Connected Car in Europe
Strategies and technologies for connected driving
Dear Reader,

The fact that Connected Car applications and features are no longer an option is very clear to all the OEM’s and Tier-1 suppliers. The question therefore is about creating ideas and taking them through the new product introduction cycle as product features. The next wave of Automotive is also about how the technologies can help address issues of Urbanization — Congestion and Pollution and provide seamless, safer mobility to customers. The initiatives that are gaining ground as experiments across Europe include Driverless Cars and Urban Mobility in the SMART cities.

Responding to these challenges manufactures need to build new capabilities. Convergence of multiple technologies such as Digital and Telematics and leveraging the Internet of Things will be crucial. As manufacturers invest billions of euros into these programs they also need to ensure alignment of Supply Chain and Fulfillment processes in a value chain that is becoming increasingly dependent on the electronics manufacturing ecosystem. Therefore, delivering Superior Experience to customers need Connected Car applications as well as aligned fulfillment practices. Cognizant’s Connected Vehicle Services addresses these needs with a range of solutions such as Car360.

Another critical component for most OEM’s is Monetization. Cognizant’s Analytics solutions can assist the OEM’s and T1’s in realizing positive returns on their Connected Car investments. These analytics solutions present interesting possibilities for cutting down design cycle times, help in predicting failures and improve quality while exploring avenues for tie-ups with insurers and retailers. Cognizant solutions also take into account Data Privacy, Security and an integrated infrastructure operations to assist the automotive ecosystem.
Company profile Cognizant Technology Solutions

Cognizant is a leading provider of information technology, consulting, and business process outsourcing services, dedicated to helping the world's leading companies build stronger businesses. Headquartered in Teaneck, New Jersey (U.S.), Cognizant combines a passion for client satisfaction, technology innovation, deep industry and business process expertise, and a global, collaborative workforce that embodies the future of work. With over 75 development and delivery centers worldwide and approximately 211,500 employees as of December 31, 2014, Cognizant is a member of the NASDAQ-100, the S&P 500, the Forbes Global 2000, and the Fortune 500 and is ranked among the top performing and fastest growing companies in the world.

We combine automotive industry domain expertise with our capabilities in user interface design, mobility, social media and analytics to develop various Digital Automotive Experience applications, such as those targeted at new age consumers. The automotive industry is fast catching up with the consumer electronics industry in terms of lifestyle applications and this service offering from Cognizant is designed to bridge the gap. We build a range of applications such as pre-purchase research tools for car buyers, social media intelligence for OEMs or vehicle service management systems for car owners.

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The connected car topic has left its visionary status: over 40% of the companies are currently in ‘production mode’: integrating their connected car offerings into products (8%), implementing their rollout (22%) or running operation (13%). But over half of the suppliers and manufacturers (55%) are still at the beginning with research and development activities (14%), the design and implementation (30%) or the testing (11%) of connected car offerings.

Car-to-driver connectivity is obviously the most interesting area: 41% of suppliers and 48% of manufacturers (with connected car offerings) have got a strong focus on car-to-driver connectivity. Furthermore, connected car solutions will most likely become both added value to new vehicles and add-on product to older vehicles: 67% of the companies focus on embedded connected car solutions and 35% on aftermarket solutions.

The ‘second wave’ is coming: Basically, information services, such as environmental information (69%), news (61%) and navigation (52%) services are the primary services provided currently. In the medium term, the focus will be on driving assistance (21%) and security services (14%), which will push the maturity of corresponding ‘car-to-x connectivity’ technologies.

Collaboration between manufacturers and suppliers is key: Manufacturers and suppliers are facing a variety of challenges: About one-third of all companies surveyed consider the lack of standards across manufacturers and suppliers (38%), the entrants of new competitors (36%) and the integration of different technologies and service provider ecosystems (35%) a major challenge. Manufacturers and suppliers agree: Standardization adds value and makes business scenarios work, but hinders market positioning and opportunities.
Core statements II

**Beyond technological realization:** For almost 3 out of 4 companies, connected car represents a long-term strategic topic. When it comes to business models, companies most often state consistent user experience (72%) and the definition of an adequate invoicing mode (70%) as major challenges in terms of connected car offerings. Especially for German and British companies both issues represent major challenges while French companies seem to handle these challenges more easily.

**Connected car offerings are perceived to be key business drivers in the future:** Nearly half of the companies surveyed completely or mostly agree that connected car offerings will be the major business drivers in the future (52%). Furthermore, connected car offerings will become a complementary business: 95% of CxOs surveyed are of the opinion that connected car offerings will not be a substitute for the current business.

**Common understanding:** Connected car services will become a mandatory requirement (98%) and a main differentiator for vehicle manufactures (87%). But just 17% of the companies intend to invest in connected car technologies within the next 12 months or the next two years. The majority have no investment plans, because projects are already at implementation stage or the topic is not of relevance. Nearly 70% of companies that are planning or discussing investments are considering investing in security technologies. Infotainment solutions as well as in-car connectivity technologies are of importance for more than 60%.

**Support from third-party service providers is welcomed:** 69% of the companies surveyed prefer joint product development with external service providers. The most requested services include software development (95%), security (90%) and testing services (87%). Consulting and IT service providers are very important for over 30% of the companies surveyed, whether manufacturers or suppliers.
Key decision making: Corporate management are still the major driving force for many companies in the automotive sector, combining investment promotion with budget allocation responsibilities. In large enterprises, investments are more often promoted by business units while corporate management and IT rather represent the role of the budget owner.

There are (still) plenty of investment obstacles for connected car offerings! It is worth noting that 64% of all CxOs surveyed state: “Connected car is not a focus topic.” – with no differences between manufacturers and suppliers. Security challenges rank third behind unclear costs of change and political barriers as important obstacles. Political support is requested in some important areas. But the most important area for politics (with over 40% of the votes) is supporting legalization to enable piloted driving.
1) Background and methodology
With the connected car topic the automotive industry is about to experience a technological leap that will substantially change mobility. Automotive manufacturers are increasingly considering the integration of information technology and external services in their cars.

Under connected car technologies we understand all (hardware & software) technologies within a vehicle that enable (one- or two-way) communication between the vehicle and a third party (e.g. driver, environment, other vehicles) as well as all infrastructure and back-end technologies that are required in order to complete a connected car business case.

Under connected car services we understand all information- and communication-related services that are offered (to a driver or a vehicle) from outside the vehicle by original equipment manufacturers (OEMs) or third-party service providers.

This study explores the strategies of the automotive industry to develop and launch connected car technologies and services.

The projects include topics such as cloud computing, big data, vehicle connectivity, Internet of Things, or autonomous driving. Leading car manufacturers as well as software and hardware suppliers are working together to develop a successful service value chain for connected car scenarios.

Against this background PAC conducted a survey among 250 CxOs in European automotive companies (France, Germany, Italy, the Netherlands, Spain, Sweden and the UK) with more than 50 employees.

The study deals with the following questions:

- What is the status quo in terms of the development of connected car services and which areas are in the focus?
- Which trends and changes are important for (future) connected car offerings?
- What are the (main) challenges that automotive companies are facing in general and in terms of connected car offerings?
- What role do politics and standardization play regarding connected car offerings?
- What are the strategies and objectives that automotive companies pursue?
- How important are external services and the cooperation with different players?
- What are upcoming investment plans and who are the decision makers?
Between November 2014 and January 2015, 250 CxOs in European companies of the automotive sector were surveyed by telephone (CATI). (In the following analysis, Italy, the Netherlands, Spain and Sweden are summarized as „Other“.)

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Connected Car in Europe
Automotive manufacturers and suppliers with 50 and more employees

The sample contains companies with **50 or more employees** and comprises **manufacturers** and **suppliers** from the **automotive sector**.
2) Status of connected car development projects
Over half of the European companies are (still) at the beginning with their R&D activities, design & implementation and testing

Connected car offerings finally made it to the portfolios of car manufacturers and suppliers comprehensively. Almost all companies participating in this survey are currently actively working on dedicated offerings. Their distribution along the value chain, however, varies significantly. While a group of early adopters have already brought their offerings to the market or are busy with the rollout, PAC has identified a “second wave” of connected car offerings which is currently dominating the market with a major focus on designing and developing new solutions. PAC believes that the topic has finally left its visionary status and is on its way to become one of the driving forces for the automotive industry.

First of all, we asked all automotive companies in our survey in which stage of the value chain they were currently active in terms of connected car offerings.

The survey results show that over 40% of the companies are currently in ‘production mode’: integrating their connected car offerings into products (8%), implementing their rollout (22%) or running operation (13%).

But over half of suppliers and manufacturers (55%) are still at the beginning with research and development activities (14%), the design and implementation (30%) or the testing (11%) of connected car offerings.

Just a few (2%) indicate that they do not have any connected car offerings at the moment.

Between suppliers and manufacturers as well as small, medium-sized and large companies there is not much difference.
European countries are on a par with regard to value chain development

In general, all European countries represented in this survey are comparable in terms of connected car value chain development. However, there are some characteristics where the countries differ: Especially in France and other European countries such as Italy, Spain or the Netherlands, design and implementation represent the majority of current activities, which significantly differs from the UK and Germany. In those countries, design and implementation activities are also at a high level, but Germany and the UK are leading when it comes to R&D activities in Europe.

In terms of rollout and operational activities there is no real difference between the individual countries. At each of the specified stages over a third of the participating companies already have connected car offerings on the market. These companies are mainly positioned in the large enterprise segment and are rather OEMs than suppliers.

At which stage of the value chain is your company currently active in terms of connected car offerings?

<table>
<thead>
<tr>
<th>Region</th>
<th>Integration into products</th>
<th>Rollout</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>8%</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>France</td>
<td>8%</td>
<td>37%</td>
<td>18%</td>
</tr>
<tr>
<td>Germany</td>
<td>19%</td>
<td>27%</td>
<td>23%</td>
</tr>
<tr>
<td>UK</td>
<td>18%</td>
<td>26%</td>
<td>20%</td>
</tr>
<tr>
<td>Other</td>
<td>11%</td>
<td>32%</td>
<td>25%</td>
</tr>
</tbody>
</table>

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Connected car solutions will primarily be embedded in new vehicles but also represent a promising aftermarket.

Does your company focus on developing embedded connected car solutions or on aftermarket connected car solutions?

- Embedded connected car solutions: 67%
- Aftermarket connected car solutions: 35%

Asking about how the companies bring their connected car offerings to the market, it seems like connected car solutions are mainly a primary market object, being embedded in vehicles before shipping. Only around a third of all participants are considering connected car solutions as a driver for their aftermarket business. This, however, is still a significant share, which suggests that these solutions will most likely become both added value to new vehicles and add-on products to older vehicles.

However, especially manufacturers (98%) in the large enterprise segment (87%) regard connected car solutions as added value embedded in their core products. Across the European landscape this is confirmed mainly in the UK and Germany, but also in other countries this statement represents the prevailing opinion.

While this result could have been expected in general, it is a bit surprising how strong the emphasis on aftermarket solutions is already at the moment. PAC interprets this as a good sign for the development of the overall industry and the role of connected car technologies in the market, as overall business scenarios are only feasible if the majority of vehicles on the road (including older ones) are capable of being connected.
All companies with connected car offerings were asked what was the focus for their connectivity strategy.

- Car-to-driver connectivity (infotainment systems, human machine interfaces, simple drive assistant) is obviously the most interesting area with strong focus for both supplier (41%) and manufacturers (48%).
- But also In-car connectivity (CAN bus systems, Ethernet, WLAN) and Car-to-x-connectivity (integration of remote services, security services, traffic management services) are important.
- Just the topic Car-to-car connectivity (piloted driving, piloted parking) plays a minor role at the moment.
- Regarding company size there is not much difference.

In terms of technological maturity in the market, the current focus of solutions and offerings is basically still on connectivity within the vehicle. This can be seen in the predominance of a “strong” and “very strong focus” on “car-to-driver” as well as “in-car” connectivity. These offerings, such as infotainment systems and simple drive assistants, but also technologies such as CAN bus systems or Ethernet in the car are already available on the market. The ‘second wave’ mentioned before is basically going to focus more on the “car-to-x connectivity” domain, which comprises topics such as remote service integration, security concepts or traffic management systems. These projects are currently in R&D or design phases and expected to enter the market within the next years.

Finally the results show that “car-to-car” connectivity and, coupled with this, the concept of piloted driving are still of minor relevance for companies in Europe. In some countries one reason for that is a lack of political support for this topic, which we are going to go into more detail about later in this study. However, PAC believes another important reason is that vehicle manufacturers have not yet defined clear strategies on how to position themselves towards the topic of autonomous driving.
Strong focus on car-to-driver and in-car connectivity throughout Europe

What is your focus in terms of connectivity?

<table>
<thead>
<tr>
<th>Region</th>
<th>Car-to-x connectivity</th>
<th>Car-to-driver connectivity</th>
<th>In-car connectivity</th>
<th>Car-to-car connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>28%</td>
<td>46%</td>
<td>28%</td>
<td>8%</td>
</tr>
<tr>
<td>France</td>
<td>25%</td>
<td>52%</td>
<td>27%</td>
<td>7%</td>
</tr>
<tr>
<td>Germany</td>
<td>28%</td>
<td>45%</td>
<td>35%</td>
<td>11%</td>
</tr>
<tr>
<td>UK</td>
<td>27%</td>
<td>51%</td>
<td>35%</td>
<td>6%</td>
</tr>
<tr>
<td>Other</td>
<td>32%</td>
<td>35%</td>
<td>31%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Comparing the technological maturity of connected car offerings in Europe, all major countries have a similar maturity level with current solutions basically focusing on in-car-connectivity and car-to-driver connectivity. In each country, 4 out of 5 companies either have a “strong focus” or a “very strong focus” on these two domains.

It becomes more differentiated when taking a closer look at the other two domains: with respect to car-to-x connectivity, it seems that British companies have a slightly stronger focus on that domain than companies in other countries. As the British market in general is rather service-oriented, and automotive services come into play in this domain, this might be an explanation. At the same time, this domain is underrepresented in countries such as Italy, the Netherlands, Spain or Sweden.

It seems to be the other way around in terms of car-to-car connectivity, where especially France and Germany are taking a lead role with large manufacturers such as Renault, Volkswagen or BMW working on these technologies, while British companies do not put a strong focus on that yet.
Companies have a broad-based focus on connected car offerings

While the current focus is basically on connectivity within the vehicle, there is no real emphasis in terms of R&D activities. All domains, from the design and development of technologies, applications and services over integration issues up to back-end systems and service provision, are in the focus of manufacturers and suppliers. This highlights the complexity of the topic as none of these domains would be valuable on the market as a standalone offering. Only in a joint scenario, connectivity technologies, applications, services and back-end systems will reflect a valuable connected car solution. In terms of maturity, solely connectivity technology development and infrastructure enablement have already reached higher levels and may no longer remain in the strong focus of R&D activities for more and more companies.

- All companies that currently have connected car offerings at least in the early stages of development were asked which areas they focus on.
- Over one-in-three companies put a very strong focus on integration services (36%) with only marginal differences between manufacturers and suppliers as well as small, medium-sized and large companies.
- But interestingly, detailed analysis shows that suppliers (36%) are much more strongly focused on the design and development of connected car applications, including mobile apps, than manufacturers (15%).
### Design and development are domains of France and Germany while service provision is a British domain

When taking a closer look at the three most important R&D activities, it is interesting to see that indeed there are certain differences across the countries. In terms of the development of applications and services it seems that especially French and German companies are putting a strong focus here while, for instance, British companies are rather concentrating on the provision of connected car services. In Germany, companies also put a strong focus on the development and integration of back-end systems and infrastructure enablement. These topics seem to be less important in the other countries.

Comparing manufacturers and suppliers results show that car manufacturers across all countries are basically concentrating on integration issues and service provision while suppliers are mainly focusing on application and service development.

### Where do you currently focus your efforts in research and development?

<table>
<thead>
<tr>
<th>Region</th>
<th>Design and development of connected car applications</th>
<th>Design and development of connected car services</th>
<th>Provision of connected car services</th>
<th>Development and integration of back-end systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>25%</td>
<td>50%</td>
<td>25%</td>
<td>49%</td>
</tr>
<tr>
<td>France</td>
<td>27%</td>
<td>60%</td>
<td>23%</td>
<td>63%</td>
</tr>
<tr>
<td>Germany</td>
<td>27%</td>
<td>51%</td>
<td>32%</td>
<td>51%</td>
</tr>
<tr>
<td>UK</td>
<td>22%</td>
<td>41%</td>
<td>20%</td>
<td>43%</td>
</tr>
<tr>
<td>Other</td>
<td>24%</td>
<td>45%</td>
<td>21%</td>
<td>39%</td>
</tr>
</tbody>
</table>

*Shares in percentage of all companies that have connected car offerings at least in early stage of development, n = 246 (60/75/49/62) (very strong & strong focus)*

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The majority of companies already offer environmental information, entertainment and navigation services

The ‘second wave’ theory is also confirmed when taking a closer look at current service offerings. Basically information-related services such as environmental information, news and navigation services, are in the center of service design and provision at the moment. In PAC’s view this situation matches the connectivity maturity level (as indicated before) as these services mostly come along with a mature “car-to-driver” connectivity in the vehicle.

It is interesting to see where the focus is going to be in the medium term. Here, driving assistant services as well as security and after-sales services will basically become more important and will push the maturity of corresponding “car-to-x connectivity” technologies on the market as well.

- More than two-thirds (69%) of all companies surveyed – whether they have connected car offerings or not – have environmental information services (including weather, traffic or travel information for example) already in place.
- Furthermore: 61% of companies offer news & entertainment services (e.g. music, video streaming) and every second enterprise offers navigation services (e.g. car finder).
- The most interesting areas in the near future will obviously be security (e.g. stolen vehicle tracking) and driving assistant services (distance control, lane control, traffic signaling). Interestingly, every third company would like to offer the latter in the short or medium term.

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After-sales and security services are important offerings today – driving assistance will enter the market in the medium term

Which connected car services does your company offer today or are planned in the short or medium term?

<table>
<thead>
<tr>
<th>Region</th>
<th>After-sales services</th>
<th>Security services</th>
<th>Communication services</th>
<th>Driving assistant services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>43% 2% 5%</td>
<td>42% 6% 14%</td>
<td>38% 4% 2%</td>
<td>13% 12% 21%</td>
</tr>
<tr>
<td>France</td>
<td>63% 2% 0%</td>
<td>44% 10% 7%</td>
<td>51% 2% 2%</td>
<td>8% 7% 20%</td>
</tr>
<tr>
<td>Germany</td>
<td>42% 1% 11%</td>
<td>42% 3% 19%</td>
<td>44% 4% 1%</td>
<td>15% 10% 22%</td>
</tr>
<tr>
<td>UK</td>
<td>39% 0% 4%</td>
<td>37% 3% 16%</td>
<td>29% 0% 2%</td>
<td>16% 10% 18%</td>
</tr>
<tr>
<td>Other</td>
<td>28% 5% 5%</td>
<td>43% 5% 12%</td>
<td>26% 8% 2%</td>
<td>11 20% 25%</td>
</tr>
</tbody>
</table>

In terms of after-sales services, German companies are going to follow their French competitors, massively extending their offerings in this area in the medium term. French companies in turn are going to put a medium-term focus on providing services regarding driving assistance, which, however, seems to be an important market driver in all countries.

In the medium term, security services will also become a market driver for companies in the UK and Germany while companies in the other European countries that participated in this survey are basically going to focus on driving assistant services.

These results nicely show the concentration of different go-to-market strategies among European companies in the automotive sector and correlates with the statement (considered in the following chapters) that connected car offerings strongly differ depending on local market requirements.
The results of the survey show that there are currently two ‘waves’ of connected car offerings on the European automotive market: There is one group of early adopters that have already brought their offerings to the market or are currently busy rolling out their solutions and services. This group represents around 35% of all participants. And there is a ‘second wave’ of companies (55%) whose connected car offerings are currently in the design and development phase. Only 2% of the companies are not working on connected car solutions at the moment. This shows that the topic has already reached a serious level of maturity and is on its way to become one of the driving forces for the automotive industry.

Taking a closer look at this maturity level there are two major conclusions to be taken from the results of the survey: Solutions and offerings that are currently available on the market are basically concentrating on connectivity within the vehicle. These include infotainment systems and early drive assistants but also technologies such as CAN bus systems or Ethernet in the car. In the medium term, the ‘second wave’ will bring more solutions around “car-to-x connectivity” onto the market, which will include topics such as remote service integration, security concepts or traffic management systems.

Automotive companies across all participating countries in Europe confirm that connected car solutions will mainly be a primary market object. Especially manufacturers (98%) confirm that they embed connected car technologies into their vehicles before they get shipped. Furthermore, the topic will also play an important role on the aftermarket. Considering modern security concepts that only make sense if all cars are connected, such technologies can also be sold as added value to older vehicles already in use.
3) Current challenges in connected car offerings
Manufacturers and suppliers face a variety of challenges

- About one-third of all companies surveyed consider the lack of standards across manufacturers and suppliers, the entrants of new competitors and the integration of different technologies and service provider ecosystems (content providers, travel services, diagnostics & maintenance) as a major challenge.
- Interestingly, small (50-499 employees) and medium-sized companies (500-1,000) as well as suppliers (44%) are more often concerned about new competitors entering the market.
- Furthermore, the enabling of connected car services across vehicles at multiple different life cycle stages is a major topic (34%) especially for small-sized (50-499 employees) companies.
- In contrast to that: The availability of connectivity infrastructure is considered less of a challenge.

Automotive companies are well aware of the fact that for successful connected car solutions, collaboration between manufacturers and suppliers is key. In order to make collaboration a lot easier, industry-wide standards for technologies, software development and service provision need to be applied and accepted. However, there are plenty of obstacles in this venture. Consequently, this represents a major challenge for most of the companies.

Furthermore, companies also recognize that it is not necessarily only external market challenges (like standardization or new competitors) that need to be taken care of. Companies regard internal challenges to be almost at the same level of importance: e.g. better integration of partner ecosystems and adjusting organizational structures to a new market positioning.
Standardization divides the European automotive landscape into two parties: standard drivers and users

How do you rate the challenges for your company?

<table>
<thead>
<tr>
<th>Region</th>
<th>Lack of standards across manufacturers and suppliers</th>
<th>New competitors entering the market</th>
<th>Integration of different technologies and service provider ecosystems</th>
<th>Management of internal change at manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>38%</td>
<td>36%</td>
<td>35%</td>
<td>34%</td>
</tr>
<tr>
<td>France</td>
<td>20%</td>
<td>40%</td>
<td>28%</td>
<td>25%</td>
</tr>
<tr>
<td>Germany</td>
<td>30%</td>
<td>39%</td>
<td>30%</td>
<td>31%</td>
</tr>
<tr>
<td>UK</td>
<td>52%</td>
<td>38%</td>
<td>40%</td>
<td>44%</td>
</tr>
<tr>
<td>Other</td>
<td>54%</td>
<td>28%</td>
<td>44%</td>
<td>38%</td>
</tr>
</tbody>
</table>

The perception of the four major challenges, however, is significantly varying across the countries in this survey. While standardization represents a major challenge for almost every second company in the UK, Italy, Spain, the Netherlands and Sweden, it hardly has the same relevance for companies in France and Germany. This indicates a certain market structure of “drivers” and “users” of industry standards and, in PAC’s view, there are certainly different interests in defining standards as the following results will show.

New competitors entering the market are basically also regarded as a major challenge in countries where manufacturers and suppliers have already held a market leading positioning for decades (Germany, France, UK). In smaller markets this challenge seems to be less critical. The management of internal changes as well as the integration of partner ecosystems seem to be major challenges for every third company in each of the countries with a little emphasis on the UK market. Here reorganization and process redesign do not appear to be among the most popular endeavors. PAC especially expects this last challenge to become one of the most difficult ones for vehicle manufacturers in the future.
Manufacturers and suppliers agree: Standardization adds value and makes a scenario work, but hinders market positioning and opportunities

Taking a closer look at the requirement of standardization, it becomes clear that in this process companies are faced with both sides of the coin. While there is a common understanding among all survey participants that standardization is not a waste of time and adds value to connected car offerings, results also show that standardization represents an obstacle in terms of market positioning and opportunity generation. Here the individual role of a company within the value chain comes into play: while vehicle manufacturers surely have an interest in the protection of their intellectual property and market positioning (and consequently rather opt against standardization which does not represent their own standard), companies on the supply side that have to deal with many different requirements from individual manufacturers at the same time, of course have a natural interest in standardization, which will result in better efficiency and higher profits for them.

As expected: Nearly every respondent agrees that standardization adds value to connected car offerings (97%) and takes the view that it is an essential need to make a scenario work (96%).

And there is hardly any difference between suppliers and manufacturers or small, medium-sized and large companies.

But at the same time, the CxOs believe that standardization hinders market positioning and opportunities – interestingly the bigger the company, the more CxOs agree.

Finally, for the overwhelming majority of respondents standardization is not a waste of time and does not mean ‘follow the leader’. Here again, there is no difference between suppliers and manufacturers or between company sizes.

As expected: Nearly every respondent agrees that standardization adds value to connected car offerings (97%) and takes the view that it is an essential need to make a scenario work (96%).

And there is hardly any difference between suppliers and manufacturers or small, medium-sized and large companies.

But at the same time, the CxOs believe that standardization hinders market positioning and opportunities – interestingly the bigger the company, the more CxOs agree.

Finally, for the overwhelming majority of respondents standardization is not a waste of time and does not mean 'follow the leader'. Here again, there is no difference between suppliers and manufacturers or between company sizes.
Standards add value to connected car offerings but they also hinder market positioning

How do you rate the statements about the standardization topic for connected car developments?

<table>
<thead>
<tr>
<th>Standardization...</th>
<th>...adds value to connected car offerings.</th>
<th>...is an essential need in order to make a scenario work.</th>
<th>...hinders market positioning and opportunities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>46%</td>
<td>34%</td>
<td>29%</td>
</tr>
<tr>
<td>France</td>
<td>32%</td>
<td>43%</td>
<td>28%</td>
</tr>
<tr>
<td>Germany</td>
<td>45%</td>
<td>28%</td>
<td>23%</td>
</tr>
<tr>
<td>UK</td>
<td>60%</td>
<td>30%</td>
<td>34%</td>
</tr>
<tr>
<td>Other</td>
<td>49%</td>
<td>37%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Shares in percentage of all companies, n = 250 (60/75/50/65)
(completely apply & mostly apply)

In Germany and in other European countries, such as Italy or Spain, companies confirm that standardization may hinder an advantageous market positioning and the winning of new opportunities. Especially in Germany there are various market leading companies that would prefer their own technologies, processes and tools being declared as standards than having to adapt to a competitor’s methodology. Consequently, there is also stronger reluctance in these countries towards regarding an industry-wide standardization as an essential need in order to make connected car scenarios work. In case of doubt these companies may also consider an individual push of technologies and applications. This result becomes even more obvious when comparing the responses of large enterprises to those of smaller or medium-sized enterprises. The larger the company, the stronger the recognition of standardization as a potential risk to their individual business. Since mainly large enterprises are heading the boards of European standardization committees, the pace of an industry-wide standardization remains a parameter of individual corporate business development.
The biggest challenge regarding a future business model: packaging multiple connected car services for a holistic customer experience

- The survey results show that – on the one hand – suppliers (80%) are obviously more often confronted with the (major) challenge to bundle multiple third-party services into a consistent user experience than manufacturers (66%).
- But also the definition of the invoicing mode (directly with connected car services fees and indirectly with packaged vehicle prices) more often represents a major challenge on the supplier side (76%; manufacturers: 64%).
- On the other hand manufacturers are more concerned about the allocation of revenue streams across different partners (service, content, infrastructure providers; 58%) and a clear and distinctive definition of the business model (42%; suppliers: 46% / 29%).
- Nevertheless: more than half of all companies (55%) surveyed also mentioned the change of ownership strategy (usage rather than ownership e.g. car sharing/pooling).

It is not surprising that companies state a consistent user experience and the definition of an adequate invoicing mode as major challenges when it comes to business models. Activities so far had often been focused on the technological realization of connected car offerings. Now that this aspect has been dealt with, many companies are turning their attention to the business aspects of these new offerings. Only few companies have been running these work streams in parallel so far. Furthermore, both aspects have to be in line with the overall branding and portfolio strategy, which represents a complex mission for many companies.

PAC believes that the development of a consistent business model behind a connected car offering will become one of the major challenges for many companies in the automotive sector in the future.
There are strong uncertainties regarding a future business model among European manufacturers and suppliers.

How do you rate the challenges in terms of a future business model?

<table>
<thead>
<tr>
<th>Region</th>
<th>Bundling of multiple third-party services into consistent user experience</th>
<th>Definition of invoicing mode</th>
<th>Clear and distinctive definition of business models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>72%</td>
<td>70%</td>
<td>36%</td>
</tr>
<tr>
<td>France</td>
<td>53%</td>
<td>52%</td>
<td>20%</td>
</tr>
<tr>
<td>Germany</td>
<td>77%</td>
<td>78%</td>
<td>47%</td>
</tr>
<tr>
<td>UK</td>
<td>78%</td>
<td>82%</td>
<td>44%</td>
</tr>
<tr>
<td>Other</td>
<td>80%</td>
<td>68%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Especially for German and British companies, but also for companies in other European countries, both issues represent major challenges while French companies seem to handle these challenges more easily. The same situation applies when it comes to a clear and distinctive definition of business models. Again, French companies are regarding this task solely as a minor challenge or even as no challenge at all while German companies (and to some extent also British ones) appear to be struggling here.

The reason for that may be found in more scientific and technical-minded managers in the organizations of German and British companies, whereas in French companies management positions are rather occupied by people with an economics or management background. Another reason may be that the focus of French companies is rather on applications and services (in terms of communications and environmental information) that are easier to package into existing offerings, while for German or British companies, who are strongly focusing on security offerings, this may be more difficult to sell to end customers.
European automotive companies are faced with a large variety of business and technological challenges. These can be quite heterogeneous and require a close cooperation between manufacturers and their suppliers. Standardization is an agreed method to make collaboration easier. And according to the survey results, for connected car solutions industry-wide standards for technologies, software development and service provision need to be applied and accepted.

The opinions on how to do this and which standards to apply are quite diverse though. While on the supplier side standardization helps to make collaboration processes with partners more efficient and reduces dependencies on individual manufacturers, standardization for manufacturers always includes a risk in terms of market positioning and opportunity generation. Vehicle manufacturers surely have an interest in the protection of their intellectual property and market positioning. Therefore manufacturers prefer to establish their own technology or process as standard than to adapt to a competing one, as long as the application of a standard does not imply any other benefits for them. In the end, customers are going to determine which technology, software or services standards are going to be accepted in the market.

Another interesting outcome of the survey is the conclusion that more and more companies are now going to focus on the business aspects of connected car offerings (including pricing models and user experience), while activities so far had often been focused on the technological implementation alone. These aspects also have to be in line with the overall branding and portfolio strategy of a vehicle manufacturer. Tackling these business challenges will become a difficult venture for many companies.
4) Strategic approach and the relevance of external services
Connected car is clearly a long-term topic and a market changer for the automotive industry.

Does connected car represent a long-term strategic topic in your company or is it an ad-hoc activity?

Long-term strategic planning 72%

Ad-hoc activity, depending on current needs 28%

Shares in percentage of all companies, n = 250 (single choice)

Connected car already has its defined position in the strategies of automotive companies and will not disappear from the vehicle portfolios anymore. For almost 3 out of 4 companies, connected car represents a long-term strategic topic. This situation intensifies even more the larger the enterprise. 80% of large enterprises confirm this statement and even 95% of all vehicle manufacturers do so. On the supplier side, the situation may be different, especially regarding smaller enterprises. Here up to 50% still regard connected car technologies and applications as an ad-hoc activity, following custom-specific requirements in development and service provision. This situation indicates the dependency of suppliers, especially smaller ones, and their reluctance towards adjusting business models and technological roadmaps for the benefit of their mostly heterogeneous customer groups.
Connected car offerings are perceived to be a key business driver in the future.

- Nearly half of the companies surveyed completely or mostly agree that connected car offerings will be one of the major business drivers in the future (52%). On the supplier side about 60% of respondents completely or mostly agree. Also in small (50-499 employees; 51%) and medium-sized (500-1,000 employees; 61%) companies the statement gained greater consent than in large enterprises with more than 1,000 employees (40%).

- But more than one in ten respondents state that connected car offerings will only be relevant for customers in certain situations (12%) and will become a luxury offering at the high end of the portfolio (14%).

Automotive companies regard connected car offerings as a high-end addition to their existing portfolio, being well aware, however, that it might only be relevant for customers in certain situations, such as in the case of security functionality like automatic emergency notification. Depending on the functionality, the luxury aspect of connected car offerings as well as the ability to price new features vary accordingly. Furthermore, it seems that European automotive companies feel well prepared regarding connected car offerings. A share of over 60% of all survey participants do not see or are not sure whether there are competence issues in their companies in terms of connected car offerings. At least the risk of a competence issue seems to have the least impact on the companies’ strategies. One reason may be that companies are well aware of the availability of high-quality external service providers in terms of technology design & development as the following results will highlight.
Connected car will be a major business driver – but its role within the portfolios of European automotive companies may be different

To what extent do you apply the following statements to your strategy?

<table>
<thead>
<tr>
<th>Region</th>
<th>Connected car offerings...</th>
<th>...are expected to become one of the major business drivers in the future.</th>
<th>...will only be relevant for our customers in certain situations.</th>
<th>...will become a luxury offering at the high end of our portfolio.</th>
<th>...will become a competence issue for our employees, dealers/suppliers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>9% 43%</td>
<td>12% 33%</td>
<td>14% 33%</td>
<td>10% 29%</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>2% 40%</td>
<td>16% 33%</td>
<td>19% 25%</td>
<td>5% 17%</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>10% 33%</td>
<td>9% 20%</td>
<td>11% 30%</td>
<td>11% 27%</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>13% 44%</td>
<td>10% 44%</td>
<td>14% 40%</td>
<td>12% 30%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11% 57%</td>
<td>14% 38%</td>
<td>11% 38%</td>
<td>12% 42%</td>
<td></td>
</tr>
</tbody>
</table>

Comparing the individual strategies by country intensifies this statement. It is interesting to see that connected car solutions are regarded as major business driver basically in countries like Italy, Spain, Netherlands or Sweden. And in the same countries companies rather expect to encounter competence issues with this topic. At the same time companies in France, Germany and the UK rather understand connected car offerings as a luxury add-on to their existing portfolios and tend to adjust their offerings closer to specific customer situations while connected car offerings are not expected to become a competence issue.
Connected car offerings will become a complementary business

In terms of corporate strategies it is obvious that connected car offerings are going to play a complementary role for most of the European automotive manufacturers and suppliers. Only a minority of participants, basically on the supplier side, would call these offerings the new core competence of their company. The majority of the European companies see connected car technologies as an additional value to their actual core products without currently having a major impact on business development. Consequently, PAC believes that connected car offerings will become one of the major business pillars in the future, but not the only one.

95% of CxOs surveyed are of the opinion that connected car offerings will not be a substitute for current business. Particularly on the supplier side this statement is more often rejected.

Furthermore, the connected car topic is mainly seen as future driver (see previous page), rather than as current business driver: three quarters (76%) of all companies do not regard connected car offerings as their major business driver at the moment.

But regarding the core competence the answers differ: half of the respondents believe that connected car offerings will become a new core competency – the other half does not.
Almost every CxO believes that connected car services will become a mandatory customer requirement

- The results are clear: An overwhelming majority of all respondents agree: Connected car services will become a mandatory requirement (98%) and a main differentiator for vehicle manufacturers (87%).
- Most CxOs (92%), however, also believe that the importance of connected car offerings will vary significantly across different countries.
- In addition, the respondents also quite agree that connected car services and technologies are not an expensive offering just for luxury class vehicles.
- Between suppliers and manufacturers or between medium-sized and large companies there is not much difference.

In terms of customer requirements, 2 out of 3 companies in the automotive industry expect connected car services to become a mandatory criterion. However, this criterion’s importance and emphasis are likely to vary strongly between the individual countries and markets. Furthermore, there seems to be a common understanding that connected car services will not allow to increase vehicle sales prices in the future. This means customers will expect this kind of technology and services but may not necessarily want to be charged extra for them. This situation will define a manufacturer’s ability to differentiate within a difficult market environment, including the additional challenge that costs of development are to be carried by existing business models. As the definition of business models and pricing, however, is still work in progress, this challenge cannot be determined before offerings are positioned on the market.
Automotive manufacturers and suppliers demand external support in developing connected car offerings and technologies

Does your company execute connected car projects only internally or do you consider joint product development with external service providers as part of your strategy?

Projects are executed only internally

31%

Joint product development with external service providers

69%

When it comes to the realization of connected car solutions, automotive manufacturers and suppliers regard product development as a joint project with external service providers. This indicates that a shortage of skills and staff in these technologies may not have an impact on strategies, but on operational processes. Especially on the supplier side, support from third-party service providers seems to meet with a warm reception, while manufacturers appear to be a bit more independent. This correlates with the trend of insourcing IT and development capabilities at large vehicle manufacturers in recent years. PAC believes that this trend will be ongoing and vehicle manufacturers will be shifting their core competencies more into the direction of software development.
Human resources for connected car activities are currently limited

<table>
<thead>
<tr>
<th>How many people in your company are working on connected car technologies, services or offerings?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shares in percentage of all companies that execute projects only internally, n = 77</td>
</tr>
<tr>
<td>Less than 10%</td>
</tr>
</tbody>
</table>

- In the majority of companies less than 10% of the workforce are working on connected car technologies, services or offerings.
- Between suppliers and manufacturers or between medium-sized and large companies there is not much difference.

Taking a closer look at the current staff situation in automotive companies, which state to develop independently, it is obvious that only a minority of people are working on connected car technologies, services or offerings. It seems that only in the UK and Germany, as well as in large enterprises, a share above the average of 5% is taking care of this new domain. This suggests that connected car offerings do not play a major role as standalone solutions for these companies but will rather be integrated into overall vehicle production.
The most requested services include software development, security and testing

- 95% of companies that consider joint product development with external service providers (see page 36), show demand for software development, including mobile applications. Remarkable: the bigger the company, the stronger the demand.
- Security and testing are also of great interest. Both topics are more often requested by small (50-499 employees) and medium-sized (500-999 employees) enterprises. Nearly 40% of all respondents even state a strong demand for testing.
- Interestingly: regarding training services the supplier side (77%) shows a higher demand than manufacturers (59%).
- But in terms of analytics (analytics on vehicle data, driver analysis, performance optimization), cloud services (cloud-based content provision, infotainment, apps) and consulting there is limited concern.

Companies focusing on a joint product development basically need support in testing, software development and the development of new security functionalities as well as infrastructure. All these domains are located in the traditional IT world and had not been the core expertise of automotive manufacturers and suppliers so far. Therefore it is no surprise that demand for external support is high here.
External support is basically needed in software development, security and testing services

In which area do you see demand for external support?

<table>
<thead>
<tr>
<th>Region</th>
<th>Software development</th>
<th>Security</th>
<th>Testing</th>
<th>Systems integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>24%</td>
<td>29%</td>
<td>37%</td>
<td>24%</td>
</tr>
<tr>
<td>France</td>
<td>18%</td>
<td>11%</td>
<td>18%</td>
<td>14%</td>
</tr>
<tr>
<td>Germany</td>
<td>31%</td>
<td>33%</td>
<td>38%</td>
<td>13%</td>
</tr>
<tr>
<td>UK</td>
<td>27%</td>
<td>32%</td>
<td>49%</td>
<td>25%</td>
</tr>
<tr>
<td>Other</td>
<td>18%</td>
<td>36%</td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>Shares in percentage of all companies that consider joint product development with external service providers, n = 173 (38/48/37/50) (very strong demand &amp; strong demand)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While the demand for software development support is high across all participating countries, there are more differences between the countries in the other domains. While the strong focus of German companies on security aspects also results in a strong demand for external support in this topic, the demand for systems integration is comparably low. British companies have a strong demand for testing services while they feel more comfortable in training. French companies do not seem to see a strong demand in each of these domains while it is the opposite situation in other countries, such as Italy, Spain or Sweden.
Comparing manufacturers and suppliers, the largest differences in the demand for external support are in security, systems integration, training and business analytics where, in every instance, the suppliers see more demand.
Consulting & IT service providers are obviously the most important partners

In general, automotive companies ask for support from consulting & IT service providers. This is basically where software development, testing and industry-specific consulting competencies can be offered in bundled service packages. Furthermore, automotive companies maintain tight relationships and collaboration partnerships with electronic device manufacturers, such as Google, Samsung or Apple. Their products do not only require interfaces to the products of automotive companies, end customers also request certain usability standards to be represented in a vehicle environment. Especially the latter represents a tough challenge to many automotive companies.

• Consulting and IT service providers are very important for over 30% of the companies surveyed, be it manufacturers or suppliers.
• Interestingly, on the supplier side electronic device manufacturers, such as Apple, Google or Microsoft, are of high importance for 31% of the respondents in executing connected car projects.
• To clarify: Governmental services include highway agencies or emergency services, for instance. Content providers are brands such as Netflix or Spotify, and third-party service providers are companies such as TomTom.
• The results do not show any significant differences with respect to company size.

How important are the supplier groups for your company to execute connected car projects?

<table>
<thead>
<tr>
<th>Supplier Group</th>
<th>Very Important</th>
<th>Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting &amp; IT service providers</td>
<td>35</td>
<td>41</td>
</tr>
<tr>
<td>Electronic device manufacturers</td>
<td>23</td>
<td>50</td>
</tr>
<tr>
<td>Governmental service providers</td>
<td>18</td>
<td>51</td>
</tr>
<tr>
<td>Content providers</td>
<td>19</td>
<td>48</td>
</tr>
<tr>
<td>Third-party service providers</td>
<td>17</td>
<td>50</td>
</tr>
</tbody>
</table>

Shares in percentage of all companies, n = 250 ('Partially/less/not important' not shown)
Interim conclusion

What has been implied in the previous chapters in terms of market challenges and current status of developments is now confirmed when asking European automotive companies about their corporate strategies: Connected car represents a long-term strategic topic and will not disappear from the companies’ portfolios anymore. 80% of the large enterprises confirm this statement and even 95% of all vehicle manufacturers do so.

For positioning these solutions as a high-end addition to their existing portfolios, most European automotive companies feel well prepared in terms of in-house competencies. However, they are also aware that they are not able to realize these solutions and services exclusively on their own. Consequently automotive manufacturers and suppliers consider product development as a joint project with external service providers. Companies are especially asking for external support in terms of testing, software development and the development of new security functionalities as well as infrastructure. All these domains reside in the traditional IT world and have not been the core expertise of automotive manufacturers and suppliers so far.

Therefore the first contact for automotive companies is obviously a business partner among the group of consulting & IT service providers. This is basically where software development, testing and industry-specific consulting competencies can be offered in bundled service packages. Also automotive companies maintain tight relationships and collaboration partnerships with electronic device manufacturers, such as Google, Samsung or Apple. The seamless integration of these external devices as well as the adoption of approved and popular usability patterns represent a major challenge for many vehicle manufacturers.
5) Investments, obstacles and the role of politics
Just a few companies are currently planning investments

At first sight it seems that investments in connected car technologies are not on the agenda for automotive companies at the moment. The truth behind is different, however. Results show that upcoming investments are rather focused on the second wave of design and development. Many companies, early adopters as well as large shares of the followers, have already made their major investments so that projects are already at implementation stage. Furthermore, these companies have already built up their competences in-house or defined their partner ecosystem structures.

To sum up, just one company in six (17%) intends to invest in connected car technologies within the next 12 months or the next two years. Even one quarter of all companies surveyed are still discussing investment projects. The majority of enterprises is not planning investments, since they already have projects at implementation stage or the topic connected car is not of relevance for investments.

There is hardly any difference between manufacturers and suppliers or small, medium-sized and large companies.
The most important investment areas are security, infotainment and in-car connectivity

- Nearly 70% of companies that are planning or discussing investments consider security technologies.
- But also infotainment solutions (navigation, radio, music player, Internet device) as well as in-car connectivity technologies (CAN bus systems, Ethernet, WLAN) are of importance for more than 60%.
- Interestingly, the three mentioned topics are especially for manufacturers of high relevance (80%).
- Also infrastructure technologies (backend systems, data center network) are more of interest for manufacturers (49%) than for suppliers (15%). Moreover, it also turns out that the bigger the company, the higher the willingness to invest in infrastructure technologies.
- Finally, big data technologies (analytics on vehicle data, driver analysis, performance optimization) are important for every second company (50%).

When companies are discussing investments, the current focus is basically on security technologies, infotainment as well as in-car connectivity. Interestingly, regional focuses are comparatively diverse in these questions: While companies in Germany and France are mainly investing in security technologies, British companies are putting a stronger focus on in-car connectivity technologies, while companies in Spain, Italy, the Netherlands or Sweden are concentrating on infotainment technologies. The emphasis on future development activities seems quite heterogeneous in Europe.
Business units are (also) the budget owner in the majority of companies

Corporate management still acts as major driving force for many companies in the automotive sector, combining investment promotion as well as budget allocation responsibilities. Given the strong share of medium-sized companies in this sector, this is not a surprising result. It becomes more interesting when taking a look at the details: In large enterprises investments are more often driven by business units while corporate management as well as IT rather take the roles of budget owner. The situation is the other way around in medium-sized and small companies: Here, the IT department acts as an investment driver and budgets are located in the business units or corporate management. There are no significant differences between manufacturers and suppliers here.

- In almost 70% of all companies surveyed, corporate management is/would be simultaneously investment driver and budget owner in terms of connected car projects. In the other third of companies the management is either investment driver (11%) or budget owner (18%).
- Interesting: While in small (50-499 employees) and medium-sized companies (500-999 employees), IT is mentioned more often as investment driver, in large enterprises (1,000+ employees) CIOs are more often the budget owners.
- Important: In many companies business units are not only the investment driver (16%) but (also) the budget owner (84%).
Business units are strong budget owners in each of the countries

Which units are/would be investment drivers, budget owners, both or none of these?

<table>
<thead>
<tr>
<th>Region</th>
<th>Corporate management</th>
<th>IT</th>
<th>Business units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>11% 18%</td>
<td>28% 12%</td>
<td>16% 25% 59%</td>
</tr>
<tr>
<td>France</td>
<td>5% 13%</td>
<td>22% 12%</td>
<td>13% 20% 67%</td>
</tr>
<tr>
<td>Germany</td>
<td>24% 19%</td>
<td>35% 20%</td>
<td>21% 28% 51%</td>
</tr>
<tr>
<td>UK</td>
<td>11% 18%</td>
<td>30% 10%</td>
<td>12% 20% 68%</td>
</tr>
<tr>
<td>Other</td>
<td>6% 22%</td>
<td>25% 3%</td>
<td>14% 32% 54%</td>
</tr>
</tbody>
</table>

Shares in percentage of all companies, n = 250 (60/75/50/65) (investment driver, budget owner, both)

Comparing the individual countries in terms of investment roles, there are three aspects to highlight here:

- In each of the participating countries, business units are the major budget owner for connected car technologies and service offerings.
- In Germany and the UK, IT units have a leading role as investment driver, identifying innovative technologies and determining strategic investments for their organizations.
- In France, corporate management plays a key role as being both investment driver as well as budget owner.
There are (still) plenty of investment obstacles for connected car offerings!

Besides investments plans there are still major obstacles for many manufacturers and suppliers. Basically this is because “connected car” is not the only topic companies are currently working on, but one among many others, such as e-mobility, lightweight bodywork or reusable and flexible chassis. So, this topic is important but there are also many others. This is especially the case at small and medium-sized companies. However, there is further insecurity in terms of cost of change. This shows that many companies are not aware of how they need to change their internal processes in order to be able to provide connected car technologies and services.

- It is worth noting that 64% of all CxOs surveyed state: “Connected car is not a focus topic.” – with no differences between manufacturers and suppliers. Just large companies have a (slightly) more positive attitude towards the connected car topic.
- In addition, half of the companies (50%) state the unclear costs of change as an important obstacle – slightly more often in small (50-499 employees) and medium-sized (500-999 employees) companies.
- Security challenges rank third, followed by political barriers.
- Interestingly, one in three large companies (1,000+ employees) mention the difficult technology selection process (33%).

---

Wich issues are obstacles to your company investing more in connected car offerings?

<table>
<thead>
<tr>
<th>Issue</th>
<th>Shares in percentage of all companies, n = 250 ('No' not shown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connected car is not a focus topic.</td>
<td>64</td>
</tr>
<tr>
<td>Unclear costs of change</td>
<td>50</td>
</tr>
<tr>
<td>Security challenges</td>
<td>28</td>
</tr>
<tr>
<td>Political resistance</td>
<td>27</td>
</tr>
<tr>
<td>Unclear customer expectations</td>
<td>23</td>
</tr>
<tr>
<td>Difficult technology selection process</td>
<td>19</td>
</tr>
<tr>
<td>High operational costs</td>
<td>18</td>
</tr>
</tbody>
</table>

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For European automotive companies, connected car offerings are one investment topic among others

Wich issues are obstacles to your company investing more in connected car offerings?

<table>
<thead>
<tr>
<th>Region</th>
<th>Connected car is not a focus topic</th>
<th>Security challenges</th>
<th>Political resistance</th>
<th>High operational costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>64%</td>
<td>28%</td>
<td>27%</td>
<td>18%</td>
</tr>
<tr>
<td>France</td>
<td>68%</td>
<td>18%</td>
<td>27%</td>
<td>10%</td>
</tr>
<tr>
<td>Germany</td>
<td>49%</td>
<td>40%</td>
<td>31%</td>
<td>25%</td>
</tr>
<tr>
<td>UK</td>
<td>66%</td>
<td>26%</td>
<td>26%</td>
<td>10%</td>
</tr>
<tr>
<td>Other</td>
<td>77%</td>
<td>23%</td>
<td>25%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Shares in percentage of all companies, n = 250 (60/75/50/65) (single choice)

Especially German companies do not follow the general statement of connected car being just one topic among many others. Here obstacles for further investment are basically seen in unsolved security challenges regarding human-machine interaction, autonomous decision-making or even piloted driving. Open political questions represent a major obstacle in each of the participating countries. Furthermore, connected car service models entail high operational costs, which especially the first wave of adopters are experiencing at the moment. These issues within the processes and business models remain unsolved, which consequently limit further investments in this topic as well. For PAC this is another indicator that one of the major challenges to bring connected car solutions to success is managing the internal changes at manufacturers and suppliers.
In some important areas political support is requested

Automotive companies agree, that political support is essential for establishing connected car services as a new market driver. Especially in terms of piloted driving, there are still many hurdles to be taken in terms of a legal background. To date, even domestic testing routes have been hard to claim for European companies. But also regarding further infrastructure investments in terms of communication and transportation infrastructure, automotive companies consider their governments as being responsible for that. Otherwise, further investment could be difficult to approve. Regarding the latter, companies also wish for incentivized tax breaks in order to free up budgets for R&D.

- With more than 40% of the votes, the most important area for politics is seen in enabling the legal background for piloted driving. Particularly large enterprises with at least 1,000 employees take this view (51%).
- Other important aspects are at large the political support for further transportation infrastructure investments (99%) and incentivized tax breaks to open up opportunities for more investment (99%).
- Just one company in six assesses political support in obtaining the permission for open-road testing as very important.
- Between small, medium-sized and large companies there are only marginal differences.
The investment cycle for connected car solutions and services is currently coming to an end. The survey results show that the early adopters as well as large shares of the ‘second wave’ followers already placed their major investments in these solutions, put their products into implementation, built up their competences in-house or defined their partner ecosystem structures.

When companies are still discussing investments at the moment, the current focus is basically on security technologies, infotainment as well as in-car connectivity. And in order to trigger such investments, corporate management still acts as major driving force for many companies. Given the strong share of medium-sized and owner-driven companies in this sector, this is not a surprising result. In large enterprises investments are more often driven by business units while corporate management as well as IT rather take the roles of budget owner.

Besides investments plans, there are still major obstacles for many manufacturers and suppliers. Basically this is because for many small and medium-sized companies, connected car is not the only topic they are currently working on, but one among many others, such as e-mobility, lightweight bodywork or reusable and flexible chassis. This means the topic is important but there are also many other topics competing for budgets.
6) Conclusion
Connected car solutions will become one of the major business drivers for the automotive industry in the future. They already have a significant impact on existing vehicle development and aftermarket sales, as the results of our comprehensive survey across the European automotive sector show. PAC observes that the market has now reached its ‘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 in development and testing phases. These solutions are likely to play a major role in the market players’ product portfolios and positioning strategies soon.

Automotive manufacturers and suppliers confirm that connected car solutions represent 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. However, technological competence does not represent a challenge to automotive companies. Major challenges are basically located around the questions of business model definition, guaranteeing consistent user experience as well as finding adequate pricing models for new vehicles and additional services. Answers to these questions will determine the future success of companies in this industry.
This study highlights that manufacturers and suppliers in countries all over Europe are basically dealing with the same challenges and are furthermore open for external support, mainly in terms of software development and testing. Competencies that manufacturers do not necessarily have in-house. The study highlights that software will become the new core competence in the automotive market and manufacturers are currently working on changing this deficit. However, in any case, there will be future collaboration scenarios and partnerships between manufacturers, suppliers and external service providers, such as IT systems integrators or electronic device manufacturers.

While the technological maturity of the market is currently shifting from in-car connectivity to car-to-x connectivity and one major focus will be on the design and provision of third-party services, the future in this market is a wide-open field. Although the survey highlights that piloted driving is still a spark on the horizon of the automotive industry, it is yet a topic (and a target) which is expected to impact the market in the future. On the way, many legal, technological as well as business issues still need to be solved. That will happen.

PAC believes that connected car represents one of the most important topics for the automotive industry in Europe and a chance to establish a sustainable positioning on the global market. To achieve this, even closer collaboration between manufacturers and suppliers but also between automotive and IT companies will be necessary. Standardization will play a key role here but also the definition of joint business models.

While companies already are on the right track, there is still some way to go.
Appendix
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Founded in 1976 and headquartered in Paris, France, PAC is part of the CXP Group, the leading European research & advisory firm in the field of software and IT services.

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