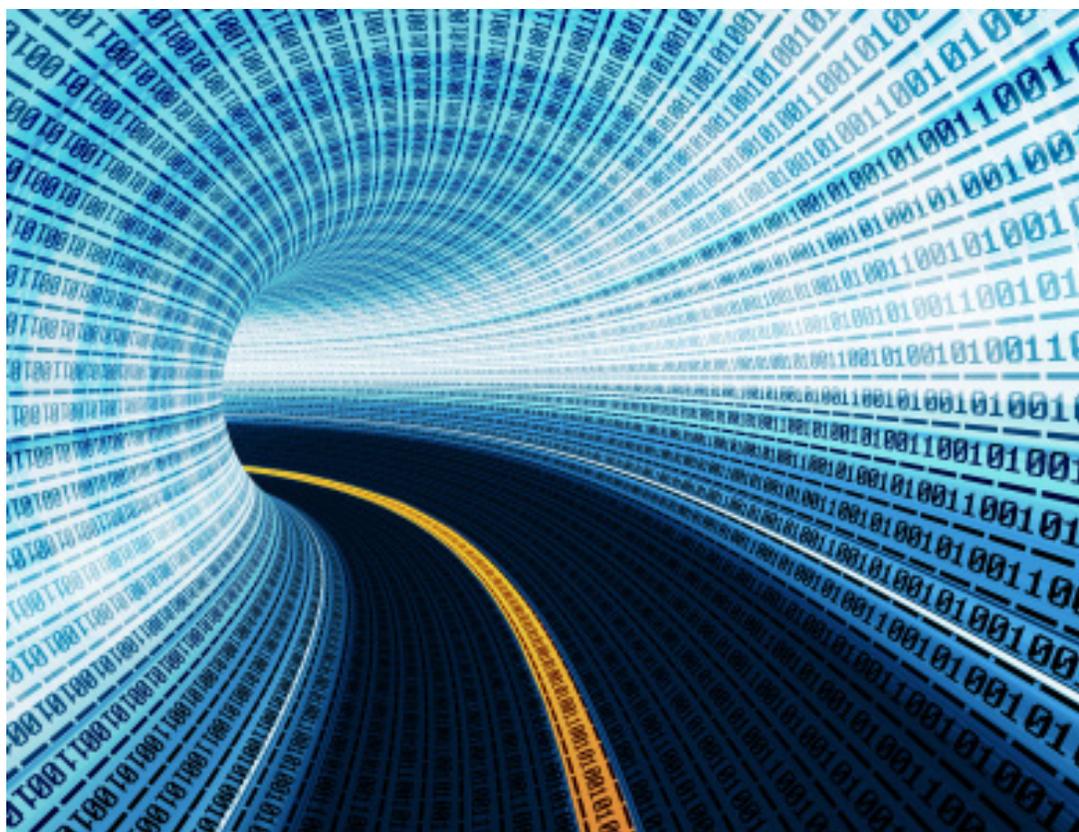


## Connected vehicles enter the mainstream

Trends and strategic implications  
for the automotive industry



### Laying the groundwork

Over the last quarter century the world has witnessed the steady emergence of mobile communication technologies that continue to redefine how people connect with each other. Today, the virtual networks that connect consumers, businesses, friends, families and everyone in between are alive 24 hours a day, seven days a week as people seek immediate access to information.

The emergence of mobile communication technologies has now spilled over into the automotive industry, resulting in a dramatic impact on not only vehicle connectivity, but also on how consumers view transportation as a means of staying connected. Connectedness is also in its infancy and, as a result, consumer desires are still being defined. While a 2011 study released by Gartner found that 46 percent of people aged 18 to 24 would choose access to the Internet over owning a car, a recent survey of 1,000 consumers conducted by Deloitte shows that more than a third (37 percent) want to stay as connected as possible while in their vehicles. Forty-four percent of those aged 18 to 24 responding to Deloitte's survey rated connectivity as being extremely important.

The results of these consumer surveys, and several others measuring interest in vehicle connectivity, demonstrate how the "connected vehicle" industry continues to evolve and be impacted by a number of factors — including emerging technologies, consumer interests and demands, and connected service alternatives.

The implications for most automakers and their business collaborators in response to these trends are significant and result in a number of new challenges. At the same time, 24x7 demand for information also creates new opportunities for vehicles to take their rightful place as a connected node on the mobile communications highway — a node that not only delivers the connectivity consumers demand, but can also create new pathways of V2X (vehicle-to-vehicle, vehicle-to-infrastructure, etc.) connectivity that can improve driver safety, improve vehicle performance and durability, and enhance the overall driving and vehicle ownership experience.

### Evolution of the "connected vehicle" industry

Convergence between the automotive, communications, and technology industries is relatively new. Historically, vehicles, wireless networks, and Internet-based technologies were all developed separately without any meaningful cross-industry linkages. While automakers typically developed vehicle technologies in a relatively closed manner and at a more deliberate pace that mirrored vehicle development cycles, mobile phone manufacturers focused on on-the-go communications and the ability to communicate in different locations. And despite the connectivity early mobile phones provided, core applications were limited to analog wireless calls and short text messages. It was not until the dawn of the Internet that consumers and businesses began to recognize the ability to promptly access an abundant amount of information, thereby fostering global connections and communities.

In the 1990s, two important trends emerged. First was a push toward increased vehicle safety equipment (e.g., mandatory airbags and daytime running lights); second were the simultaneous advancements in electronics, communications, GPS, and cellular technology. Near the end of the decade, automakers began exploring different connectivity models by embedding cellular technologies into their vehicles, thereby forming a bridge between the automotive and mobile phone industries and creating the new "connected vehicle" industry.

These early connections focused on enhancing driver safety through wireless-enabled services such as automated crash notification, emergency roadside assistance, and vehicle locator services. At the same time, consumers began to understand how their vehicles could serve as a gateway to infotainment content — thereby creating two distinct opportunities and business models for automakers to consider, one focused on safety and one focused on entertainment. Both are important to consumers. Those responding to Deloitte's survey identified safety services as very important, yet 39 percent also indicated a desire for technology to provide other information and entertainment content that aids in driving, such as real time traffic, gas prices, navigation, and points of interest.

In response, automotive manufacturers have accelerated the development of new technologies, infrastructure, business models, and marketing messages to support these emerging services.

### **Today's brave new world**

Today, advancements in wireless connectivity have delivered easy and affordable access to Internet-based services such as cloud-based music, social networking and online shopping to the palms of consumers' hands. As a result, many consumers are taking their technology, personalization and ownership cues from experiences outside of the vehicle, yet expect those same experiences to be available in the cars and trucks they drive. Consumers are also beginning to consider in-vehicle technology to be more important to brand<sup>1</sup> in determining loyalty, and are increasingly expecting to receive in-vehicle technology training during sales delivery at the dealership<sup>2</sup>.

This latest phase in connected vehicle services and the need to meet consumer demand has created some interesting questions for the various stakeholders in the vehicle connectivity value chain, including:

- Are automakers responsible for preselecting Internet-based content that is made available in the vehicle, or can automakers simply provide the platform and allow consumers to customize content as desired?
- How can communications and technology companies work with automakers to balance connectivity and concerns with distracted driving?

- How can these stakeholders collaborate to improve the pace at which new mobile technologies become available in the vehicle?
- How can automakers take steps to determine that a vehicle's on-board technology systems remain compatible with new technologies that emerge over the life of the vehicle?
- How can automakers leverage infrastructure supporting vehicle connectivity to create new innovations that improve driver safety, extend the life of the vehicle through services such as on-board diagnostics, and reduce the vehicle's impact on the environment?
- How do automakers and their collaborators balance fees for services with consumer expectations?

To investigate these areas, we should understand trends across the consumer electronics and retailing industries, and the strategic implications for automakers.

### Trends, expectations and implications

Trends in consumer electronics, dynamics in retailing, and increasing organizational complexity present challenges that automotive manufacturers should address. As Table 1 below outlines, four primary consumer trends are resulting in expectations for in-vehicle connectivity and each creates a strategic implication automakers should consider.

Table 1: Consumer trends influencing connected services

	Consumer Trend	Resulting In-vehicle Expectations	Strategic Implications for Original Equipment Manufacturers (OEM)
1	Consumption of data has grown exponentially with the arrival of streaming audio and video, and this looks to accelerate.	Consumers will likely come to expect higher levels of connectivity with access to data-intensive programs in the car.	Develop a clear hardware strategy which supports both business model financial targets and customer needs.
2	Consumers are increasingly willing to trade personal information for “free” content.	Consumers may come to expect “free” connected services in exchange for their usage data or exposure to in-car advertisements.	Consider their strategic goals, as well as the loyalty and price sensitivity of their customer base in developing a business model to support this trend toward free content.
3	Consumer electronics show an increasing emphasis on personalization and customization.	Consumers will likely expect personalization options/features in service offerings.	Consider customization as more than a selling point, but rather as a mechanism of building long-term loyalty and raising switching costs.
4	Discretionary spending has increasingly shifted to consumer electronics, which have short product life cycles.	Consumers will likely expect the technology in their car to keep reasonable pace with the electronics on the market.	Assess their historical partners abilities to keep pace with technological advancement and forge strategic collaborations as necessary.

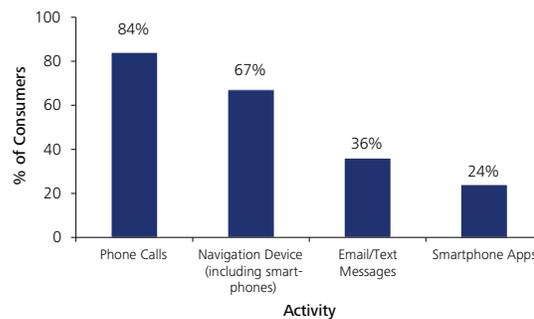
**Consumption of data has grown exponentially with the arrival of streaming audio and video; many consumers will likely come to expect increased in-vehicle connectivity**

Smartphone penetration is currently 43 percent of the total mobile market, and is anticipated to go beyond 50 percent early in 2012<sup>3</sup>. Mobile data traffic is also expected to increase 10X between 2011 and 2016, driven primarily by video traffic from tablets and smartphones<sup>4</sup> and largely rooted in the advent of faster 4G wireless networks and stronger chip sets.

As a result, many consumers are beginning to expect in-vehicle connectivity. In fact, as illustrated in Figure 1, which is based on a Deloitte’s recent telematics consumer survey, consumers are already performing a variety of connected tasks in their vehicles. Not surprisingly, making phone calls and using navigation systems ranked as the most popular connected services drivers use. However, more than a third of those surveyed indicated emailing or texting in the vehicle and nearly a quarter of all respondents indicated the use of smartphone apps. Thirty-seven percent also indicated they would like to stay as connected as possible while in the vehicle, and

many ranked streaming entertainment content as most desirable. Respondents also showed interest in connectivity beyond communications; 65 percent identified remote vehicle control as important to their next purchase, and 77 percent favored remote diagnostics that helped minimize dealer visits. For automakers with strong analytics capabilities, consumers’ desire for vehicles that deliver connectivity beyond communication features can translate into opportunities to enhance the overall vehicle ownership experience.

**Figure 1: Current in-vehicle connected device usage**



Source: Deloitte 2011 Telematics survey

Fifty percent of respondents rated accident and emergency services as very or extremely important, regardless of age. Thirty-two percent of respondents 18 to 34 years old rated streaming audio as very or extremely important in considering their next car purchase, and 31 percent felt the same about streaming video. In contrast, only 12 percent and 8 percent, respectively, of respondents over 35 years old placed this level of importance on streaming media.

**Strategic implications**

To take a competitive advantage, automakers should weigh the strategic priorities when deciding on a hardware strategy that delivers connectivity. Automakers should think holistically about the benefits enabled by connected

services for both their organization and consumers, and must determine what hardware is needed to make the business model for the desired feature set economically viable for both parties. Table 2 highlights some choices automakers might consider.

Table 2: Strategies to consider across the hardware continuum

Strategic priorities	<i>Hardware strategy continuum</i>	
	Connected	Embedded
<b>Services Offered/ Degree of Vehicle Integration</b>	<ul style="list-style-type: none"> <li>Utilizes consumer’s mobile bandwidth for heavy infotainment applications</li> <li>Limits access to vehicle-data and does not allow remote access</li> </ul>	<ul style="list-style-type: none"> <li>Utilizes embedded cellphone to connect to remote content</li> <li>Provides integration to vehicle data and can allow for remote access</li> </ul>
<b>Reliability</b>	<ul style="list-style-type: none"> <li>Unreliable during emergency events</li> <li>Relies on consumer-quality cellular access</li> </ul>	<ul style="list-style-type: none"> <li>Integrated into vehicle’s safety system</li> <li>Higher-powered antennae to increase connection</li> </ul>
<b>Cost/Risk Mitigation</b>	<ul style="list-style-type: none"> <li>Low cost/MSRP impact</li> <li>Consumer takes on wireless responsibility</li> </ul>	<ul style="list-style-type: none"> <li>High cost/MSRP impact</li> <li>OEMs takes on wireless usage risk</li> </ul>

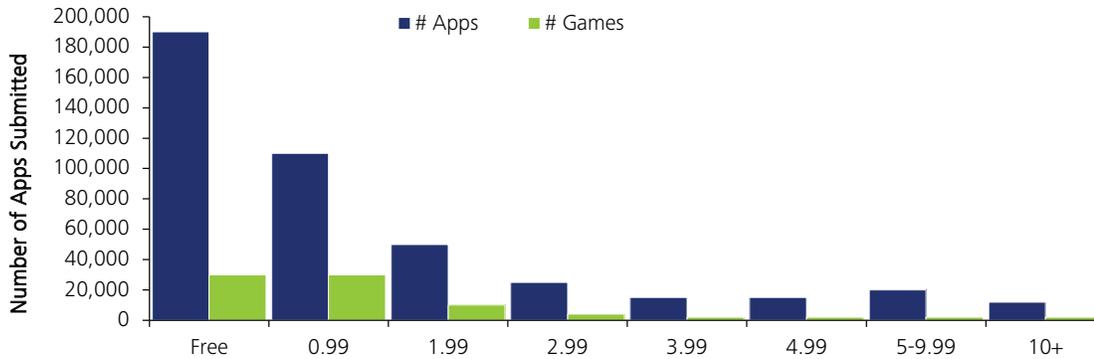
**The expectation of “free” content — in practice, accepting personally targeted advertising in exchange for valued content — will remain pervasive**

Today, the concept of “free” usage of Internet-based content is ingrained in consumers’ consciousness — an accepted quid-pro-quo of rich user experiences for consumption data and the targeted advertisements it drives. Common examples include email services that provide access at no charge in exchange for permission to mine users’ email content, or free use of smartphone applications in return for consent to analyze consumer

behavior and location, as well as display advertisements. Figure 2 demonstrates the dominance of “free” content. Nearly half of all apps that are downloaded from Apple’s app store are free, and the majority of the most highly downloaded apps (defined as more than 50,000 downloads) are also free.

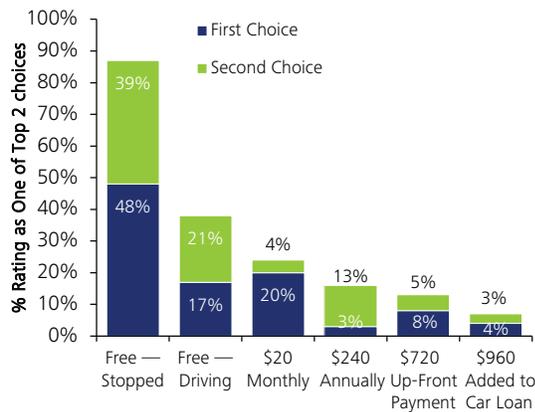
As a result of their experiences with access to free advertising-based content, consumers in general are beginning to expect the same type of “free” access from their connected vehicle technology, thereby forcing automakers to find ways to offset costs.

Figure 2: Distribution of iOS apps and gaming apps by price



Source: AppBrain 2011, 148Apps.biz

**Figure 3: Payment preferences**



Source: Deloitte 2011 Telematics survey

According to Deloitte’s telematics survey, when presented with a choice of “payment” options for generic telematics packages\*, respondents overwhelmingly preferred a “free” advertising-based option. However, as illustrated in Figure 3, a significant segment expressed a preference for some kind of payment plan option. Specifically:

- Nearly two-thirds (65 percent) expressed a top preference to receive free service in exchange for location-based advertising rather than accepting an out-of-pocket payment plan.

- Nearly 50 percent would be willing to receive free advertising-based services while stopped; only 17 percent would be willing to accept those same services while driving
- More than a third (35 percent) preferred an out-of-pocket plan as their first choice.
- Approximately 10 percent expressed a willingness to accept a payment plan, but refused any advertising-based option.
- In contrast, 29 percent of survey respondents indicated they would accept some type of advertising option, but would not accept a payment plan.

**Strategic implications**

As Figure 4 highlights, automakers should evaluate several trade-offs in developing a connected vehicle business model and develop a clear set of strategic priorities. Automakers should acknowledge and anticipate consumer demand for a “free content” business model; however, this should not be the only model considered, as it may not directly align with an OEM’s customer base. At the other end of the spectrum, some OEMs may plan to target demographics that would be most effectively served by a business model that rolls all subscription costs into a vehicle’s MSRP. Further, some OEMs seeking broad-based penetration should consider offering customers a choice between multiple payment options.

**Figure 4: Strategic priorities to consider when developing a connected vehicle business model**



\* Generic telematics package included GPS navigation, one Internet radio application, one on-demand streaming audio application, and a navigation-integrated point of interest search engine

Due to the significant development period associated with developing an ad-based solution (technical development, collaborator identification, negotiation, and alignment), any automaker coming to the market first with an ad-based solution may also create a significant point of differentiation from its competition. In considering this approach, however, automakers should also be wary of the consequences of “free” ad-supported services, including:

- Possible dilution of brand value, especially within the luxury segment
- Control over the customer experience
- Increased risk of driver distraction and commensurate liability
- Potential perception of privacy invasion and subsequent backlash
- Increased operational challenges in learning to manage in-vehicle advertisers

### **Many consumers expect an increased degree of personalization; personalization, in turn, can increase switching costs**

Customization and personalization of technology devices such as smartphones, tablets, laptops, and software have long provided consumer benefits that mobile and technology companies have utilized to create a unique experience and brand loyalty. This trend is now becoming more prevalent in the automotive industry as consumers’ desire to customize their vehicles seems to be growing.

According to the 2012 results of Deloitte’s annual Gen Y Automotive Survey, 72 percent of automotive consumers ages 19-31 want their smartphone applications to be accessible in a new car. The surveyed Gen Y consumers also want to be able to customize their car interiors after the initial purchase with embellishments that include technology features, with 77 percent indicating they would like to buy additional accessories and upgrades for their cars on an ongoing basis.

As a result of providing consumers increased opportunities to customize the technologies they use, many companies have created “switching costs” — the monetary and inconvenience costs many consumers consider when evaluating new technologies and/or service providers.

With respect to in-vehicle connectivity, consumers may also begin to expect that connected services are able to intuitively and remotely personalize their driving experience. According to Deloitte’s telematics survey:

- Forty-three percent of respondents stated the ability to sync personal data and settings from the vehicle to other devices was somewhat, very, or extremely important.
- Customization was a significant driver of their vehicle purchase decision; 37 percent described the ability to express themselves as somewhat, very, or extremely important in their vehicle purchase decision.
- Thirty-three percent cited the ability to customize their in-car technology experience as very or extremely important when considering a new vehicle purchase.

### **Strategic implications**

Customization should evolve beyond being a simple selling point. Consumers’ growing perceived value for personalization of the vehicles they drive will likely compel automakers to consider customization as a mechanism capable of increasing switching costs, and thereby building long-term brand loyalty.

Automakers should also determine which in-vehicle value-added experiences can be customized early in the vehicle development timeline and take steps to make these settings accessible remotely. Moreover, automakers should consider capabilities such as easily syncing contacts and calendars, and transfer of vehicle settings such as radio channels, downloaded apps, etc., as opportunities to raise “switching costs.” Finally, automakers may also consider customization earlier in the sales delivery process as a way to demonstrate services and attract or pull customers into a deal before the buyer enters the financing phase of the purchase process.

### Consumers are beginning to expect shorter product life cycles

Perhaps one of the most significant consumer trends impacting in-vehicle connectivity is the fact that consumer electronics commonly installed in or connecting to vehicles have far shorter product lives than automobiles. Automakers should consider how to reconcile this fact.

**Table 3: Consumer electronics products and warranties**

Illustrative Product Type	Common Warranty Period
Gaming Software	No Warranty
MP3 Player	1 year
Cell Phone	1 year
Plasma/LCD TV	2 years
<b>Automobile</b>	<b>3–10 years</b>

Note: Warranty period is used as a proxy for anticipated product life. Examples are intended to be illustrative, but are based on actual warranty information

As Table 3 illustrates, consumers have become accustomed to the short product life cycles of consumer electronics. Hardware such as phones, laptops, and desktops are often antiquated within two or three years, and software is commonly replaced by newer versions — frequently on an annual basis.

As a result of these experiences with electronics, new vehicle consumers will likely expect their vehicle systems to maintain compatibility with newly purchased consumer electronics for five to six years, the average length of new vehicle ownership in the United States<sup>5</sup>. Consumers may also increasingly expect their in-vehicle software to be automatically updated to keep pace with ongoing enhancements. In fact, according to Deloitte’s telematics survey, 62 percent of respondents considered minimizing the time and effort required to maintain software and services current as somewhat, very or extremely important when considering a vehicle purchase. This creates a

complex set of challenges for many automakers who should determine how to most effectively accommodate consumer desires while developing “automotive-grade” hardware and software.

### Strategic implications

To address this trend and keep pace with the consumer electronics industry, automakers should assess their historical collaborators’ abilities to deliver rapid technology advancements in a timely manner, and in some cases, consider forging new strategic collaborations. Recent strategic collaborations announced between OEMs, automotive suppliers, and other nontraditional collaborators outside of the automotive industry suggest many automakers are already executing against this trend.

Given the long lead times for vehicle hardware development, automakers should develop ways to determine what content requires automotive-level specification, or “automotive-grade,” and what content does not. Automakers should determine how to either revamp or accelerate the development process, or better anticipate the direction of consumer electronics to confirm the most effective, long-term compatibility. To do so, automakers should adapt and become proficient in this distributed ecosystem, and engage in forming new collaborations with technology companies that are able to provide a view into consumer technologies in the pipeline. Automakers should also better collaborate with their automotive teams to better manage the pace of technology change than traditional Tier One automotive supplier relationships.

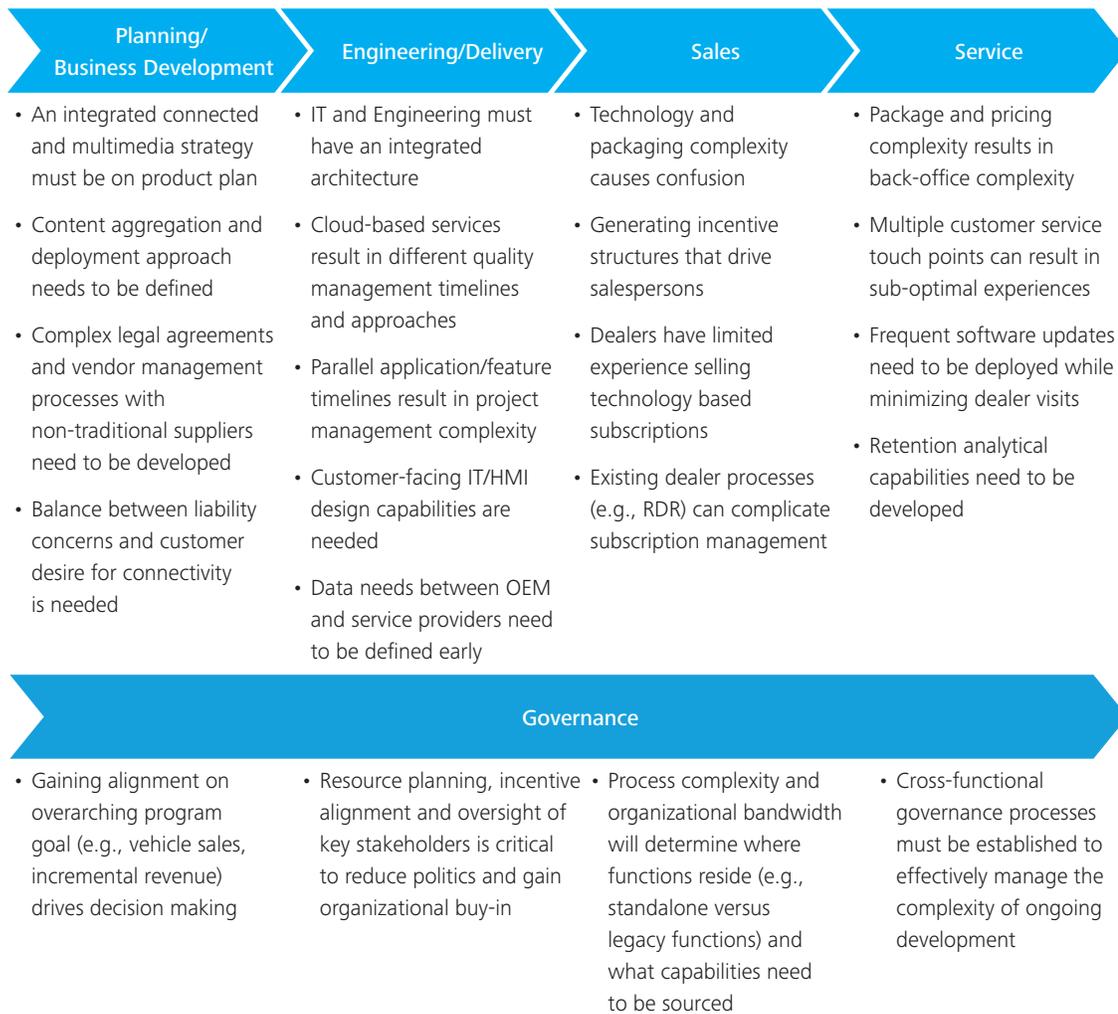
Finally, automakers should also be wary of their approach to post-purchase software updates and should balance customer expectations for the most current technology available with the potential side effects of frequent dealership visits — where software upgrades may be viewed much in the same way as product recalls and thereby negatively impact customer perceptions and brand loyalty.

## Getting into the game

### Operational challenges and governance

Launching a connected platform is a transformative action that can often generate operational pains and consequently requires significant governance discipline, as illustrated in Figure 5.

Figure 5: Operational and governance challenges



Source: Deloitte analysis

Automakers that have yet to enter the “connected vehicle” industry should keep in mind three important themes when considering a business model:

- Vehicle connectivity is different from other areas of automotive operations. As such, understanding and developing a connected vehicles business model and defining supporting services require a specialized set of skills. Also, we have seen OEMs oversimplify the requirements associated with this area and often do not recognize the complexities of launching a new connected vehicle service.
- OEMs sometimes believe they can bucket the responsibility of developing and owning vehicle connectivity into one function, such as IT or product development. In reality, effective solutions require a cross-functional approach that spans the enterprise.
- As the industry and specific manufacturers figure out the “right” connected vehicle solutions for their customers

and organizations, automakers may frequently make changes to the external collaborators they choose to work with in developing their business models. To effectively manage these frequent changes and rapid cadence, efficient contract management processes should be developed and implemented to confirm that the interests of the parties are addressed while also minimizing potential disruptions to consumer services.

**Navigating change**  
**The next 10 years**

As Figure 6 illustrates, the adoption of connected vehicle technologies over the next decade is likely to continue to increase steadily as the industry continues to experiment with various business models and automakers become increasingly capable of meeting the challenges previously outlined.

**Figure 6: Forecasted diffusion of telematics features**

	2013	2014	2016	2016	2016	2018	2018	2018	2018
<b>Feature</b>	Streaming media	Virtual guide books	Cloud-based settings	Smart part failure detection	Integrated parking finder	Vehicle to infrastructure	Intelligent in-vehicle transactions	V2V awareness	Near field transactions
<b>Description</b>	Streaming audio and video	Guide books downloaded virtually to the vehicle	Cloud based personal setting transferred within a brand line	In-vehicle analytics to detect part failures in advance	NAVI integrated parking spot identifier	Communication between vehicle and infrastructure to dynamically reroute	E-wallet integration allowing for voice-enabled in-vehicle transactions	V2V awareness to prevent accidents	Near field communications for transactions

Source: Deloitte analysis

Advancements in existing and new technologies that positively impact the ownership and driving experience is likely to also spur adoption, as can the other key influencers described in the box to the right.

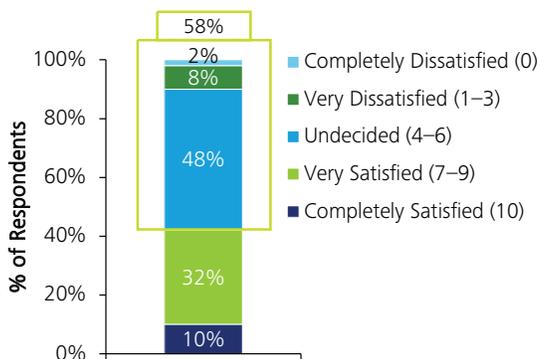
Consumers also continue to highly value safety and security features. According to Deloitte's 2012 survey of Gen Y automotive consumers, safety features such as collision avoidance and sleep detection systems ranked as the most sought-after vehicle technologies, above both hardware and software technologies like navigation and voice texting. Additional research indicates 54 percent of consumers still identify automatic crash notification as important to their next vehicle purchase<sup>6</sup>. And 58 percent of today's consumers, according to Deloitte's telematics survey, are dissatisfied or neutral about current options for avoiding accidents, as illustrated in Figure 7. Consumer demand for these features will likely result in innovations that will further enhance driver safety, and thus fuel the adoption of connected vehicle services.

In addition to safety offerings, services that can enhance driver convenience and enrich travel will likely be key elements in enhancing the customer experience and overall value. According to Deloitte's telematics survey and as illustrated in Figure 8, 43 percent of respondents are dissatisfied or neutral about current options for enhancing comfort.

**Specific influencers of advanced connected services adoption**

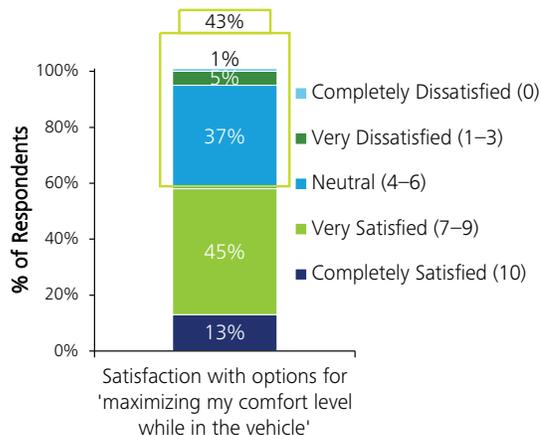
- **Collaboration:** Technologies required for the deployment of advanced telematics services already exist today. The challenge lies in the need for all relevant players to collaborate in integrating and aggregating technology and data to build the relationships that will transform these technologies into stable, consumer-ready offerings.
- **Open platforms and common standards:** Many of the services, such as V2X communication, will require interoperability and communication across competing OEMs before the full potential can be realized. This necessitates an agreement on common standards and protocols for capturing and transmitting vehicle data.
- **Bridging product life cycles:** Automakers should demonstrate discipline in cohesive product planning to help bridge the gap between the vastly different product life cycles of vehicles (five to seven years) and consumer electronics/software (less than one year), and find ways to bring innovations from the latter into consumers' cars and trucks throughout their vehicle life cycles.

Figure 7: Satisfaction statistics with existing collision avoidance systems



Source: Deloitte 2011 Telematics survey

Figure 8: Satisfaction statistics with options for improving comfort level



Source: Deloitte 2011 Telematics survey

### Emergence of the “v-space”

The final trend and opportunity we see emerging over the next several years from the “connected vehicle” industry is the creation of the “v-space.”

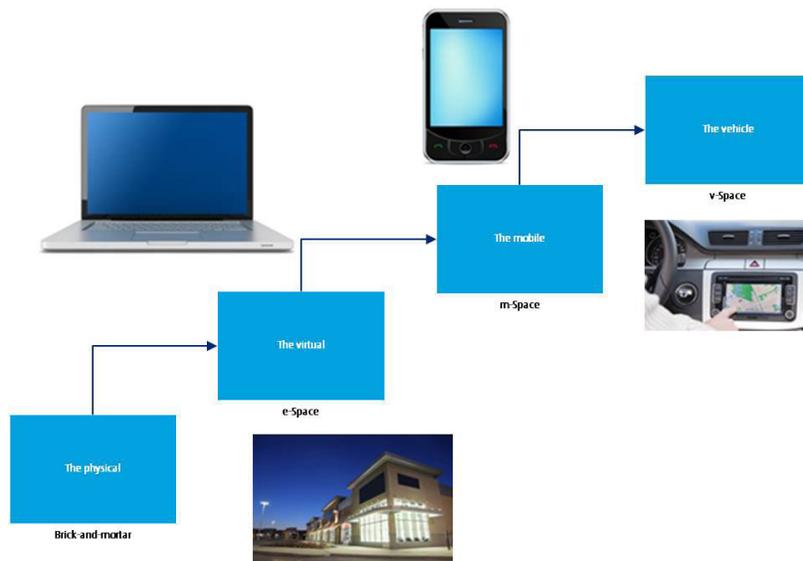
As Figure 9 illustrates, over the last 20 years, we have evolved from a physical world of brick-and-mortar, to the online world, then into a mobile world. However, for connected services, there is still tremendous opportunity to explore the untapped world for in-vehicle services that are truly different and not merely duplicative of mobile services. It’s not just the e-space, nor the m-space for mobile, but a v-space, where this rare customer value can be realized.

The v-space is really the final frontier for automakers where certain apps and services are designed to make their mark on the driving experience in a way that does not duplicate what is available via smartphone. This will not only be driven by advancements in technology, but also, as we’ve recently seen, by driver distraction laws that will place pressure on creating an integrated experience as opposed to letting drivers continue to use their smartphones while driving.

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As laws addressing distracted driving continue to evolve, automakers will experience increased complexity in delivering in-vehicle connected services. Integrating voice activated hardware and services into a cohesive user experience are options automakers might consider. Forty-one percent of respondents to Deloitte’s telematics survey rated voice activated technology in their vehicles as very important.

Figure 9: Evolution of the “v-space”



V-space is not just about the vehicle-driver connectivity. Technology will likely continue to evolve and change how vehicles exchange information with each other, which can further enhance safety and the driving experience. Improvements in infrastructure, electrical grids and broadband can also enable vehicle connectivity. In the midterm, safety systems can start to rely on data from other vehicles, including speed, stability control usage, and braking style. Weather data can become more and more granular to provide relevant microclimate information to drivers on different roads, and traffic information will likely become both an input and output to increasingly real-time safety systems. Automakers with the ability to connect these features — through hardware and software, as well as enhanced human-machine interface capabilities — to deliver a different customer and driving experience will likely excel in this new v-space.

### Conclusion

The “connected vehicle” industry will likely continue to mature at a steady pace over the next 10 to 15 years. Spurred by ongoing advancements in technology, improvements in supporting infrastructure, and increasing consumer demand, automakers will likely find themselves in a period of experimentation as the industry defines the required model that is viable for the stakeholders in the value chain.

Despite the challenges and volatility that is likely to accompany this brave new world for the next several years, one thing is certain — the role of the vehicle will continue to be redefined and expanded beyond transportation. Tomorrow’s “connected vehicle” will likely become a node on the mobile communications highway capable of connecting drivers with friends, family and information at a pace they desire. At the same time, automakers have the opportunity to make driving safer and reduce the impact vehicles have on the environment by leveraging new V2X communications pathways that can also be formed as a result of these new and exciting developments. Those automakers that take a cross-functional approach in developing their connected services business model and engage functions across the enterprise, while also creating services that address consumer experiences from other industries may have the most significant chances of taking an advantage against their competitors.

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