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NAVIGATING THE FUTURE OF CONNECTED VEHICLES: INTEGRATION, INNOVATION & STRATEGIC COLLABORATION



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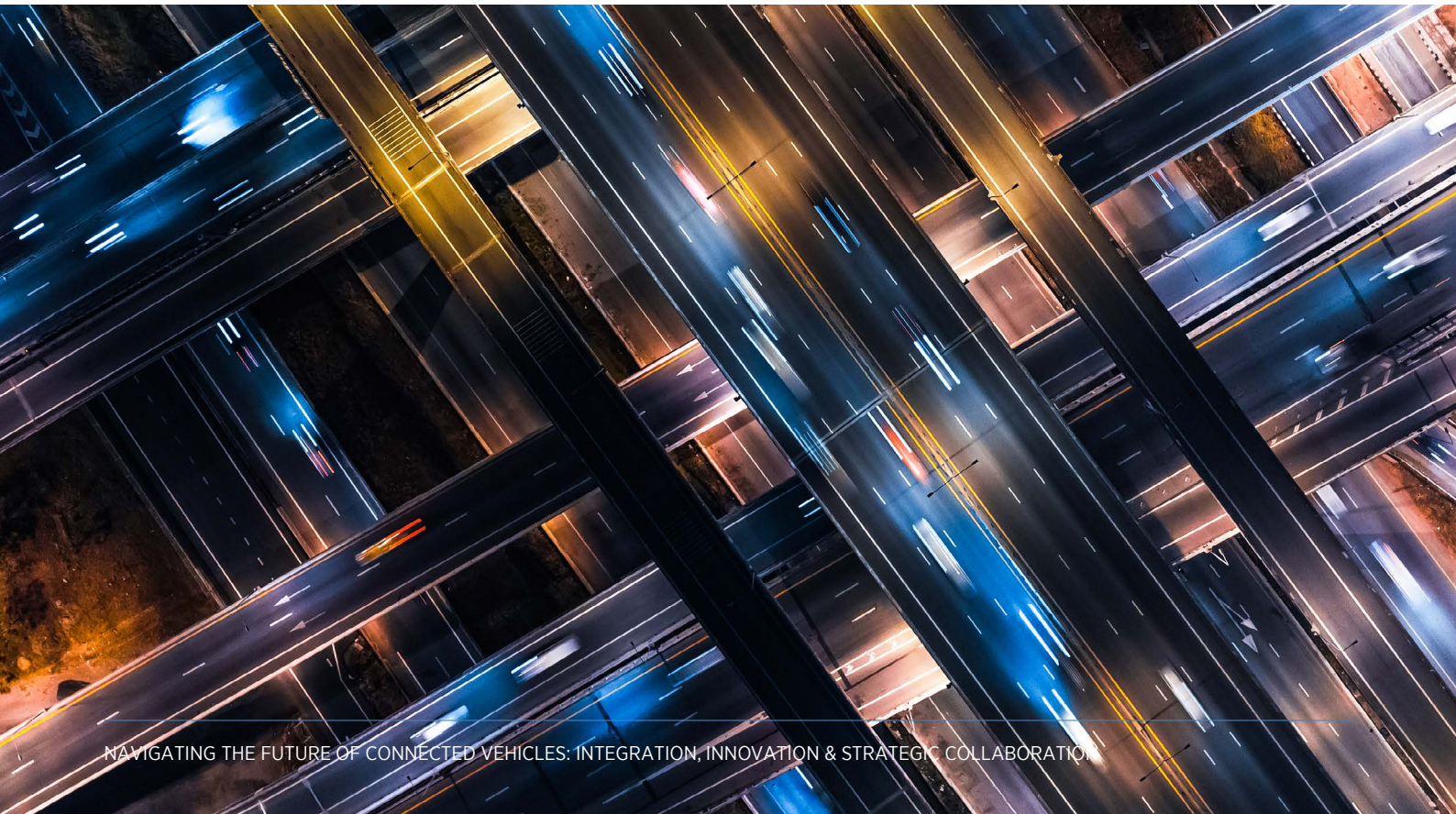
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OPENING LETTER

In today's rapidly advancing technological environment, vehicles are transforming from simple transportation means to sophisticated, connected devices. The merging of technology and mobility has led to vehicles equipped with advanced sensor networks, communication protocols, and real-time data analytics—ushering in an era of connected mobility that enhances driving experience, safety, and efficiency on a global scale

This transformation has created numerous opportunities and challenges that industry stakeholders must navigate to shape the future of connectivity.

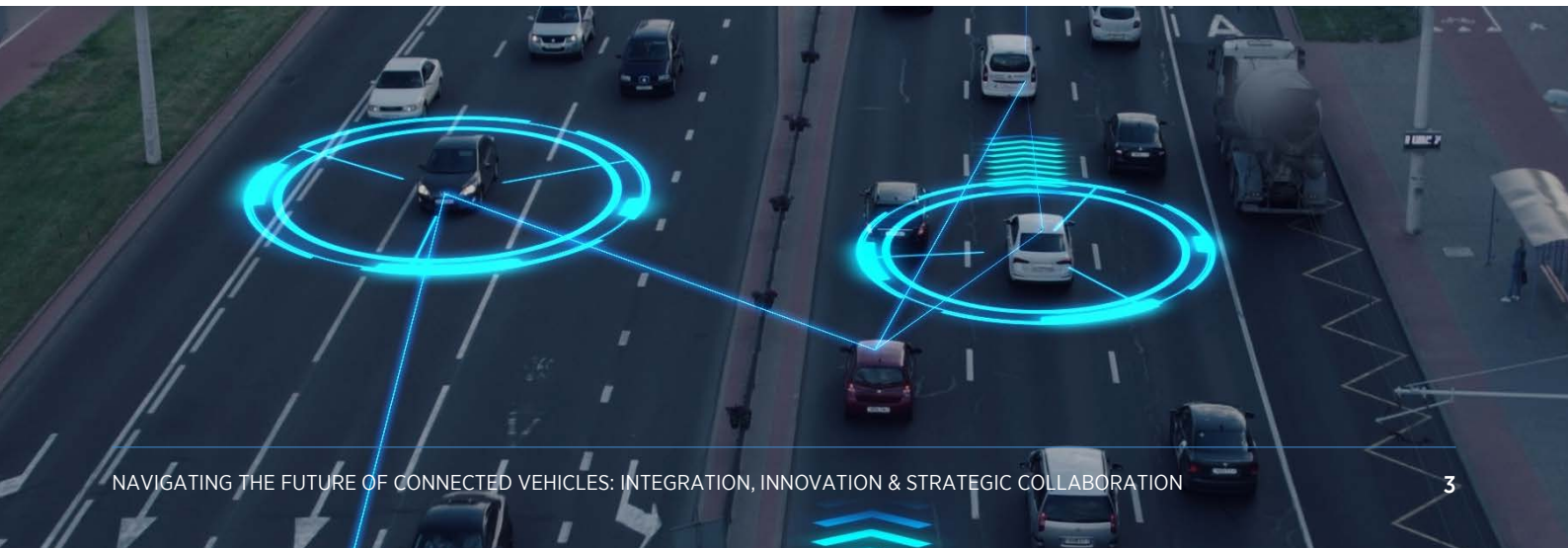
We are thrilled to present a comprehensive market analysis report, **Navigating the future of connected vehicles: Integration, innovation & strategic collaboration.** This report provides a deep exploration of the connected vehicle landscape, enriched by the insights of professionals directly involved in this dynamic field.

Our objective is to offer insights into the evolving role of connectivity and its impact on drivers, passengers, and communities. The report explores how companies are tackling challenges, including regulatory complexities and the need for collaboration between automotive manufacturers and tech firms. By examining technical advancements, we aim to foster discussions that inspire innovation and strategic partnerships within the automotive sector.

We extend our sincere gratitude to those who contributed their experiences, helping us understand the exciting, collaborative path forward for connected vehicles.



Alishba Jan
Divisional Director
Automotive IQ



INTRODUCTION TO THE CONNECTED VEHICLES LANDSCAPE

Before delving into insights from our survey, it's essential we set the scene and understand the context surrounding car connectivity. The story of connected vehicles is a fascinating journey that has transformed the automotive industry, reshaped consumer expectations, and redefined the very notion of mobility.

Not long ago, cars operated independently of the digital world, focusing on mechanical performance and basic safety features. Communication technology was limited to radios and simple navigation systems. The idea of interactive, connected vehicles was once purely speculative.

However, as the internet revolution took hold and smartphones became ubiquitous, the expectation for seamless connectivity infiltrated every aspect of our lives—including our time on the road. Consumers began to desire the same level of connectivity in their cars that they experienced with their phones and computers. The automotive industry, recognising this shift, embarked on a path toward integrating digital technology into vehicles.

The initial steps were modest but significant. Bluetooth connectivity allowed for hands-free calling and audio streaming, bringing the first taste of integration between personal devices and vehicles. Infotainment systems started to appear, offering touchscreens, navigation, and limited app integration. These features began to blur the lines between traditional vehicles and digital devices.

As wireless technology advanced, so did the possibilities for in-car connectivity. The introduction of 3G and 4G networks enabled vehicles to connect to the internet, opening up a new realm of features such as real-time traffic updates, over-the-air software updates, and remote diagnostics. Telematics systems emerged, providing services like emergency response, vehicle tracking, and maintenance alerts.

Today, the connected vehicle landscape is a complex and rapidly evolving ecosystem. Cars are no longer just mechanical toys - they're sophisticated computers on wheels. Equipped with an array of sensors, processors, and communication interfaces, modern vehicles can interact with their environment in ways that were unimaginable just a few years ago.

The rise of technologies like the Internet of Things (IoT), Artificial Intelligence (AI), and machine learning has accelerated this transformation. Vehicles can now communicate with other vehicles (V2V), infrastructure (V2I), pedestrians (V2P), and networks (V2N)—collectively known as Vehicle-to-Everything (V2X) communication. This connectivity enhances safety through collision avoidance systems, optimises traffic flow, and contributes to more efficient energy use.

Consumer demand has been a significant driver of this evolution. Today's drivers expect their cars to seamlessly integrate with their digital lives. Features like advanced infotainment systems, smartphone integration through platforms like Apple CarPlay and Android Auto, and personalised user settings have become standard in many new vehicles, driven by consumer expectations.

One of the most exciting aspects of the connected vehicle landscape is its intersection with autonomous driving. Connectivity is a foundational element for self-driving cars, enabling them to communicate with their environment and make informed decisions in real-time. Advances in connectivity are accelerating the development of autonomous vehicles, bringing us closer to a future where cars can navigate roads with little or no human intervention.

As a conclusion, we've arrived at this point through a combination of technological innovation, consumer demand, and strategic industry collaboration. Vehicles have evolved from isolated machines into integrated platforms that enhance our lives in many ways.

As we stand on the cusp of even greater advancements, understanding this landscape is crucial. The challenges are significant but not insurmountable. Through continued innovation, collaboration, and a focus on delivering value to consumers, the automotive industry is poised to navigate these complexities successfully.

In the chapters that follow, we'll explore the findings of our industry-wide survey, which provides deeper insights into how industry professionals perceive the current state of vehicle connectivity. We'll examine the strategies companies are employing to overcome challenges, the partnerships they're forming, and the innovations they're pursuing.

By setting the scene with this overview, we aim to provide context that enriches your understanding of the survey results and the broader trends shaping the future of connected vehicles. It's a story of progress, challenges, and the relentless pursuit of a more connected and efficient world—a journey that continues to unfold with each technological breakthrough and collaborative effort.



EXECUTIVE SUMMARY & INTRODUCTION TO THE SURVEY

A world where every car communicates seamlessly with its surroundings, enhancing not just the driving experience but redefining mobility itself is not a distant vision but an emerging reality.

Understanding the current state of the transformation towards connectivity, as well as the challenges and opportunities it presents, is crucial for defining future strategies towards connected mobility. To provide insight into this complex landscape, we conducted a comprehensive survey among 165 industry professionals, all of whom are directly involved in their organisations' connected vehicle programmes.

The results of this survey are both revealing and reassuring. Connected vehicles are no longer seen as an emerging trend but as a central pillar of automotive development. From the boardroom to the R&D labs, companies across the sector are fully aware that connectivity is a key part of their future.

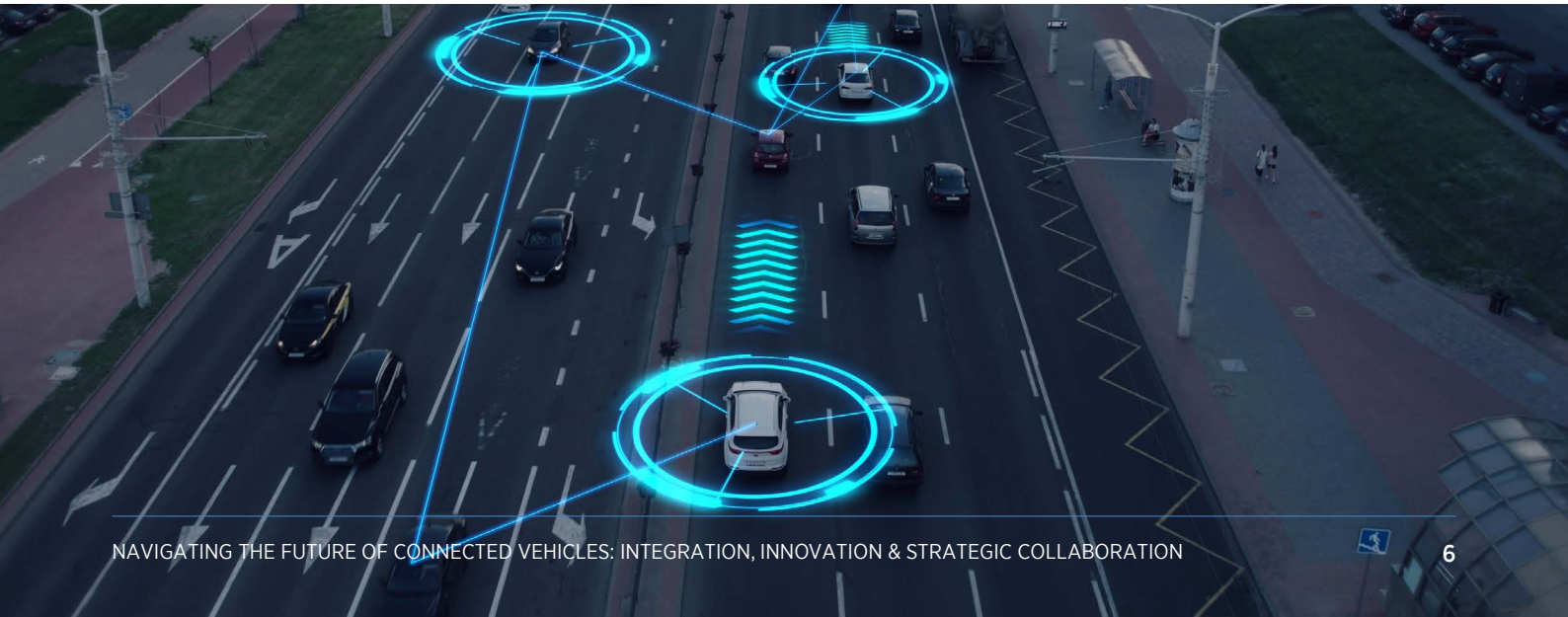
But while the destination is clear, the road to full connectivity is packed with challenges that the industry must navigate carefully. The survey reveals a complex terrain with several potholes that must be carefully avoided.

One of these potholes is related to regulations and compliance. Companies are grappling with a heap of laws and standards that vary by region, making it difficult to develop solutions that are both innovative and compliant on a global scale.

Cyber security threats loom large as well. As vehicles become more like computers on wheels, they're increasingly vulnerable to hacking and data breaches. This not only risks the safety of drivers but also erodes trust—an essential component for the widespread adoption of connected technologies. Automotive companies are investing heavily in cyber security measures, but the fast-evolving nature of cyber threats means this is a race that requires constant vigilance.

The financial investment required for developing advanced connectivity features is another significant challenge. The costs can be staggering, especially when factoring in the need for continuous updates and the infrastructure to support them. This is a particular strain for smaller companies or those with tight margins, forcing these companies to make tough decisions about where to allocate resources.

Perhaps one of the more subtle challenges revealed by the survey is the struggle to clearly demonstrate the added value of connected vehicles to end customers. While the technology offers numerous benefits—from real-time traffic updates to enhanced safety features—communicating these advantages in a way that resonates with consumers is no easy task. There's a gap between what the technology can do and what customers understand or perceive as valuable, and bridging that gap is essential for driving widespread adoption.



But throughout all the issues – there is a silver lining for both organisations big or small.

The rise of connected vehicles is driving strong collaboration between major industry players and various tech companies from fields such as IoT and telecommunications. This cross-industry support enables the automotive sector to broaden its horizons and benefit from diverse expertise. The survey that we have conducted shows clearly that this collaboration potential is well recognised in the industry, highlighted as one of the biggest strategic opportunities that companies foresee in the next 2-5 years.

The potential for monetising car data is another exciting avenue. Vehicles generate a wealth of information that, if harnessed responsibly, can lead to improved services, better vehicle performance, and even new revenue streams. Companies are exploring ways to use this data to enhance customer experience while navigating the important considerations of privacy and security.

Ultimately, the survey offers a balanced view of where the industry stands today. On one hand, there's a widespread acknowledgement of the importance of connectivity, and significant strides have been made in integrating these systems into vehicles. On the other hand, there are still major challenges to overcome, particularly around regulation, cyber security, monetisation and consumer perception.

What is clear, however, is that the connected vehicle space is full of potential. As companies continue to innovate and collaborate, the landscape will likely evolve quickly, unlocking new opportunities and reshaping the way we think about transportation. The journey may be complex, but the destination—a future where connected, autonomous vehicles are the norm—is undeniably within reach.

This survey was conducted from 26th July to 7th September 2024 and published in December 2024.



THE EVOLVING REALITY OF CONNECTED VEHICLES

What we see painted in front of us is a picture of an industry in motion, where connected vehicles are more than just an idea—they are an evolving reality. The push towards connected capabilities shows a desire to not just transform the vehicles themselves, but to transform the very experience of driving, owning, and interacting with a car. Connectivity isn't just a technological shift; it's the beginning of a new way to think about what it means to drive.

we dive deep into the survey results, it's clear right from the onset that automotive organisations worldwide are embracing vehicle connectivity with high enthusiasm and adoption rates. This is reflected not only in the high levels of awareness surrounding company strategies for connected cars but also in the widespread recognition of its importance.

Over 40% of respondents view connectivity as an essential component of their business strategy for the next one to two years. Connectivity isn't just an option anymore; it's core to how companies envision the future of automotive innovation and competitiveness. 70% of survey respondents indicated a positive stance towards the integration of connected vehicles. This enthusiasm highlights their importance of connected vehicles in digital transformation, competitiveness, revenue generation, and enhancing customer experience.

Yet, as with any industry shift, not everyone is moving at the same pace. A cautious minority - 11% of participants are in a "wait and watch" mode, suggesting that while they are open to the idea, they are cautious, preferring to see more developments before fully committing. Additionally, limited opposition remains, with about 12% expressing reservations, primarily due to customer demand, willingness to pay, and concerns about data privacy. This mix of forward momentum and hesitation reflects an industry grappling with a change of this scale.

When we look at the current landscape of adoption, it's clear that while a fully connected future is within reach, we're still in the early stages. Only a fraction of vehicles on the road today are truly "connected." Nearly half of the respondents said that only 21-40% of vehicles manufactured/sold by their organisations are currently equipped with connected capabilities, while around 28% indicated an even lower adoption rate of just 0-20%. This places the majority of respondents in the early to moderate phases of adopting connected vehicle technologies, with only a small proportion (less than 10%) having reached a high level of integration (81-100%).

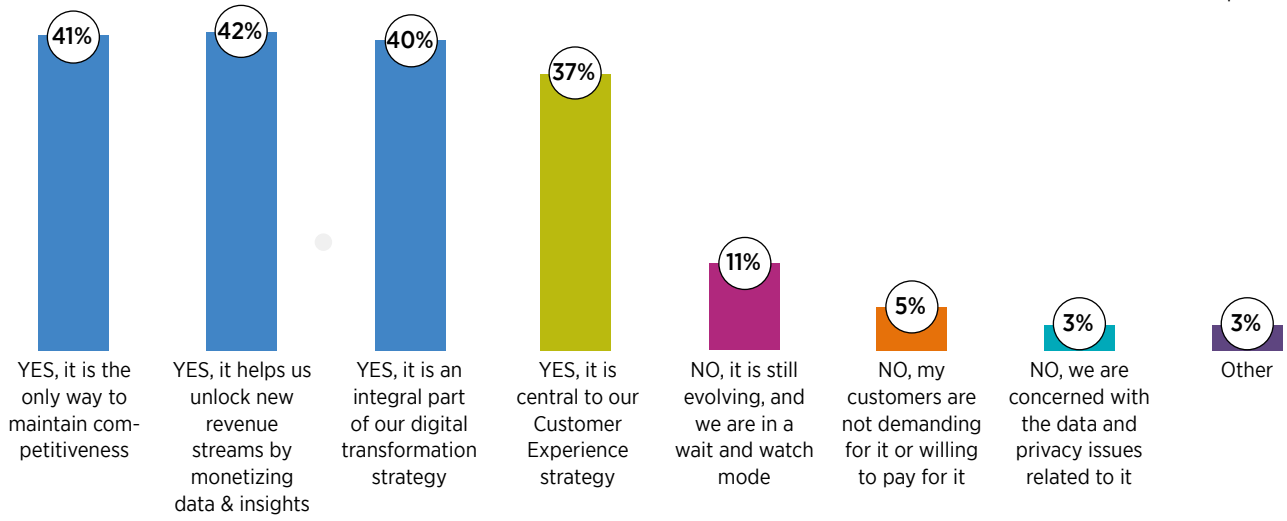
The industry is in a transitional phase, where technology and infrastructure are ramping up to meet the increasing expectations. The journey towards full connectivity is very much alive, but it's also uneven—some brands are already taking bold steps forward, while others still have one foot firmly planted in the traditional automotive model. Responses from the industry survey suggest that while there is momentum towards this technology, the current adoption rates show that full integration across all vehicles is still some way off for most organisations.

Interestingly, the type of connectivity also tells a story of diverse strategies. The survey revealed that 42% of respondents are deploying a combination of Bluetooth and cellular technologies, leveraging Bluetooth for in-car communication and cellular to keep the vehicle connected to the broader digital world. This preference for multiple connectivity options suggests that companies are looking for flexibility and the ability to offer both short-range and wide-area connectivity. Meanwhile, around 29% are opting for a cellular-only strategy, and some are experimenting with satellite connectivity for even broader coverage, with 19% using satellite in combination with cellular. However, satellite connectivity is not used as a standalone option, likely due to its higher cost, limited bandwidth, or the niche nature of its use cases, such as remote areas.

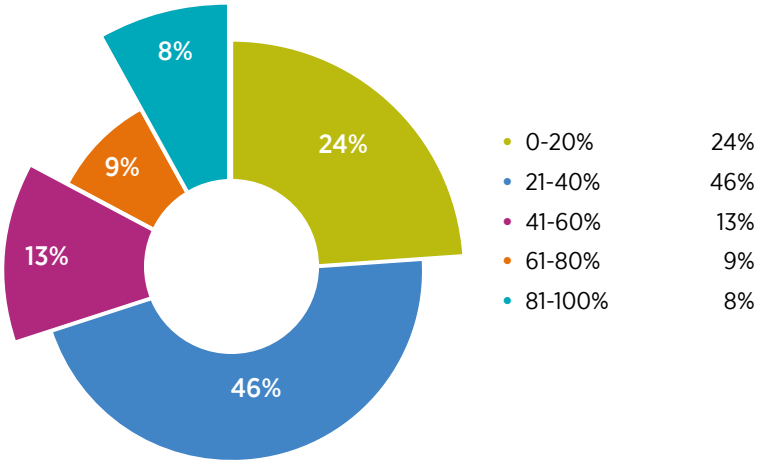
OVER 40% OF SURVEY RESPONDENTS VIEW CONNECTIVITY AS AN ESSENTIAL COMPONENT OF THEIR BUSINESS STRATEGY FOR THE NEXT 1-2 YEARS

Are connected vehicles an integral part of your 12-24 months business strategy?*

*multiple choice

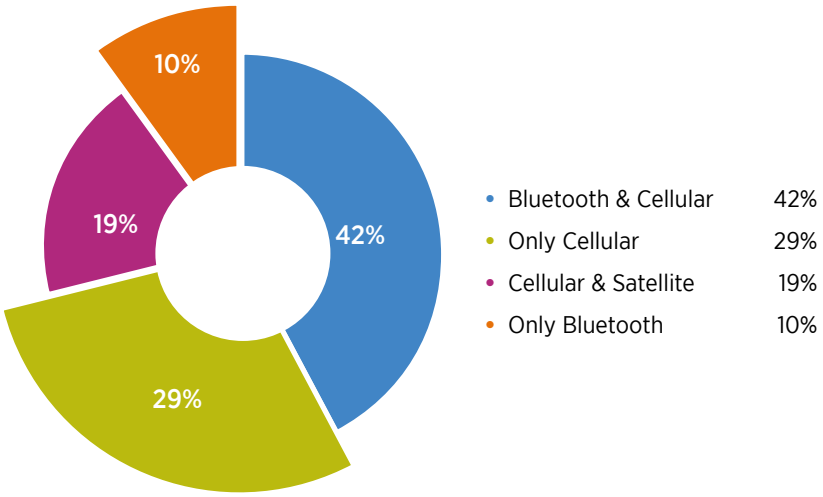


What percentage of your vehicles are currently equipped with connected capabilities?



These mixed approaches underline a pragmatic industry, one that recognises there's no one-size-fits-all solution in the evolving connectivity puzzle. Instead, the industry is building a layered network to ensure that vehicles remain connected, whether parked in a garage, cruising the highway, or driving through remote landscapes.

What kind of connectivity is part of your overall connected vehicle strategy?



EXPLORING COMPLEXITIES OF & OPPORTUNITIES FOR CONNECTED VEHICLES

We focus next on the complexities and opportunities surrounding the implementation of connected vehicle technologies. As automotive organisations push forward with their plans, they're not just facing straightforward challenges—they're navigating nuanced realities that influence how easy or difficult it is to bring these innovations to life.

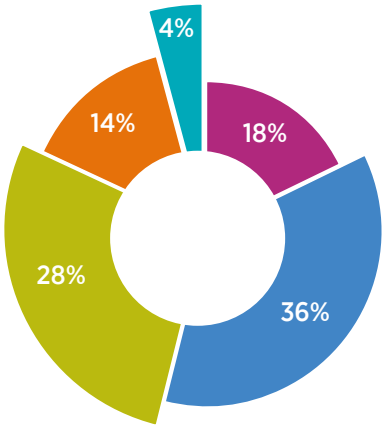
Nearly 17% of respondents found integrating connectivity into vehicles to be somewhat or very difficult, which highlights some of the persistent challenges the industry faces today. Despite enthusiasm for connected vehicles, real-world implementation still brings significant hurdles. Issues like fragmented standards, compatibility across various systems, and navigating different communication protocols add complexity to the process. These challenges indicate that while the benefits of vehicle connectivity are clear, turning that vision into reality isn't easy. Automakers must tackle these barriers head-on, finding ways to streamline integration and develop technologies that can work seamlessly across different environments. This part of the journey is crucial, as true connectivity will only be realised when every component, from hardware to software, works in harmony.

The survey data reveals a diverse range of experiences when it comes to incorporating connectivity, with responses spread relatively evenly across different levels of ease and difficulty. Notably, a significant 40%-respondents—find the integration process difficult, suggesting that many companies still don't have the necessary capabilities or resources to manage the implementation. Out of these, around 20% respondents face significant challenges, often related to technical complexities, infrastructure, cost, or integration issues.

This split suggests that while progress is being made, there remains a substantial proportion of organisations that need support to fully realise the potential of connected vehicles.

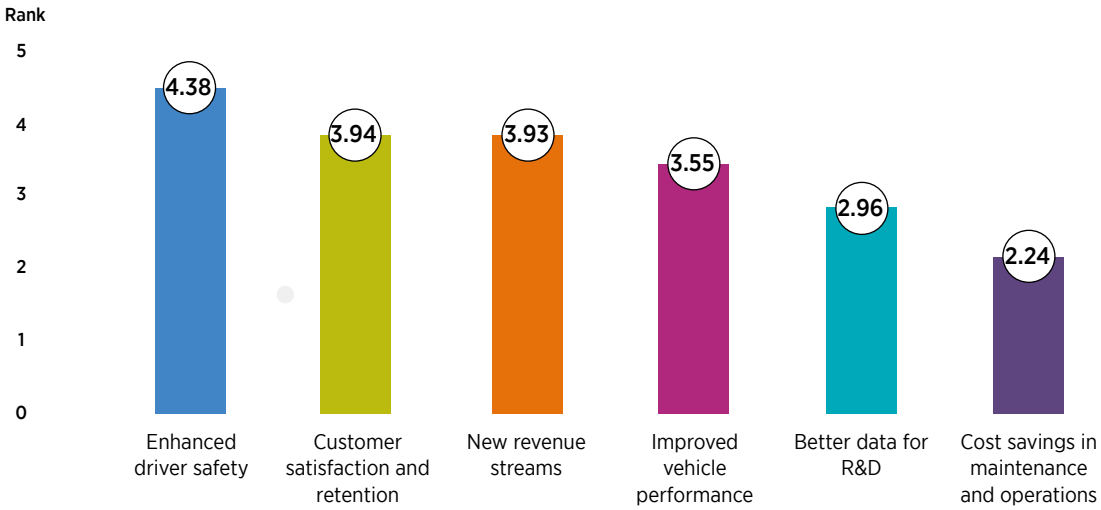
The benefits, however, make these efforts worthwhile. Enhanced driver safety emerged as the standout advantage, topping the list with nearly 40% of participants ranking it as their number one benefit. Improved vehicle performance followed, underscoring the belief that connectivity directly leads to better, smarter vehicles. New revenue streams, driven by data monetisation, came in next. It's clear that companies are not just thinking about making vehicles better—they're also considering how connectivity can open up new business models. Customer satisfaction and retention featured prominently too, as organisations increasingly view connected technologies as a way to enhance the driver's experience, offer personalised services/recommendations, and build stronger customer relationships. Cost savings in maintenance and better data for R&D also received attention, but they were less prioritised compared to safety, performance, and revenue opportunities.

How easy or difficult is it for you today to incorporate connectivity into your cars/vehicles?



Very easy	18%
Somewhat easy	36%
Neutral	28%
Somewhat difficult	14%
Very difficult	4%

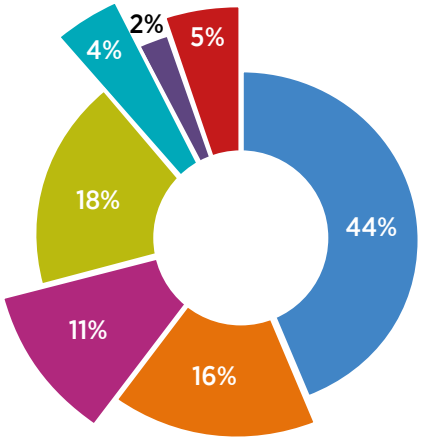
What are the top benefits you see from implementing connected vehicle technologies?



This analysis highlights that enhanced driver safety remains paramount, with customer satisfaction, improved vehicle performance, and new revenue streams also serving as key motivators. This reflects a customer-centric approach and a focus on vehicle efficiency. In contrast, better data for R&D and cost savings in maintenance are seen as secondary benefits, suggesting a greater emphasis on value creation and customer experience over purely operational efficiencies.

This brings us to an essential piece of the connectivity puzzle—the service providers themselves. The automotive world doesn't just rely on in-house solutions; connectivity hinges on partnerships, which means choosing the right connectivity service provider is vital. When asked if they were happy with their current provider, the responses painted a varied picture. Around 44% of respondents were content with their provider, feeling no need for change. However, nearly 56% expressed some level of dissatisfaction, citing issues ranging from limited global coverage to a lack of speed and agility in service delivery. Others were unhappy with limited support, lack of interoperability, and a shortage of additional capabilities like AI-driven insights and analytics. This reveals mixed satisfaction levels among respondents. This reveals a clear divide—while some automakers are happy with the status quo, others are actively searching for something better, something more adaptable to the evolving landscape of connected vehicles.

Are you happy with your current connectivity service provider?



- YES, everything is great, and we are not looking to change 44%
- NO, their coverage is not truly global 16%
- NO, we are not able to maintain speed and agility while working with them 11%
- NO, my current provider does not have additional capabilities like AI analytics and insights, 360-degree view of our deployments, outcomes-driven approach etc. 18%
- NO, they do not support interoperability 4%
- NO, their support and services do not match our expectations 2%
- Other 5%



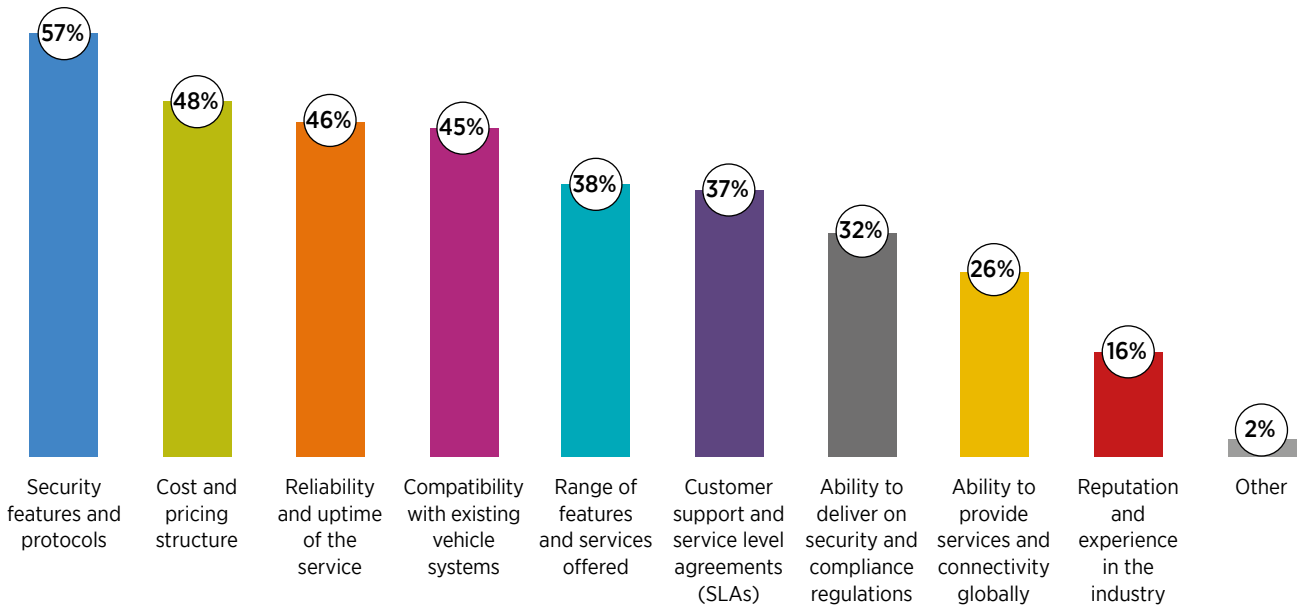
OVER 56% OF SURVEY RESPONDENTS ARE DISSATISFIED WITH CURRENT CONNECTIVITY SERVICE PROVIDER

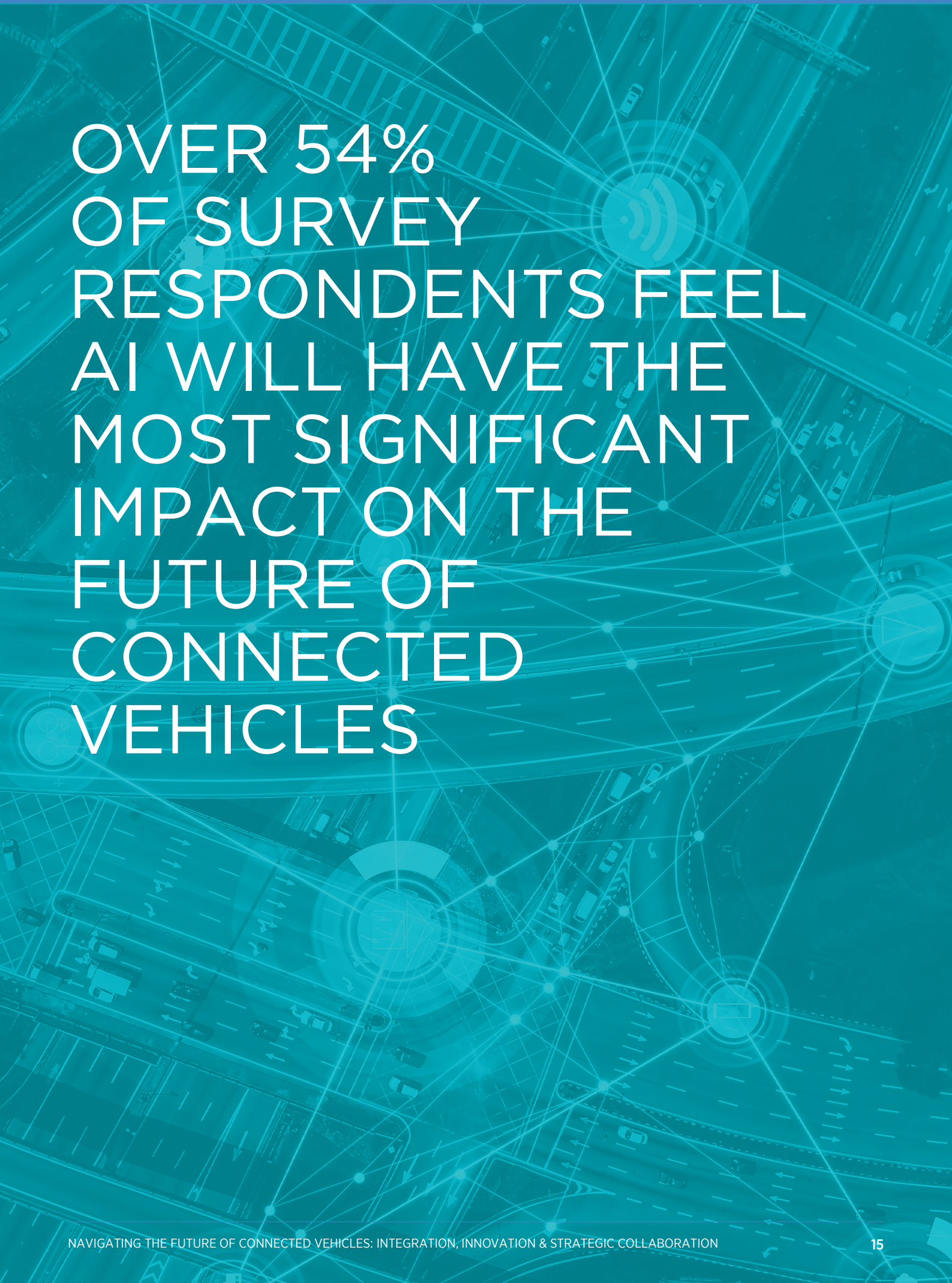
The data shows mixed satisfaction levels, with a significant proportion of respondents unhappy with their current connectivity service providers due to coverage, capabilities, performance, and support. There is also a notable demand for advanced features and truly global reach, as many companies look for more comprehensive and innovative solutions. Issues related to performance, agility, and interoperability further underline the technical challenges some organisations face with their connectivity services. This analysis reveals a demand for advanced features and global reach. Overall, this points to a market need for service providers that can offer robust, feature-rich, and globally reliable services.

So, what factors matter most when selecting a connectivity service provider? The survey revealed that the most important factors in choosing a good provider are reliability, security, and cost. 46% of survey respondents have prioritised reliable connectivity, as no one wants a connected vehicle that can't stay connected. Security is also critical, with around 57% highlighting the need for robust security features and protocols. Cost remains a key consideration, with 48% of respondents assessing pricing structures when selecting their partners. Additionally, compatibility with existing systems and the ability to meet compliance standards were identified as important factors.

What are the most important factors you consider when selecting a connectivity service provider for your vehicles?

*multiple choice





OVER 54% OF SURVEY RESPONDENTS FEEL AI WILL HAVE THE MOST SIGNIFICANT IMPACT ON THE FUTURE OF CONNECTED VEHICLES

THE ROLE OF AI

AI's role in connectivity is transforming vehicles into dynamic extensions of our digital lives. These vehicles are becoming personalised environments that adapt to routines, anticipate needs, and connect seamlessly with the broader smart ecosystem.

As we dig into the next section of the survey, it's clear that Artificial Intelligence (AI) along with ADAS and 5G will play the biggest role in shaping the future of connected vehicles.

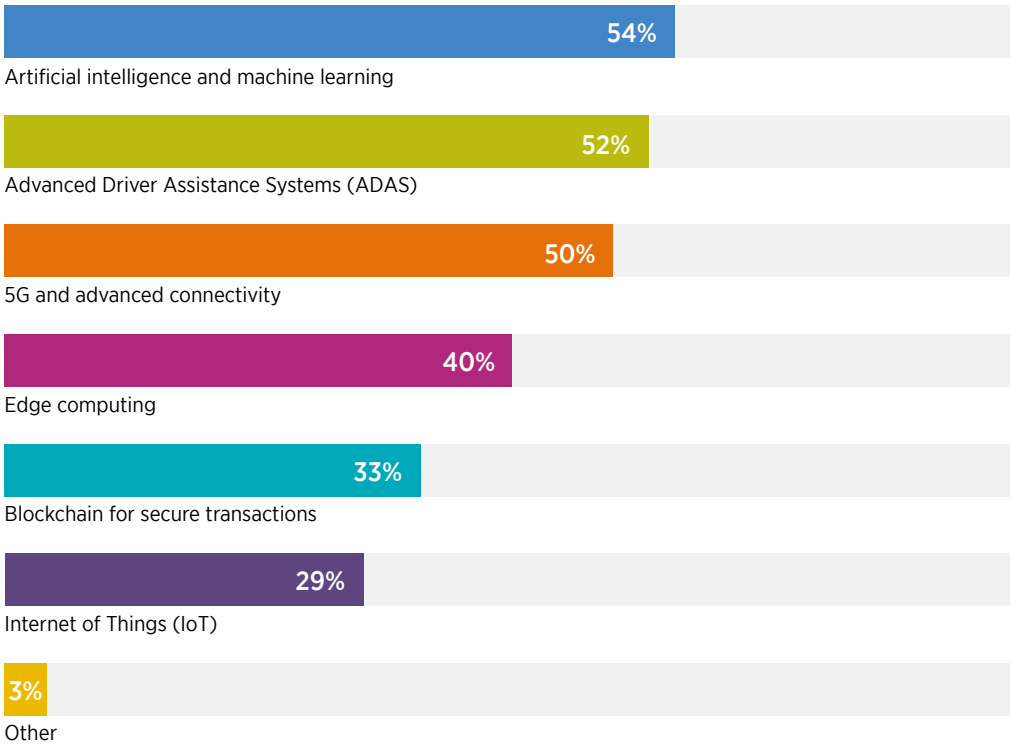
This reflects a focus on technologies that enhance vehicle connectivity, safety, and intelligence. These technologies are crucial for the evolution of autonomous driving, real-time communication, and enhanced customer/driver experience.

Automotive professionals are looking to AI as the driving force behind a new era of mobility, with 54% of respondents identifying it as having the most significant impact. AI's transformative potential goes beyond just adding intelligence; it's about making vehicles adaptive, personalised, and proactive. From enhancing predictive maintenance—anticipating problems before they occur—to optimising vehicle performance in real-time, AI is poised to revolutionise how cars operate and how drivers interact with them.

5G and advanced connectivity follow closely, with about half of survey participants seeing its impact as crucial. While AI drives intelligence, 5G provides the backbone for reliable communication, making it possible for vehicles to stay connected and benefit from real-time data exchange. Together, these technologies create a powerful synergy—AI making sense of data, and 5G ensuring that data flows seamlessly. This combination is seen as the fuel that moves the ship forward, enabling everything from improved telematics to seamless over-the-air (OTA) updates.

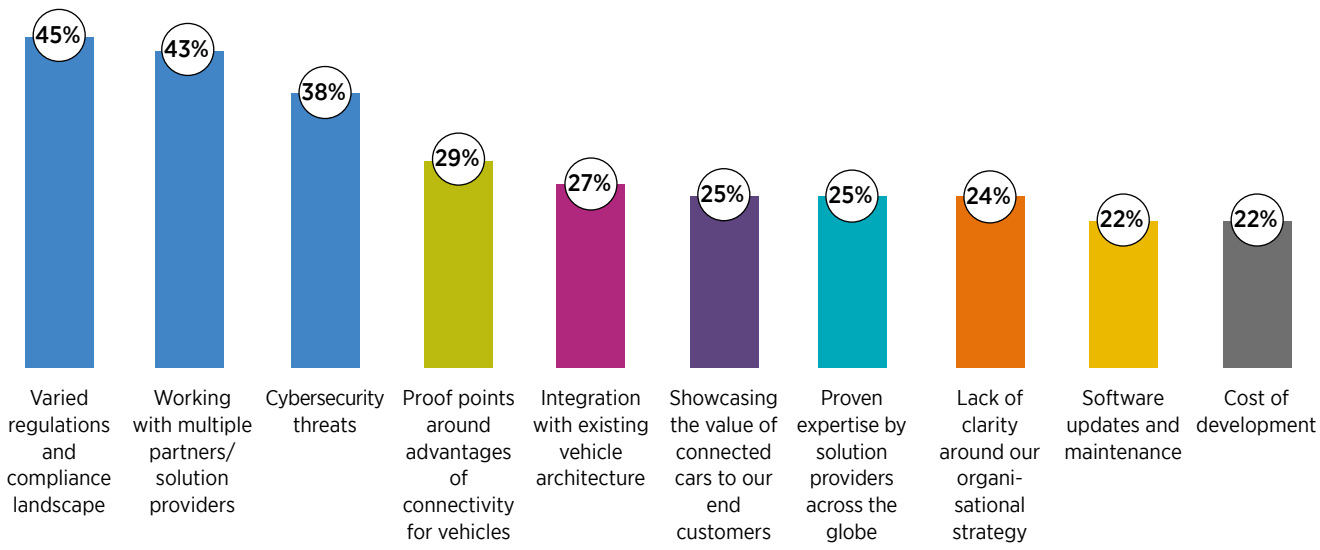
Which emerging technologies do you believe will have the most significant impact on the future of connected vehicles?*

*multiple choice



What are the most significant challenges you face when deploying connected solutions for your vehicles?

*multiple choice



However, along with these innovations come significant challenges that automotive companies are striving to overcome. Approximately 45% of respondents pointed to regulations and compliance requirements as major obstacles, complicating the consistent deployment of AI-driven connected solutions across different regions. Navigating this regulatory maze is critical for unlocking the full potential of connected vehicles, yet it remains a persistent hurdle.

Cyber security, is another prominent concern. 38% of respondents worry about the evolving threat landscape and vulnerabilities associated with increasingly connected and intelligent vehicles. Ensuring that these systems are safeguarded from threats is essential not only for the security of data but also for maintaining consumer trust. This challenge is further amplified by the complexities of working with multiple solution providers, as indicated by 28% of respondents, and the high cost of development, noted by 22%.

Moreover, the integration of connected solutions into existing vehicle architectures presents additional difficulties. About 38% of survey participants cited integration as a significant barrier, underlining the technical challenges involved in adapting legacy systems to work seamlessly with cutting-edge connected technologies.

These issues make it clear that while the benefits of AI and connected solutions are transformative, their implementation is fraught with complexities that require careful planning and collaboration across the industry. Automotive companies must prioritise robust security measures, regulatory compliance, and strategic partnerships to overcome these challenges and fully harness the power of connectivity to drive innovation forward.

OTA procedures are where AI and connectivity intersect to truly reshape the automotive landscape. AI is playing a crucial role in optimising this process, from predicting the best times to push updates to ensuring seamless integration with existing vehicle systems.

Despite the promise of OTA technology, the industry is still working to perfect it. Currently, only 14% of respondents report a high success rate (76-100%) for OTA downloads, while 43% experience moderate success rates and 17% report low success rates. This signals a clear opportunity for improvement—particularly in infrastructure and AI-driven optimisation.

A stable, reliable OTA process is key to delivering the promise of true connectivity, ensuring vehicles are always up-to-date, secure, and equipped with the latest features.

TOP 3 DEPLOYMENT HURDLES

1. COMPLEX REGULATORY & COMPLIANCE REQUIREMENTS

2. DIFFICULTY WORKING WITH MULTIPLE PARTNERS

3. EVOLVING CYBER SECURITY RISK & THREAT LANDSCAPE

Encouragingly, there is a strong appetite for better performance. A striking 67% of survey participants are willing to invest more to increase OTA success rates, highlighting the industry's commitment to overcoming these challenges. This eagerness reflects a shared vision of leveraging AI to enhance connectivity, keeping vehicles not only functional but ahead of the curve in terms of innovation and safety.

As the survey provides mixed results when it comes to OTA, the following recommendations provide a roadmap for organisations looking to improve their OTA success rates and unlock the full potential of this technology.

For those experiencing low OTA success rates, where only 0-25% of updates are completed successfully, the first step is to identify and address the root causes. This often involves a detailed review of the OTA infrastructure. By evaluating the reliability of the networks used for updates and scrutinising the update mechanisms, organisations can pinpoint the specific areas that need improvement. Whether it's a network bandwidth issue or a glitch in the update process itself, understanding the problem is the first step towards resolving it.

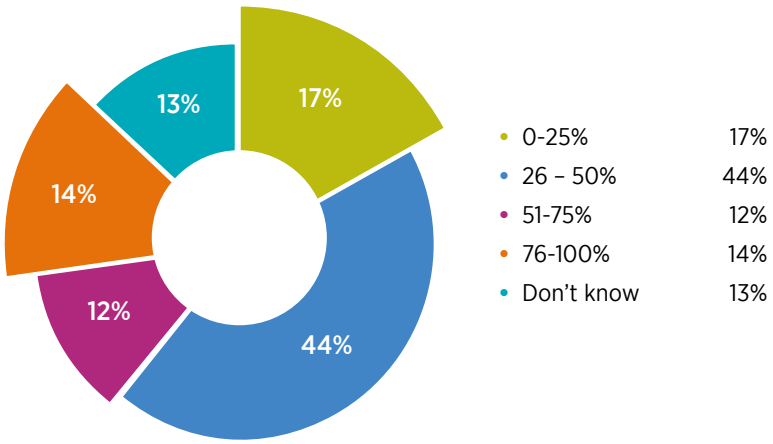
For companies that are unsure of their success rates or are unaware of where issues may be occurring, it is vital to enhance monitoring and reporting systems. Investing in tools that provide clear visibility into OTA performance will allow organisations to quickly identify problems as they arise. These tools will not only highlight the technical issues but will also provide data on where and when updates fail, making it easier to address these challenges proactively.

Interestingly, some organisations are already achieving high success rates of 76-100%. For those in this position, there is an opportunity to share best practices with companies facing difficulties. The exchange of knowledge within the industry could help lift overall performance, allowing more organisations to achieve smoother, more reliable OTA updates. Collaboration and transparency in these areas could significantly elevate the standards across the board.

For organisations in the 26-50% success range, the path to improvement lies in continuous improvement. Ongoing optimisations in deployment strategies, network management, and update processes can help reduce the number of failed updates and push success rates higher. This is not a quick fix but an approach that requires dedication to evolving with technology and constantly improving systems.

Additionally, support and training are critical. Providing training and resources to teams responsible for OTA deployment and troubleshooting can lead to better outcomes. Equipping staff with the knowledge and tools they need to manage OTA updates effectively will naturally result in higher success rates.

What is the success rate you are experiencing with OTA downloads for your connected vehicles?

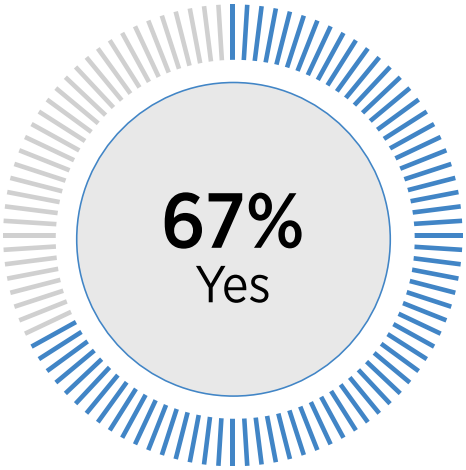


Beyond the technical recommendations, there is also a need to highlight the return on investment (ROI) for organisations willing to invest in improving their OTA infrastructure. For many, the initial costs may seem daunting, but the long-term benefits—fewer manual interventions, improved customer satisfaction, and cost savings—can more than justify the expense. Demonstrating the potential ROI can help decision-makers see the value of these improvements and encourage investment in better OTA processes.

For organisations that are more hesitant to invest, focusing on the value of enhanced OTA capabilities is key. Often, presenting case studies or data that showcase the operational efficiencies and reduced downtime resulting from higher OTA success rates can help shift perspectives. It's about framing the investment not just as a cost but as a crucial step toward greater efficiency and reliability.

Offering flexible solutions can also bridge the gap between organisations that are eager to invest and those that are more cautious. By providing tiered or scalable options, organisations can choose the level of investment that best suits their budget and needs. This approach allows companies to start small and scale up as they begin to see the benefits of improved OTA performance.

Are you willing to pay additional costs for increasing the remote OTA success rate?





MONETISING CONNECTIVITY

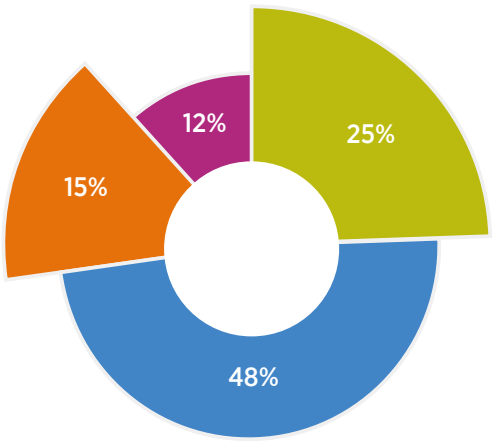
As we move further into the survey results, it's only natural to also focus on how automotive companies are navigating the economics in the context of the evolving role of connected vehicles. The focus in this final part of the survey has shifted beyond just integrating technology—it's centred on how to monetise connectivity, sustain these advancements, and balance the associated costs effectively. The conversation is about turning connectivity into a profitable part of the business while ensuring that it remains a value-add for the customer.

When it comes to managing the costs of connectivity—particularly consumer and infotainment data—the industry is taking a varied approach, with many leaning towards cost-sharing strategies. The largest group, about 48%, aim to apply a mixed cost-sharing approach, with plans to absorb these costs themselves and passing it to their customers. This approach acknowledges that while consumers value connected features, there's a practical limit to what they are willing to pay directly, therefore indicating a trend towards finding a middle ground that can balance financial responsibility and customer affordability.

However, this approach comes with its own challenges. Cost-sharing might lead to potential confusion over what's included and what's not, and customers may be put off by additional fees that weren't previously part of their vehicle ownership experience. The risk is that if not communicated clearly, shared costs could reduce the perceived value of connected services.

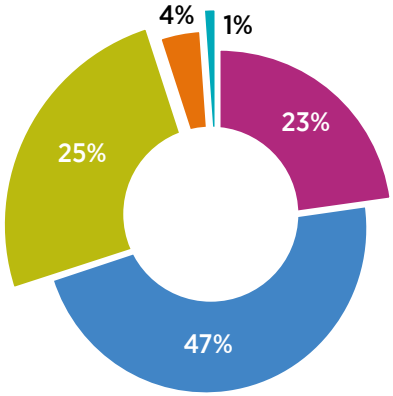
In contrast, around 25% of participants plan to absorb all the connectivity costs themselves, using it as a customer value proposition—essentially treating it as an embedded feature that adds to the overall appeal of the vehicle, and differentiate in an otherwise crowded market. Meanwhile, 15% intend to pass all the connectivity costs onto their customers, treating it as an optional feature rather than an embedded benefit. These varying approaches highlight that there is no universal solution, some prioritise customer satisfaction and competitive differentiation, while others focus on cost recovery., and companies are experimenting to find the right balance between offering value and managing costs in a way that appeals to their market.

Do you intend to cover the costs for the consumer/infotainment data element of your connectivity solution or are you going to pass this on to your customers?



- Fully cover ourselves 25%
- Partly us and customers 48%
- Fully pass on to our customers 15%
- Cover ourselves initially and then pass on to our customers after they see the value from it 12%

How do you foresee the role of traditional automotive manufacturers evolving with the rise of connected and software-defined vehicles?



- We see traditional automotive manufacturers dominating the market through innovation 23%
- We see more collaboration with tech companies 47%
- We see traditional automotive manufacturers becoming more service-oriented than product-oriented 25%
- We see ourselves facing challenges in keeping up with tech advancements 4%
- Other 1%

The evolving role of traditional automotive manufacturers was a key focus in the survey, revealing a shift in how these companies view their future. Nearly 47% of respondents believe that collaboration with tech companies will be essential for driving innovation. As vehicles become more software-defined (Software Defined Vehicles or SDVs) and reliant on complex digital solutions, partnerships with tech firms, particularly in areas such as software development, data analytics, and connectivity, are seen as crucial for staying competitive. This aligns with one of the key recommendations from the survey: traditional automakers should actively foster partnerships with tech companies. By leveraging the expertise of these firms, manufacturers can more efficiently integrate advanced technologies into their vehicles.

However, a notable 23% of respondents still believe that traditional automakers can dominate the market through their own innovation. These companies hold on to the belief that their legacy in engineering and in-house research and development (R&D) can drive future growth. The recommendation here is for manufacturers to continue investing in innovation to ensure they remain competitive. Cutting-edge technologies will allow automakers to maintain their market presence while adapting to new consumer demands and technological advancements.

Meanwhile, about 25% of respondents envision a shift from product to service-oriented models, focusing on customer experiences rather than just selling cars. This includes the development of new business models, such as subscription services, connected features, and personalised experiences. The recommendation to explore and develop service-oriented business models is key here. Automakers can provide ongoing value to customers through enhanced personalisation, offering tailored services that strengthen customer loyalty and satisfaction.

Looking ahead, the survey participants identified several key opportunities in the connected vehicle ecosystem over the next two to five years. Approximately 30% highlighted partnerships with tech companies as the most promising path forward. By emphasising partnerships, traditional automakers can tap into new innovations more rapidly and remain agile in a fast-changing market. Moreover, the development of new mobility services such as ride-hailing and car-sharing was seen as a key opportunity by 28.9% of respondents, as automakers seek to diversify their offerings beyond car manufacturing and explore more flexible, customer-centric solutions..

Monetising vehicle data remains a significant opportunity, with around 25% of respondents recognising the potential for turning connected vehicle data into a revenue stream. Developing strategies to monetise vehicle data should remain a priority, even if it is less urgent compared to forming partnerships or developing mobility services. Manufacturers can capitalise on the wealth of information generated by vehicles, turning data into actionable insights for improving services and creating new revenue streams.

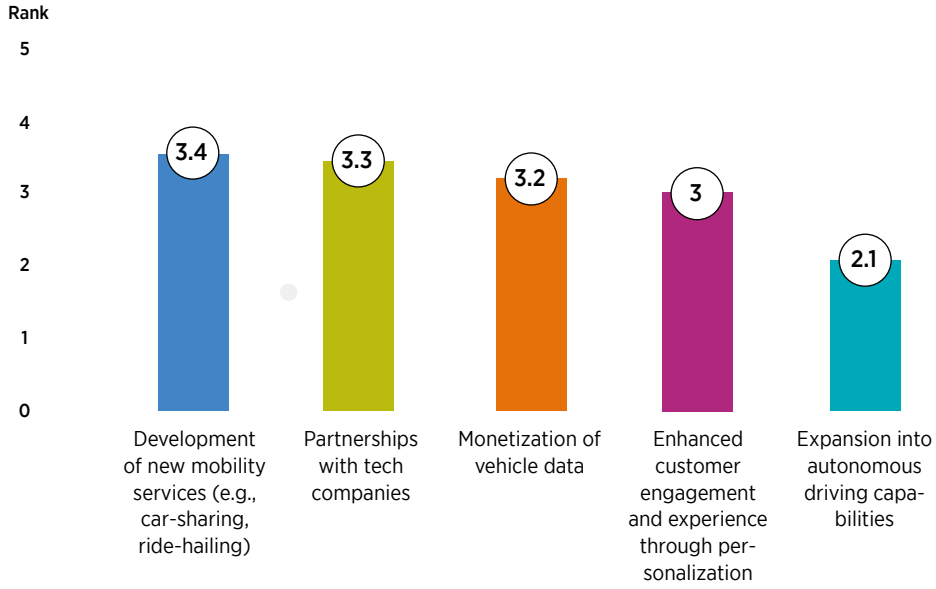
Interestingly, the expansion into autonomous driving capabilities appeared to be a lower priority for many respondents, with only 5.4% ranking it as the most important opportunity. This is likely due to the technical and regulatory challenges that still hinder widespread adoption. However, manufacturers should not lose sight of these developments and focus on creating trusted value for their customers. Monitoring advancements in autonomous driving remains essential, but resources should be allocated based on the current priority of other opportunities.

Finally, while the survey showed that keeping up with tech advancements is not a top concern for most automakers, it remains important to have strategies for continuous learning and adaptation. The recommendation to address technological adaptation ensures that manufacturers can stay ahead of emerging technologies and incorporate them effectively into their product lines. Additionally, engaging with diverse perspectives from smaller segments of the industry can help automakers understand niche trends and stay adaptable in an evolving landscape.

By aligning their strategies with these insights—focusing on partnerships, investing in innovation, exploring new mobility services, and leveraging data—traditional automotive manufacturers can better position themselves to capitalise on the most significant opportunities in the connected vehicle ecosystem over the next two to five years.

Despite the optimism around connected technologies and the opportunities they present, the willingness to fully commit to this future is tempered by some caution. A key insight here is that while many see connected vehicles as integral to their strategy, the practical concerns around costs, the need for tech partnerships, and the uncertainty in fully autonomous development highlight the challenges. The industry knows that connectivity is the way forward, but the pathway is complex and requires careful navigation.

What strategic opportunities do you foresee in the connected vehicle ecosystem over the next 2-5 years?



CONCLUSIONS & KEY TAKEAWAYS

The journey towards fully connected vehicles is filled with both opportunities and significant obstacles. Achieving seamless connectivity requires addressing issues related to integration, cost transparency, and infrastructure reliability to ensure the vision becomes a reality.

Integrating connected technologies across different regions and models remains challenging due to fragmented standards, compatibility issues, and inconsistent coordination among stakeholders.

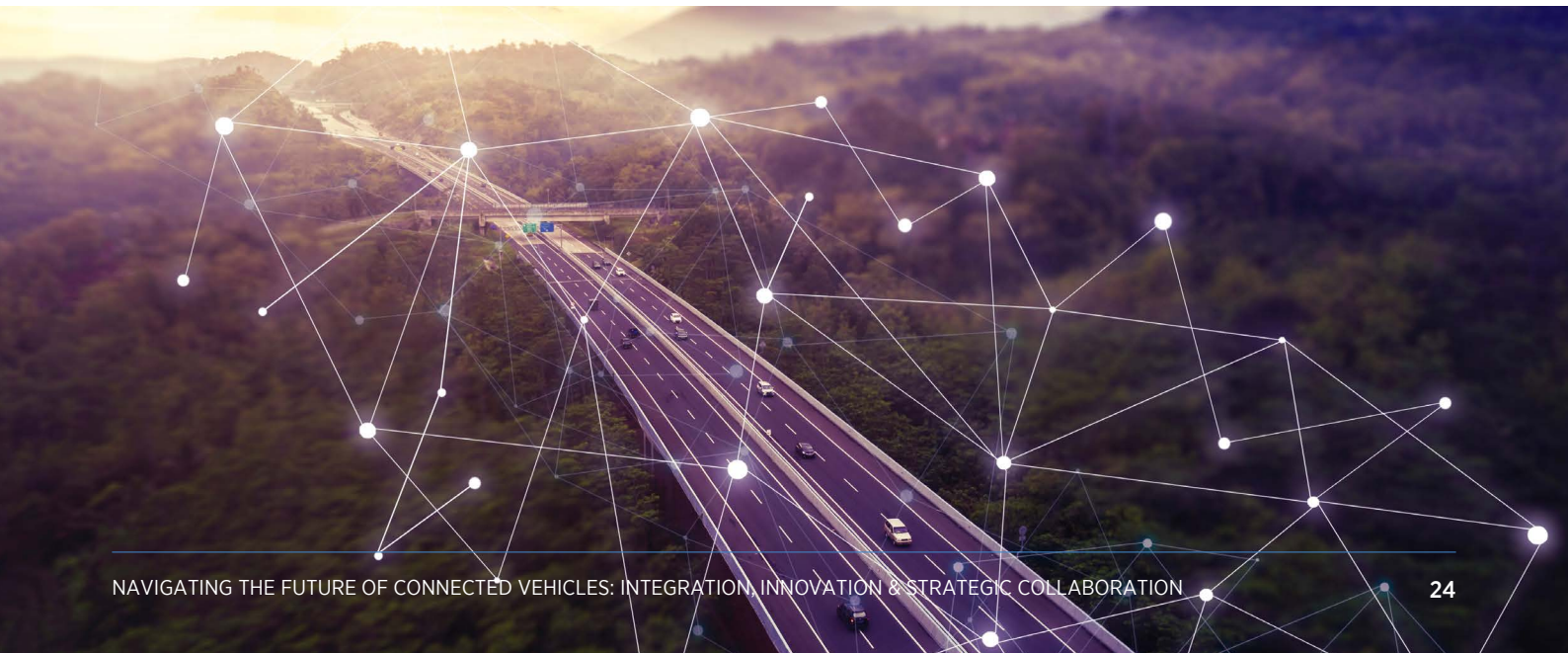
To overcome these barriers, automakers, suppliers, and technology partners must align their strategies to create a cohesive approach that supports efficient deployment and consistent adoption of connected features. This alignment is key to preventing a fragmented market where the benefits of connected vehicles are not evenly distributed.

Cost management is another critical aspect that requires attention. The lack of a unified approach to handling connectivity costs has led to varying practices across the industry, resulting in potential confusion for consumers. Companies need to clearly communicate the value and cost implications of connected features to ensure that consumers see them as integral, value-enhancing parts of the vehicle, rather than optional add-ons.

Over-the-air (OTA) updates hold immense promise for keeping vehicles current, secure, and optimised without the need for physical servicing. However, their inconsistent implementation has highlighted weaknesses in existing infrastructure, as well as challenges in ensuring compatibility across different systems and models. Investing in a more robust infrastructure and ensuring the reliability of the OTA update process are essential to fully leverage their potential. Additionally, automakers must focus on educating consumers about OTA updates to help them understand their benefits and importance.

The role of traditional automakers is also evolving in the connected vehicle landscape. Partnerships with technology firms are becoming increasingly important for driving future innovation, especially as vehicles become more complex and reliant on software, AI, and advanced connectivity solutions. However, relying solely on external partnerships poses risks, such as loss of control over core technologies. Therefore, building internal capabilities in software development, AI, and data management is equally vital for long-term success and competitiveness.

The automotive sector is at a crucial juncture—ensuring seamless connectivity requires a focused effort on overcoming integration challenges, clarifying cost structures, and building the infrastructure needed for a reliable and consistent connected experience. Addressing these challenges will not only enhance the customer experience but also ensure a sustainable and innovative future for connected vehicles, benefiting all stakeholders—from manufacturers to consumers, and the broader community.



INTERVIEW: TOM HESLINGTON



In this interview, **Tom Heslington, Head of Vehicle Connectivity at JLR** shares his insights into JLR's £18bn, five-year investment strategy to grow their connected vehicles services and how Tata Communications MOVE™ allows their customers to focus on enjoying their vehicle above all else.

How is executive leadership at JLR approaching the connected vehicles space from a technological, strategic, and financial standpoint?

As part of our Reimagine strategy, we have plans to invest £18bn over the next five years in our industrial footprint, vehicle programmes; autonomous, AI and digital technologies, and people skills. JLR has also invested in a network of global engineering hubs, including Portland, Shannon, Bangalore and Manchester, to grow our ability to deliver connected vehicle services to customers. Collectively our 11 global hubs employ over 1,500 engineers, forming part of JLR's over 11,000-strong permanent global engineering force.

Our Open Innovation programme helps to deliver Reimagine, fostering collaborative innovation with corporate entities, investors, and academia on a global scale. One of the main focus areas of JLR's innovation strategy is connectivity. Through our Open Innovation programme we have engaged with over 2,000 startups, resulting in 33 co-creation projects. The CVC arm InMotion Ventures is an early investor in one of these startups and Cesium Astro, with which we have been exploring the application of Low Earth Orbit satellites (LEO) for JLR.

We continue to invest in people to ensure we have the skills and knowledge in-house to develop our own cloud platform that powers a wide range of services such as diagnostics, telematics, ADAS, V2X and more. We were one of the first OEMs to deploy e-SIM technology at scale with Tata Communications in 2020, and we are looking to continue this ambitious leading deployment of future technology with our next-generation vehicles.

JLR is known for its strong emphasis on customer centricity, and customer experience is increasingly becoming a key market differentiator. How does your connected vehicles program help achieve your customer experience goals and enhance your competitive position, especially in line with JLR's 2030 mission?

JLR is not in an arms race to deliver digital features – we seek tech features that have material relevancy for our clients, slotting neatly into each JLR brand's values. We want to take care of the how and where the vehicle connects on behalf of the customer, removing barriers such as data packages, network operator contracts and handling SIMs. Our work with Tata Communications MOVE™ allows our customers to focus on enjoying their vehicle.

A JLR customer's experience with their car is more than just driving! The ability to manage charging, plan routes, update software, control the cabin temperature and air quality can all occur outside the vehicle.

We must ensure these experiences meet our modern luxury standards and integrate with a customer's daily digital life – they don't want to have to worry about setting up networks. This is key to customer satisfaction and the positive engagement we desire to meet our goals.

One such example of delivering connected features is Software over-the-Air. We are working closely with Tata Communications to enhance Software OTA updates by investing in the network to meet our increasing demand for vehicle data over the air. Software OTA was originally developed to update infotainment systems. It now updates a wide variety of vehicle systems, from propulsion / powertrain, braking and steering systems, transmission control for four-wheel-drive and advanced driver-assistance systems (ADAS). This feature makes a four-year-old car as up to date as one leaving the showroom today. With this, so far, we have:

- Delivered approximately 15 million unique Software OTA updates till date, with an average of over 0.5mn ECUs updated per month over the last year.
- Fitted 3 million cars with InControl suite of products and services across models. This spans across 64 countries in 28 different languages, which is one of the largest global footprints for a global automotive OEM.
- Updated over 217,000 pre-2020 model year vehicles with enhanced security with thanks to a £15m investment and our software-over-the-air (SOTA) technology

For this, we have been ranked top in the JD Power survey for updates. And this is just the beginning. Our teams are working with Tata Communications to deliver AI-driven predictive diagnostics and issue resolution.

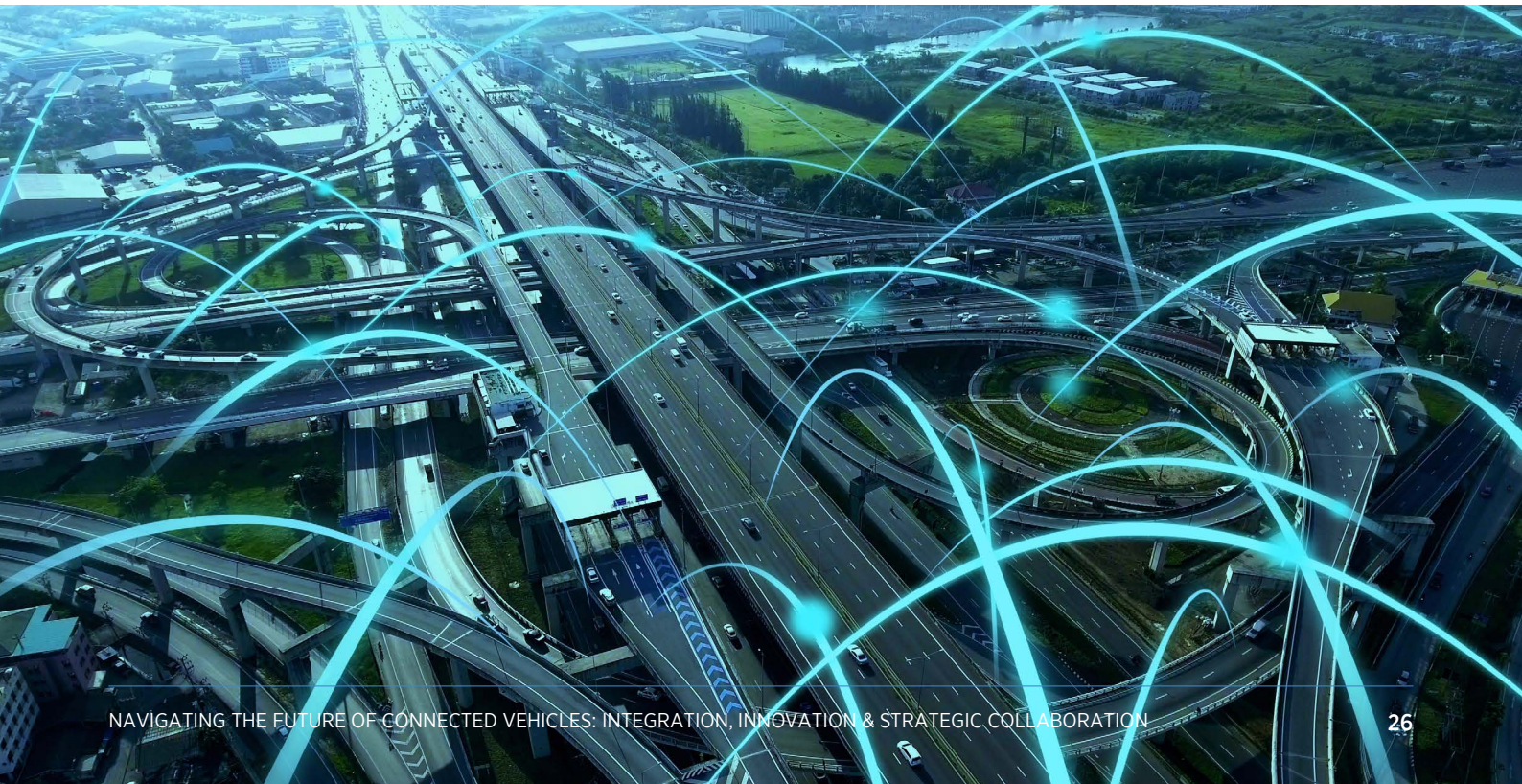
What factors are most important when selecting a technology partner for your connected car initiatives, and what led you to collaborate with Tata Communications? Can you share key use cases you are developing with Tata Communications MOVE™ and the outcomes you expect?

One of the key factors, as mentioned above, is the priority of delivering connectivity to JLR's clients that is dependable and accessible. We are the only automotive OEM that is part of a larger group featuring a telecommunications business. With Tata Communications' help we can navigate the very complex world of global telecommunications.

Tata Communications manage 100s of global network operators, deals with the different regulations and gives us a single product that we can use to deploy our connected services. We look for a partner, like Tata Communications, who is going to invest in technology and match out ambition to become a SDV player; a partner that will invest in their platform capability, network and technology to ensure we have cutting edge wireless connectivity available today and in the future.

While we can take a lot of data from the vehicle and network to establish where we have bad connectivity, a priority for JLR is to ensure quality of service and to minimise the cost of data, which Tata Communications is aligned to. As part of the wider Tata group, Tata Communications has a deep understanding of the automotive agile operating model, ensuring seamless alignment between automotive use cases and telecom capabilities.

We want to give our customers one source of connectivity and through Tata Communications network, our customers won't have to worry about connecting to different networks in different regions or areas around the world. Thus, they experience less connectivity disruption compared to other vehicle brands.



INTERVIEW: MARCO BIJVELDS



Marco Bijvelds, VP and Global Head - MOVE & Mobility Business at Tata Communications is responsible for developing an innovation & growth agenda that will help advance the MOVE & Mobility business roadmap while identifying new opportunities.

In this interview, Marco shares his thoughts on the evolving technologies that will redefine the connected vehicles of the future and how partners like Tata Communications can help OEMs navigate complexity, regulations, and security concerns.

What are the evolving technologies that will redefine the connected vehicles of tomorrow, how can the data from connected vehicles become a source of value to both OEMs as well as the end consumers?

Today's consumers see their connected vehicles as an extension of their digital lives. They just don't want their vehicles to be connected but expect them to be able to provide smart & secure experiences. Consumers expect their vehicles and the surrounding ecosystem to be able to anticipate needs, adapt to their routines, and connect seamlessly with the broader digital world.

Automotive OEMs are developing advanced use cases to enhance safety and make the vehicle intelligent. Technologies like AI & 5G will play a big role in that future of connected vehicles and we feel very excited for the automotive industry. 5G will provide that low-latency and reliable communication for use-cases like ADAS, while the data-insights will be used for driving services revenues for OEMs. One such example that we are working on with a global customer of ours is that of optimising vehicle software OTA downloads. Our customer uses data insights to recommend the best time and best network to improve its OTA update success rate.

How is borderless, multimodal connectivity, the factor defining the connected vehicle space of the future?

Vehicle connectivity is at the core of OEMs business and tech strategy. They are developing various software services and software-enabled hardware services to differentiate themselves. To ensure a seamless experience, OEMs are working with various MNOs. But we hear that they are not happy with this system of working across multiple platforms and managing multiple MNOs. Managing multiple MNOs, regulations, agreements, etc, is challenging and resource intensive. This is especially difficult for OEMs with multi-country deployments. Plus, inconsistency in data and lack of control over their connections, hampers the quality of service.

This is why they need a platform that enables flexibility of bringing their own network, so as to cause minimum disruptions. Working with our customers, we've reduced time-to-market in new markets by up to 60%. To provide a seamless experience especially across low coverage pockets, we are also working on satellite connectivity through our partner network wherever the demand is. We feel that will be a game changed along with emergence of 5G that will accelerate deployment of autonomous driving, where seamless, multi-modal connectivity becomes even more important.

As Auto OEMs navigate the ever-evolving landscape of connected vehicles, navigating complexity, regulations, and security concerns, how should they choose a partner that is much more than just a connectivity provider?

We believe that Automotive OEMs should select a partner that takes away the complexities of managing the in-vehicle connectivity and brings in years of not just telecom experience, but also industry expertise. We have seen OEM players facing challenges because of difficult and ever-changing regulatory requirements. So, they should also be working with someone reliable with a robust approach towards unified security and be able to bring both technical and consultative expertise to the table.

A vehicle made today is going to be on the road for around 10 years. The partner they work with should be agile and constantly evolving to serve their business goals and enable them to provide an out-of-the-world experience to their end customers. There is a need to provide a consolidated digital fabric enabler who can drive connectivity from cradle to grave for a car across the private (Manufacturing) and public environments.



Tata Communications MOVE™ (MOVE) provides an in-vehicle connectivity solution that enables development and deployment of connected mobility services simpler, smarter, and safer. MOVE empowers Auto OEMs to provide mobility services across 190+ countries and territories with a single contract. It leverages Tata Communications' Tier 1 global infrastructure to connect millions of devices globally.

To know more about their automotive solution, visit www.tatacommunications.com/automotive/ or mail at MOVE@tatacommunications.com