of putting things into silver boxes and doing this extremely well. However, working outside these processes may be a challenge, and this is where mobile operators could assist, sharing their understanding and experience of this connected market.”

However, objectives do vary. For automotive OEMs such as BMW and Nissan, it is a question of operators being able to deliver services to global markets, and being able to secure suitable agreements to provide global (or at least regional) coverage. Automotive OEMs, though, typically demand local connectivity solutions. In many countries, so-called ‘permanent roaming’ is prohibited, so MNOs face the challenge of providing local connections within whichever market the vehicle is sold in.

One way around this challenge is programmable SIMs. By enabling these, automotive OEMs are connected via appropriate networks in different countries. This does raise the question of automotive OEMs using this ‘over-the-air’ (OTA) provisioning capability to switch between operators, taking advantage of, for instance, improved commercial terms.

The Connected Car will cause an upheaval in the traditional dealership model

“The advent of the Connected Car will require new approaches in the relations between automotive manufacturers, dealers and customers,” says Don Butler, Vice President of Marketing at Cadillac.

For dealerships, for instance, delivery times at the point of sale were managed within 20 minutes in the past. This now takes “on average, 1.5 hours due to the abundance of features and the complexity of technologies now present,” says Butler. “However a positive benefit of this has been the extremely positive feedback of good customer satisfaction, based on thorough introductions by Certified Technology Experts. Customers do appreciate this hand-holding.”

A Connected Car does offer the significant advantage of being able to alert customers and service dealerships to poor and failing performance in the vehicles. Proactive maintenance becomes more common, and issues of warranty management become easier to handle for the dealers. It does however mean that “dealers will also need to become knowledgeable in a world similar to that of the mobile phone,” says Robert Jagler, Director Connectivity, Marketing Sales and Customer Services at Volvo Cars.
The Connected Car offers a unique opportunity for automotive OEMs to engage directly with customers. Branded app stores, upgrades to software solutions over-the-air, sharing of vehicle data, and on- and off-board vehicle solutions provide automotive OEMs with opportunities to maintain brand awareness with the customer, and most importantly, to begin to engage directly with customers through this connectivity.

As Don Butler concludes, “dealers and [automotive] OEMs each play important roles in providing services to the customer, and continuing this working relationship to the ultimate benefit of the customer is vital.”

The Connected Car will lead to new types of ownership models being developed

Dr Michael Würtenberger remarks that “selling ‘just’ cars is no longer feasible. It is mobility with required connectivity to customer services, on and off-board solutions and advanced functionality. Of course, the Connected Car stays an essential part of individual mobility.”

What the connected lifestyle, and the Connected Car, do bring to the industry are new and exciting forms of mobility and car ownership models. One great example of this is car sharing, best illustrated with the likes of ZipCar. This emerging mobility model is largely enabled through connectivity with both the vehicle, and potential customers.

Connectivity is also an essential element in the success of electric vehicles (EVs), such as the Nissan Leaf and the Renault Zoe. Power Management, and the location of recharging points, are key components in this new mobility model. Companies such as Nissan are taking this one step further in the new EV market. Ian Digman, General Manager of Europe Cross Carline Product Planning at Nissan, notes that customers are still concerned about the EVs’ ability to handle longer journeys, during holidays in particular. Nissan has already started to explore options to assist customers with these journeys, such as car sharing of non-electric models.

Autonomous vehicles are not on the immediate agenda for most OEMs

Further down the line, many of the interviewees predicted the arrival of self-driving vehicles, based either on autonomous driving technologies (as trialed by Google), or vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) solutions built on technological advances of the Connected Car.
As Don Butler says, “the market may in the near future see semi-autonomous vehicles. Technologies like cruise control have been in place for some time, but the emergence of adapted speed and braking technologies are beginning to form part of driving solutions. Controlled steering with greater accuracy, and the effect of GPS technologies on driving orientation, will also enable hands-free driving. These developments alongside similar movement in the regulatory environments will certainly create some very interesting Connected Car futures.”

Payment models for how consumers pay for Connected Car services are still not yet developed

Who pays for Connected Car services is an issue that is far from being resolved. Consumers are used to a one-off payment when purchasing a car, but with an embedded connection there is an additional bill to be paid in terms of connectivity. Nissan estimates the costs for embedded hardware connectivity, needed for services such as eCall, to be $100 a unit, meaning automotive OEMs will need to provide additional services to justify the added cost to the customer. New business models for Connected Car data are needed, with General Motors suggesting operators could recognise vehicles as a second device on a customer’s data plan for a low monthly fee. These business models are likely to vary by territory. Audi points out that it has selected the brought-in model in Europe, giving customers a choice of operators. In the US, where managing mobile operators and SIM cards is far less pervasive, T-Mobile has been selected as the connectivity partner via a built-in solution. An agreement between the two companies sees Audi customers offered industry-beating tariffs, with extra value offerings, such as no activation fees and roaming charges, included.

Relationships with operators will be key in evolving payment models for the Connected Car, and as broadband usage increases, business models will have to adapt. Traditional telematics services have very low data usage, whereas new Connected Car services could have very high data usage. For instance, Audi announced in February that its 50,000 Audi Connect customers had used over 75 terabytes of data since its launch in April 2011, four times the contents of the US Library of Congress.
Manufacturers remain cautious towards the open app ecosystem

Although apps receive a high proportion of media attention, automotive OEM manufacturers believe issues of security and reliability mean that Connected Cars are unlikely to become environments for open app development. For this reason, automotive OEMs believe innovative business models will be far less apparent in Connected Cars than in the smartphone market, as the potential will be far smaller.

Collaboration will be critical in developing apps fit for the automotive environment. For example, Renault has been working closely with the Incubator founded jointly by Paris Region Lab and Renault as a framework to encourage and share core competencies with startup companies in the application development world. Renault’s Nollet points out that “these partnerships allow software developers to understand the requirements and challenges of the automotive industry, and at the same time, share with Renault insights on the innovation processes that these companies embody.”

A connected lifestyle is a given

Finally, there was overall consensus that the Connected Car is no longer an option for automotive OEMs, it is a necessity. The reasons are many and varied. Automotive OEMs are introducing connected solutions to meet expectations of the customer regarding continuous connectivity, to comply with mandated initiatives, to improve operational performance, to enhance customer services, and to maintain brand awareness.

“46% of our customers today are from generation ‘X’ and ‘Y.’ This figure will grow to 70% in the next few years, and with this generation, a connected lifestyle is a given”, says Anupam Malhotra, Manager of Connected Vehicles at Audi of America. He believes the Connected Car is “a game changer, and as connectivity remains extremely meaningful to younger groups, this lifestyle has to be reflected in the vehicle as well.”
How has Cadillac approached the connected car market?

At Cadillac, the development of the Connected Car concept has followed two paths.

The first path is that each vehicle within the Cadillac range will have an embedded connection. This is driven by both customer demand, and the advantages to the customer, that Cadillac delivers with telematics. Telematics offers a wide range of services such as maintenance diagnostics and warranty issue management which will ultimately benefit our customers.

There are costs for having this embedded connection in the car, but we expect costs for components to decline. This probably won’t happen at the same pace and scale as for mobile phones operating in a significantly larger consumer market. However, as they search for new connections and greater data usage, operators may begin to see more opportunities in the automotive market.

The second path for Cadillac is the brought-in device option. Presently connected through Bluetooth, and using the mobile phone as a ‘pipe’, there are limits to this option as a result of the limited numbers of hotspots and limited bandwidth. Tethered mobile phones, however, do address a number of customer requirements with regards to the use of their own handset, especially as it contains personal information and music libraries.

“The less I have to change, the better off I am, and the more satisfied I will be” is a good general picture of the customer’s viewpoint. Providing both embedded and brought-in device options enables customers to choose which is more convenient for them.

Where providing choice is one important aspect for the customers of Cadillac, another is ensuring that safety and security features are present and enabled as part of any Cadillac solution.

Which business models will pay for this connection?

The embedded OnStar service utilised in Cadillacs is available initially via a subscription model, but there will come a time when customers have to renew their subscriptions. So an opportunity to propositions of develop mutual value could be explored where, for instance, US cellular carriers recognise vehicles as a second device on a customer’s data plan for, say, $10 a month. Or alternatively, a pay-as-you-go applications model could be implemented where customers manage their costs on a usage basis.

Having signed an agreement with AT&T for an LTE (4G) connection to the vehicle, Cadillac will look to explore different business models that are enabled with this connection. Recognising that the connection provides Cadillac with information, which improves overall customer management and vehicle maintenance processes, is one considerable factor but there are
additional advantages that AT&T could also derive from these connections, so again, mutual value propositions are possible.

Another avenue could be applications. Innovative business models may be less apparent in this market as the incentive for application developers is potentially not as great as that within the consumer mobile phone market. However, there will be a market for vehicle specific applications, and opportunities will exist. Of course, these application environments will need to be managed closely by OEMs to ensure the implementation of safety and security guidelines, not only in terms of the actual driver use of the applications, but also which APIs are made available.

What challenges has Cadillac discovered with the connected car market?
The smartphone business model depends on regular upgrades, for instance to operating systems, which have been taken into consideration in financial models. This is a fairly new step for the automotive industry, and plans for how to manage, if at all, payments for upgrades or recognise this revenue and/or cost in financial models will need to be implemented. Another impact of upgrades will be on relations between the OEM, the dealer and the customer. The management of upgrades through potentially over-the-air methods will potentially establish direct links between customers and Cadillac, and while this is a positive development, it is clear that dealers will need to support this process.

Another challenge is that delivery time during the sale of the vehicle could, in the past, be managed within 20 minutes, as it was mostly about the introduction of the functions of the car to the new owner. Today, this process is taking an average of 1.5 hours due to the abundance of features and the complexity of technologies now present in our vehicles.

A positive benefit of this has however been the extremely positive feedback of high customer satisfaction, based on thorough introductions by Certified Technology Experts. Consumers do appreciate this hand-holding.

Cadillac has also witnessed a change from the pure driving experience with the car - the singular Cadillac experience - to expectations of a much more personal Cadillac experience, highlighting not only the performance of the vehicle but how the driver and passengers are entertained in the car, what information becomes available, and how they remain ‘connected’ even though driving.

What do you see in the future of the connected car?
The market may see semi-autonomous vehicles in the near future. Technologies like cruise control have been in place for some time, but the emergence of adapted speed and braking technologies are beginning to form part of driving solutions. Controlled steering, and greater
Providing both embedded and brought-in device options enables customers to choose which is more convenient for them.

accuracy and effect of GPS technologies on driving orientation, will also enable hands-free driving. These developments, with hopefully similar developments in the regulatory environments, will certainly create some very interesting Connected Car futures.

Developments within ownership models of cars may also arise. Cadillac remains a luxury vehicle, and notions of possession will remain strong, but there are certainly other areas - also within General Motors - where these developments are being followed and discussed with great interest.

What new technologies can we expect?
Cadillac will manufacture all 2015 models with LTE connectivity embedded. This will improve the level of OTA updates and upgrades significantly, and enable more flexibility and options when exploring new services.

An issue of future-proofing technologies will always be present, particularly when upgrade paths, obsolescence, and modular hardware are considered. The associated validation processes are equally complicated and extensive, so where embedded connectivity is concerned, this is definitely a focus area.

Robust communication interfaces are important components, as Cadillac looks to offload as much processing as possible to the cloud. A good example of this is navigation. With the embedded solution, updates such as Google maps overlays would take place through the cloud, and would not require processing power in the actual device. The networked device in the car would be similar to the distributed processing models within IT, and would potentially address some of the future-proofing issues which can be expensive and complex but also deliver an additional benefit of data not being ‘lost’ in the device, but being stored and potentially used when managed in the cloud.

Who pays for having a connected car?
This is a tricky one, and the answer relates to the issue of for whom connectivity in the vehicle becomes a valuable resource? For drivers and passengers, it’s about the experience and the convenience of having information to hand, continuing your ‘connected' experience from the home and the phone into the car, and possibly providing a Wi-Fi hotspot for other passengers (the kids) in the car. For car manufacturers and dealers, highly valuable and important information about the vehicle becomes available from this connectivity. When data itself becomes an asset in a wide variety of contexts, such as location, this may also influence the answer as to who pays the bill.

Where is there friction in the connected car market?
The question of who pays is definitely one area of friction but, especially in the US market, there is an emerging issue with regards to the role of dealerships.

One legacy within the automotive industry is the agreement between automotive manufacturers and dealers that car repairs and general servicing would always go through them, securing future sources of revenue as well as on-going relationships with the customer.

The advent of the Connected Car, with implications such as managing software upgrades, will require new approaches in the relations between automotive manufacturers, dealers, and customers. Dealers and OEMs each play important roles in providing services to the customer, and continuing this working relationship to the ultimate benefit of the customer is vital.
Each vehicle within the Cadillac range will have an embedded connection, driven by both customer demand and the advantages to the customer that Cadillac delivers with telematics.

A brought-in option is also provided, enabling use of information already held on customers’ handsets.

The embedded OnStar service available in Cadillacs is available initially via a subscription model.

Cadillac will manufacture all 2015 models with LTE connectivity embedded.

Cadillac believes there will be less innovative business models in the Connected Car app market than the smartphone market, though there will be a niche for vehicle-specific apps.

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How has Nissan approached the connected car market?

With the newly launched Nissan Note, an initiative to target regular super-minis like Ford Fiesta, customers will also be able to enjoy NissanConnect, which provides a wealth of information such as weather, flights, fuel, and Google points of interest, all connected over a standard Data-Over-Voice connection. Future developments of NissanConnect will be made available, including smartphone integrations.

Although not the first to market, Nissan has certainly kept up with other automotive manufacturers in the Connected Car field and has been able to offer accessible solutions to many customers. With the latest “Innovation that Excites” campaign marking a profound shift in Nissan operations, we are now looking to bring new and exciting innovations to customers around the world, and these innovations will include the latest technologies.

What are the benefits of a connected car?

The telematics data from a Connected Car can provide many customer benefits. When Nissan launched Nissan Leaf with an embedded Telematics Communications Unit (TCU), taking advantage of the new vehicle architecture, it provided an opportunity to address specific demand drivers which had not been present in cars with internal combustion engines. Issues of battery management and performance information are key information factors for drivers of electric vehicles like Nissan Leaf.

As a practical example, running out of petrol is something ‘easily’ resolved in comparison to running out of power. With access to this information from the car, customers have also been able to build their confidence in the new technologies. We expect all vehicles will have embedded connectivity and building confidence in electric vehicles may accelerate this trend.

One of the huge benefits of a Connected Car like the Nissan Leaf is not only the immediate information available to the customer, but also building a detailed understanding of how people use their cars. With this information, automotive OEMs could create unique interaction possibilities, and potentially get customers to approach and talk to their dealerships even more after the purchase. Currently many people buy their car from the dealer and then have the option to proceed to local garages for repairs. However, with the constant interaction with the Connected Car, dealers could provide quicker and more proactive servicing solutions, improving ongoing relationships with the customer.

What other solutions has Nissan explored in terms of the connected car?

Most OEMs will also be opting for a tethered solution, allowing customers to ‘bring in’ and connect their mobile phones to the car. There will, in future, be a need for...
some form of embedded connectivity for eCall and bCall (emergency and breakdown calls) services. Considering the additional costs for embedded GSM, and having to address the management of data plans as well, these factors do act as a barrier. When customers buy a car, it tends to be a one-off purchase (apart from future servicing) but with an embedded connection, there is an additional bill to be paid. As most customers will already have some form of mobile phone cost already, this is definitely not an attractive proposition unless some additional features are added to the mandated telematics units for eCall. With estimated costs for just the embedded connectivity hardware at €100 per unit, the OEMs will want to provide additional services to justify this additional cost (in some cases, these costs may rise to as much as €300 when including the additional sensors and servicing required).

At present, Nissan is still working on which technology options to select, and while eCall legislation now looks to be set for 2015, considerations around 3G, 4G, and switch-offs are important as well as the associated technology costs.

**How does the connected car benefit Nissan specifically?**

The majority of automotive OEMs have implemented some form of connected solution which provides access to Facebook, Pandora or TuneIn, so to differentiate between these products and services will be difficult. With new players like Mirror-Link and Apple also entering this market with the interfaced smartphone, this is further exacerbated. OEMs will need to use this data to create a unique customer relationship and a link with the OEM.

The human-machine interface (HMI) is definitely an area of differentiation in the future. Here the question that emerges is how you make, for instance, a Facebook experience relevant to the brand of the automotive manufacturer. When driving today, there is really only one brand that is prevalent: the OEM’s brand on the steering wheel. All of these other brands are seeking to take a bit of that relationship. OEMs could be looking at how to extend out of the car, such as with information applications on your mobile phone, or online portals where your ‘performance’ and ‘experiences’ with your car become points of shared interest with others or - as in some recent trials - comparing your eco driving skills. This will often involve an element of gamification.

**Has Nissan started to identify new business models in the connected car market?**

There are some new exciting examples and thoughts around car ownership and mobility, and while these may still be some years away, they are influencing some of our thoughts, for example around Nissan Leaf. In a vast majority of the cases, the travel range for an electric vehicle is not an issue but in terms of car ownership, there is still a concern about that one trip a year that may require greater distances to be covered. Now, rather than expecting people to own a Nissan Leaf as a second
car, we are asking if there is anything that Nissan could do to help the customer address these singular, long-range journeys, for instance with innovative mobility solutions and car sharing.

Also, in car parks, vehicles are often left for more than 8 hours during which time servicing could be done, upgrades completed, and of course, car sharing models could be explored. Extending this concept to fleet management, the utilisation of the fleet outside of normal working hours is another huge area of opportunity. So, yes, this is definitely an area which Nissan is keeping an eye on.

In a Connected Car market, is there a new role for dealerships?

There is definitely a new balance to be developed between dealers and automotive manufacturers.

Dealers are an important part of the value chain, and human contact will always be an essential part of this - cars need to be repaired, tyres changed, services completed, and these human interactions are preferred by customers. With the Connected Car, some changes may be expected though. Here, interactions with the automotive OEM and its brand will be structured around the telematics of the car, as well as approved upgrades and applications being provided Over-the-Air (OTA) by the OEM.

Nissan would definitely look with interest at any opportunities to improve relations with customers, and the Connected Car will provide such an opportunity, but the human link will always be there. One interesting development may be the case where telematics provides improved information about what sort of maintenance is in fact required, removing the degree of distrust that may emerge when customers bring in their cars for a service, and those ‘additional’ costs are added to the bill.

With all this data produced, how and where will it be managed?

Completely in the cloud, ideally, where Nissan could manage that data. However the cost of offloading that data may be too high (even with the potential of Wi-Fi downloads during connected periods). However, there are significant benefits to be derived from this data - not only for the customer but also for the OEM which could now ‘share’ this information with their parts suppliers, for instance. Looking at the supply chain, suppliers of parts spend significant amounts of time and money to test and continuously monitor parts, and from a relatively small sample base of ‘test’ cars. OEMs could suddenly provide data from millions of customers, such as how brakes have performed and at what sort of ambient temperatures. Access to this sort of driving data will definitely form a growing market, subject to data ownership issues.

What areas of friction does Nissan see in the market?

Different protocols for applications and APIs, mobile phone protocols, Bluetooth restrictions, 2G/3G/4G developments, country specific regulations, roaming charges... the list is quite extensive. There have been positive developments driven by regulators and consumer groups, and within country boundaries, connectivity solutions with mobile operators are moving forward but there is still some way to go.
NissanConnect provides information such as weather, flights, fuel, and Google Points of Interest, all connected over a standard Data-Over-Voice connection.

Future developments of NissanConnect will include smartphone integration.

Issues of battery management and performance information are key information factors for drivers of electric vehicles like the Nissan Leaf.

The additional costs for embedded connectivity and having to address the management of data plans are a significant challenge.

Nissan is still working on which technology options to select, with considerations around 3G, 4G, and switch-offs important as well as the associated technology costs.

Connected Car provides new opportunities around car ownership and mobility that Nissan is exploring.
What do we envisage for the Connected Car over the next ten years? I see this space developing into a fully personalised, virtual environment with intelligent automation, creating a totally new relationship between the vehicle, the driver, and the passenger.

Cars used to be solitary machines. Not so anymore - some can now detect other vehicles around them and even “talk” to them. When cars are able to connect to each other in this way, things can get truly exciting - they can coordinate braking and acceleration, hence distancing themselves automatically with lightning-fast reaction times. We could see a single stretch of road accommodating more cars safely, automatic use of roundabouts.

In fact, fully self-driving cars will increase road capacity five-fold, eliminating congestion on most roads while reducing accidents to almost zero.

Connected Cars help make connected communities

Connecting cars also changes the way we make use of them. If safety and maintenance can be taken for granted, we as the passengers would be more willing to carpool and share them, for instance with systems like the already popular Zipcar. If you can find and rent a car easily, and find a parking space to leave it in when you are finished with it, the incentive for ownership can be greatly reduced.

This kind of car sharing will free up car parks, reduce congestion and make it easier, faster, and cheaper to travel.

Even today, car-sharing can already be improved using apps. As phones become even smarter, with location, navigation, security and identification as standard tools, the pool of people that you know you can safely share a car with will increase, reducing social barriers to sharing while making logistics easier. This helps the environment by reducing traffic, but also builds bonds in the community.

Could every car feel like ‘your’ car?

Further in the future, cars will come to you. They will take you where you want, and then you can just abandon them to go off to serve someone else. They will in effect offer a comfortable and socially inclusive form of public transport. This could even lead to buses disappearing from our streets.

The personalisation of the car environment will also become common. As you get in, the seat will automatically move to your preferred position, as instructed by your phone. Even fabrics and other interior surfaces will be able to adapt their appearance and textures electronically to your taste. This could reduce
In the far future, a vehicle’s exterior appearance could also be connected. Flexible displays and even smart paints will turn almost any surface into a potential display.

Although there are many routes to service provision that will keep the field highly competitive over the next decade, the key as always is quality. OEMs will provide high quality platforms that link fully, and with full synergy, into the car, so will be in pole position to utilise them. Being in control of the operating systems, comms and computing platforms will be a huge advantage and allow a seamless interfacing with additional special features only available to their customer. In many ways, the battles will be similar to those between features built into smartphones versus downloadable apps, but in the car of course there are more opportunities to link to exclusively accessible hardware and sensors. This will continue to provide abundant OEM opportunities, but with no room for complacency, since even small weaknesses will readily be exploited by outside companies.

"In the far future, a vehicle’s exterior appearance could also be connected. Flexible displays and even smart paints will turn almost any surface into a potential display."
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