Circuit
Business
Consulting

STUDY

AI-Driven In-Car Personalization

Opportunities and Challenges for the Future of Automotive



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About Us: Circuit Business Consulting

Circuit Business Consulting (CBC) is a management consulting firm based in Sarajevo, Bosnia & Herzegovina, dedicated to shaping the future of mobility. We operate at the intersection of technological innovation, strategic transformation, and operational execution, transforming businesses across the entire value chain.

We guide automotive leaders, OEMs, and technology innovators through digital transformation, software integration, and AI-driven personalization. Spanning the full strategic spectrum, from market gap analysis and portfolio optimization to SaaS business models and regulatory navigation, CBC turns technological complexity into a sustainable competitive advantage.

How We Support Industrial Leaders

Strategy Development & Trend Analysis

We guide OEMs and technology innovators through strategic clarity by evaluating market dynamics, benchmarking performance, and building holistic product and technology roadmaps.

Digital Solutions & Product Development

We support end-to-end development of cutting-edge digital products - managing product roadmaps, guiding software integration, and implementing scalable AI architectures to enhance customer experiences.

Portfolio Optimization & Business Transformation

We help organizations optimize product and service portfolios, transition toward new business models, and structure viable monetization strategies.

Project Delivery & Governance

We bring structured execution to complex environments, establishing workstreams, PMO frameworks, and modern quality management across hardware and software to ensure tangible, lasting outcomes.

About the Study

This study investigates the shift toward AI-driven, context-aware personalization in the automotive sector. As vehicles transition into intelligent digital companions, personalization is moving beyond manual adjustments toward predictive, real-time adaptations across driving and non-driving tasks. By leveraging Machine Learning, Deep Learning, and Generative AI, automakers can enhance natural language interactions, driver trust, and brand loyalty.

However, a gap remains between current reactive systems and consumer expectations for proactive intelligence. The study highlights emerging monetization strategies, such as subscriptions and data-driven services, while addressing key technical, regulatory, organizational, and cultural barriers to adoption. Ultimately, successfully deploying these architectures allows OEMs to redefine mobility into a deeply adaptive, personalized experience.

Consumer Expectations



The gap between today's features and tomorrow's intelligent experiences.

AI Opportunities



Context awareness, predictive capabilities, and proactive personalization.

Business Value



New revenue models, customer loyalty, and competitive differentiation.

Implementation Challenges



Technical, regulatory, and organizational barriers to adoption.

1.

The Need for Personalization in Cars

“

The trend towards autonomy is inevitable – cars will be more and more responsible for the drive, which is currently only a luxury and a wish. But with that autonomy, the focus will no longer be on driving but on creating a comforting, engaging experience for all passengers in the vehicle.

1.1 AI & Personalization shaping the future of automotive

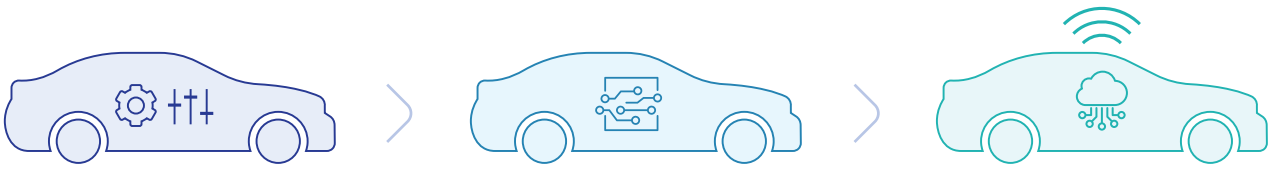
In an era where technology is continuously reshaping our lives, artificial intelligence (AI) represents another major milestone in technological development. As AI is steering the future of many industries, it also impacts the automotive industry.

We have seen a rapid transformation in the automotive industry over the last decades. What was once a realm of simple comforts, like adjusting seat positions and choosing paint colors, is now a playground for innovation. Today, vehicles are transforming into intelligent, adaptable machines that learn from their drivers. AI will accelerate this development even further, enabling cars to offer more personalized driving experience.

Personalization of vehicles represents a key driver for OEMs, especially in today's world. In general terms, personalization involves the utilization of customer data to offer individually tailored solutions [7]. In the context of vehicles, personalization affects both driving and non-driving tasks [14]. The aim is to provide OEMs with a competitive edge by delivering differentiated services that meet specific needs of their customers.

The rising expectations of modern consumers further amplify the importance of personalization. As the digitalization of everyday products and services accelerates, drivers increasingly expect their vehicles to deliver seamless, intelligent experiences that reflect their habits, routines, and emotional states. In response, OEMs are reimagining the role of the vehicle: not just as a means of transport, but as a responsive, data-driven companion that enhances comfort, safety, and lifestyle.

AI plays a pivotal role in shaping the evolution of in-car personalization. It enables systems to continuously learn and evolve over time, adapting to user behavior and preferences. These technologies enhance brand recognition, unlock new business models, and strengthen the relationship between users and their vehicles. Together, these aspects represent the three core objectives of successful in-car personalization.



MANUAL ADJUSTMENTS DIGITAL SYSTEMS AI-DRIVEN PERSONALIZATION

2.

AI and In-Car Personalization

2.1. What is AI?

In general, AI is the ability of machines to understand situations, think and make appropriate decisions. The goal is to enable machines to perform human-like tasks and learn from previous experiences [11].

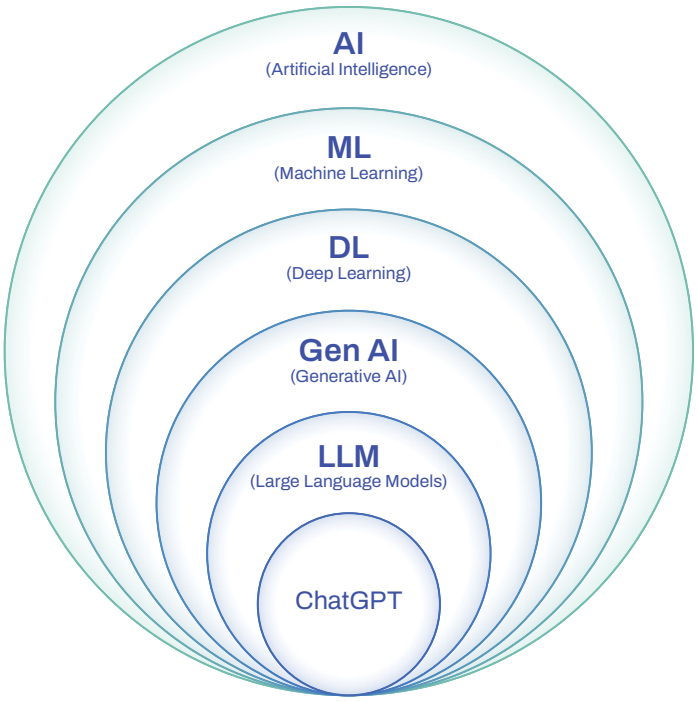
AI encompasses a wide range of applications and areas of implementation. Thereby, AI technologies can be explained through a hierarchical structure, illustrating how terms such as machine learning, deep learning and generative AI fall under the broader umbrella of AI (diagram below).

Starting from the top, Machine Learning (ML) allows machines to learn from data and improve over time without being explicitly programmed. ML techniques enable systems to identify patterns, make predictions and enhance performance. This technology forms the backbone of many modern AI systems, including predictive analytics and personalization.

Deep Learning is a more advanced subset of machine learning as it leverages artificial neural networks to process vast amounts of unstructured data. Deep learning models, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), are essential for the development of autonomous systems and AI-powered applications [15].

Generative AI is a specialized form of deep learning that focuses on generating new, original content based on patterns learned from existing (training) data. One notable form of generative AI is Large Language Models (LLMs), which are trained to understand and generate human-like text, making it possible for machines to communicate naturally with humans.

The best example of a powerful and widely known LLM is ChatGPT, capable of answering questions, generating content, and assisting with a wide range of tasks [15].



2.2. What is In-Car Personalization?

Looking at the history of automotive, personalization has always played an important role but was limited due to technical circumstances.

In terms of automotive personalization, it refers to the customization of driving systems to recognize and adapt to the unique driving patterns, habits, and preferences of individual drivers [18]. It has gained significant attention in recent years with the developments in information and web technologies. These developments have made it possible to automate the process of personalizing experiences based on vast amounts of user data.

In earlier days of automotive, vehicle features like seat positions, mirrors, and basic infotainment controls were the primary areas where personalization could be implemented and were limited to simple, one-size-fits-all features that had to be adjusted manually by the driver each time they entered the vehicle.

Today, personalization in vehicles extends far beyond seat positions and climate control to more complex systems such as driver assistance technologies, infotainment systems, and electric vehicle (EV) operations, where huge amounts of data are being utilized. The goal was always the same: to offer tailored features to improve driving safety, comfort, and efficiency to ultimately increase brand loyalty.









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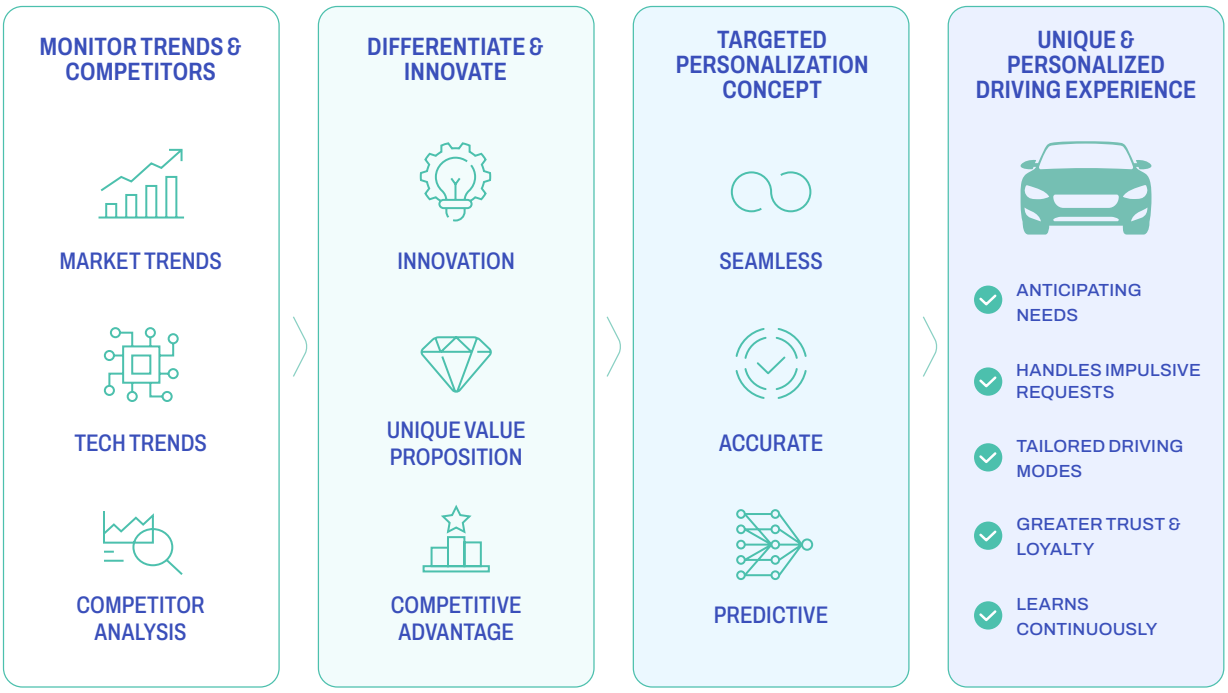
To provide unique and personalized driving experiences, OEMs need to stay up to technical and market trends but differentiate from competitors through innovative and sophisticated solutions. In that regard, it is crucial for OEMs to have a targeted personalization concept, which provides a clear vision and benefit for the end users. Looking ahead, AI is set to take personalization to new heights, enabling vehicles to become more seamless, accurate and predictive in their ability to adapt to the driver's needs. As the automotive industry continues to innovate, AI will play a central role in making in-car experiences even more dynamic and intuitive. AI-driven systems will allow vehicles to learn more about the driver, which can enable the car to not only anticipate needs before they are even consciously recognized by the driver, but also be able to handle any impulsive requests or situations accurately.

2.3. How AI Improves Personalization in Vehicles

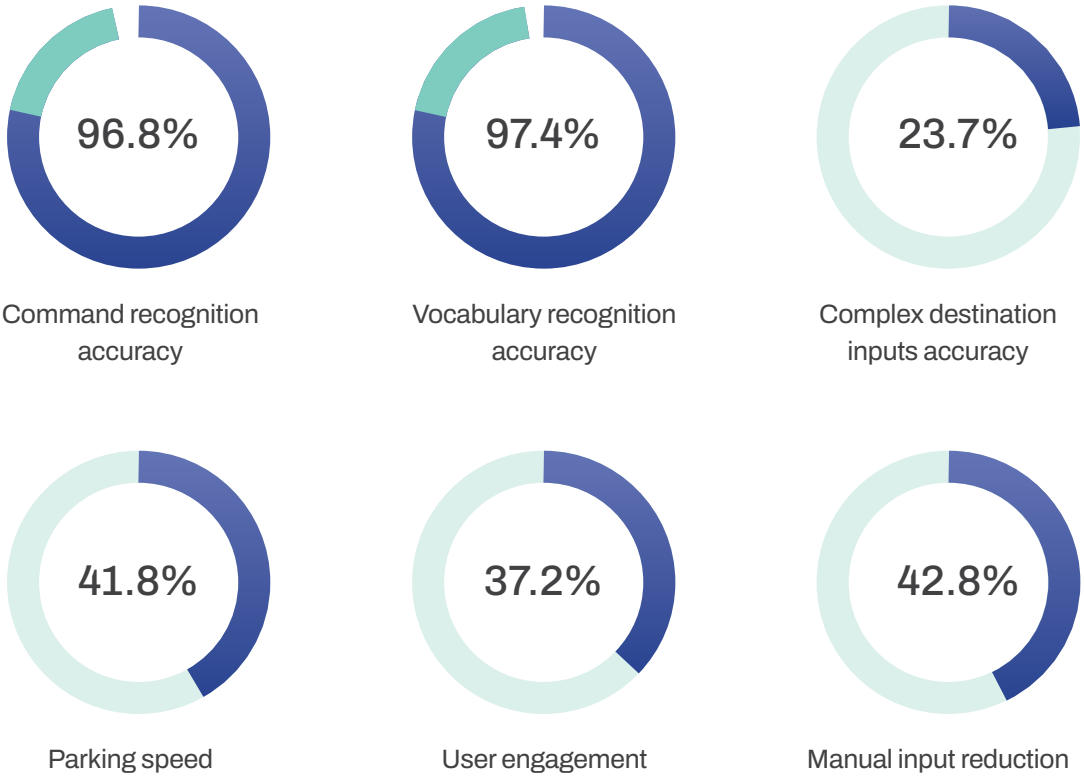
The enhancement of personalization with AI is already today visible through advanced technologies like Natural Language Processing (NLP), domain-specific language models, and predictive AI. NLP plays a critical role in improving voice assistants by allowing drivers to interact with their vehicles through natural language.

In 2024, automotive NLP systems achieved significant increase in enhancement. They are outperforming general-purpose language models across core recognition tasks. These gains—particularly in handling complex queries like destination inputs—have significantly boosted driver engagement while reducing the need for manual controls.

OEM strategic roadmap for unique & personalized driving experiences



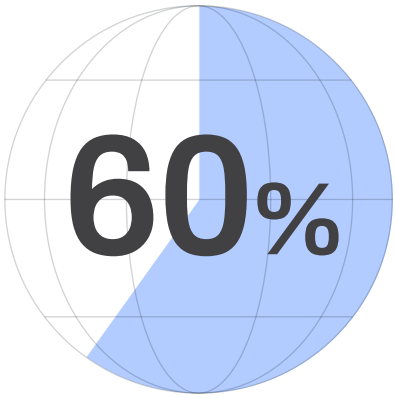
NLP personalization enhancement in 2024



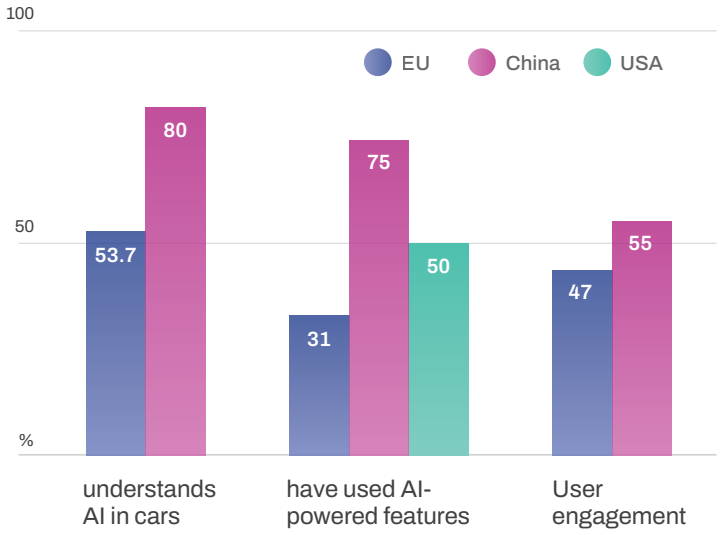
3.

Identifying Trends & Gaps in In-Car Experiences

3.1. Consumer Expectations and Demand of Personalization in Vehicles



of global end consumers state that they understand the use of AI in cars



The technological development of AI and personalized solutions within vehicles provides visible benefits. But is that recognized and demanded by end consumers?

AI in automotive represents in the eyes of end consumers a rather new technology. Only 60% of global end consumers state that they understand the use of AI in cars. There is a variety between consumers from different countries regarding the application of AI. More than 80% of respondents in China understand AI in cars, while in Europe only 53.7% [15]. When it comes to actual usage, nearly 75% of respondents in China have used AI-powered features in vehicles, compared to only 31% in Europe and 50% in the US [15]. Looking at these figures a clear correlation between the digital offerings of OEMs and consumer behavior can be seen. Chinese automotive companies have shaped local consumer demands by offering strong personalization and digital features as standard, making connectivity and customization central to the consumer experience. In contrast, in the EU and U.S., these features are often treated by OEMs as add-ons, which reflects a significant difference in approach. Studies show that 55% of Chinese consumers are willing to switch brands for better connectivity, compared to around 40–47% of consumers in Germany and the U.S. [2].

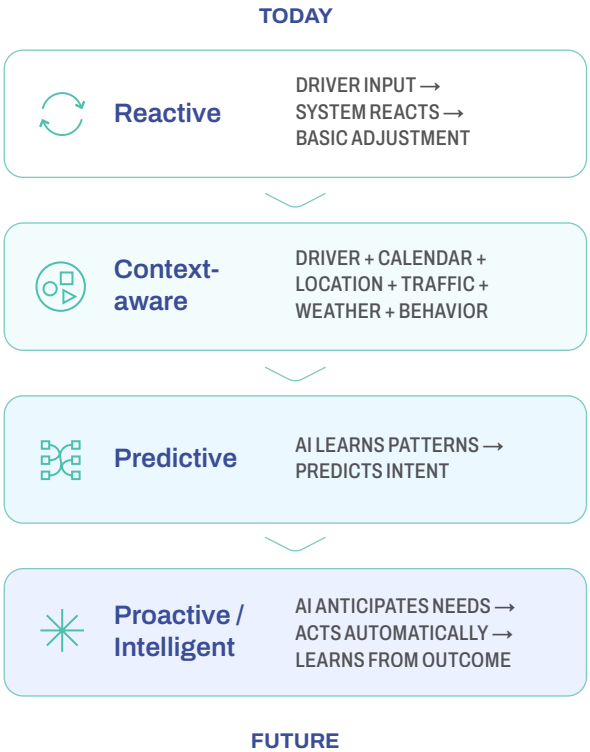
While these figures reflect a growing interest in connectivity, which serves as the foundation of AI, they also reveal a rising expectation for AI-powered personalization in the driving experience. In today's consumer world a connected product without AI applications seems incomplete. In the future it will seem outdated. Therefore it is crucial for leading OEMs to put focus on AI driven personalization and address as well as shape consumer needs with innovations. In reward end consumers will be willing to pay more and stay loyal to OEM brands. This can be seen already today in China.

3.2. Gaps in Personalization Systems

Despite recent advancements, today's in-car personalization often fails to meet the expectations of consumers in terms of AI or a truly intelligent and seamless driving experience.

But where do the personalization systems stand today in context of AI and consumer demands?

Modern consumers increasingly expect their vehicles to function as an extension of their digital lifestyle. For example, 69% of consumers want more connectivity services in their next vehicle, and 34% expect advanced (L4-level) driver assistance features [2]. Similarly, expectations around deeper personalization remain unmet. Drivers want their car to automatically adjust interior settings like seats, steering wheel, lighting, and infotainment based on who is inside. However, most current systems require manual input, lacking the intelligence to tap into external data sources proactively. Even entertainment experiences fall short; switching from a podcast at home to the same one in the car still often requires manual reconnection.



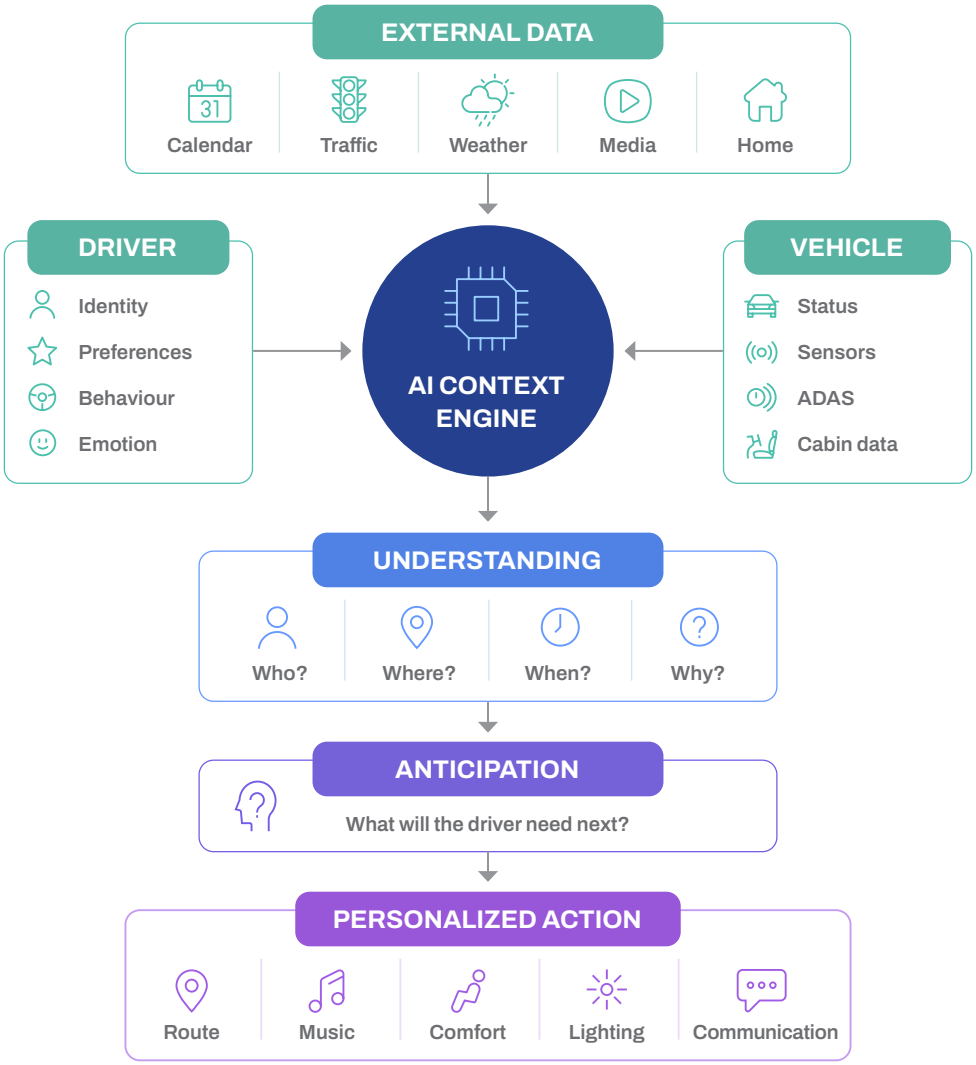
This mismatch between what is expected and what is delivered reveals that personalization remains largely superficial. Today's personalization offerings still focus heavily on surface-level features like seat position or mirror angle, but consumer desires have moved well beyond these basics. In-car systems will aim to react to the driver's emotions, but they first need to have the ability to recognize them. A technique already explored in the automotive context is facial action units in video streams, where they combined acoustic and visual input to allow for an estimation of driver emotions and is still steadily refined [4].

For example, drivers want their vehicle to start playing relaxing music during stressful commutes or changing ambient lighting based on mood. At the moment, most systems remain static, unable to grasp the emotional context or dynamically adjust the experience. Likewise, not only do owners say that interior gesture controls can be problematic (43.4 problems per 100 vehicles), but 21% of these owners also say AI-based technologies lack functionality [10]. Most vehicles still rely on one-time setups and repetitive manual inputs. This challenge also spans to the context of the action, as consumers no longer want their personalization to be static. Consumers want their car to recognize when they are rushing to an important meeting and automatically optimize for the fastest route while minimizing distractions. Conversely, they expect the system to detect leisurely weekend drives and suggest scenic routes or nearby attractions. Currently, most personalization systems operate with static preferences regardless of context. A driver might prefer energizing music during weekday commutes but relaxing music during weekend family trips, yet systems rarely distinguish between these different usage contexts. Preferences remain fixed, even though user needs clearly vary depending on who is in the car, the destination, or even the time of day. What ties all of these gaps

together is a transformation in how users expect personalization to work – from reactive to proactive. No longer satisfied with systems that respond only when prompted, drivers now want vehicles that anticipate their actions. Consumers want their vehicles to anticipate their needs rather than waiting for commands.

For example, Toyota has applied AI in its Safety Connect system to automatically notify support agents during collisions. More recently, it introduced generative AI features that help vehicles anticipate and alert drivers about maintenance needs in advance [5]. Apart from these security updates, most personalization systems are still only reactive, requiring user input to activate features. Consumers want their vehicles to learn that they, for instance, typically stop for coffee on Tuesday mornings and suggest their preferred café or recognize that they usually call their spouse during the evening commute and proactively ask if they would like to place that call. The gap between proactive expectations and reactive reality represents a significant disconnect in user satisfaction, but also one that requires AI models and learning to implement.

These gaps clearly show that personalization, as it stands today, is falling short of what drivers truly want, and that is a system that understands context, anticipates needs, and grows smarter with time. As consumer expectations continue to evolve, the pressure on automakers to deliver experiences that feel intelligent, seamless, and even emotionally aware is only increasing. That is where AI comes in. In short, AI is not just a tool for improving personalization, it is the key to unlocking its full potential. But what could this look like in practice? We shall dive deeper into potential opportunities in the future of in-car personalization.



3.3. Opportunities for Future Personalization

> Imagine stepping into your car after a long day. As the door closes, the cabin lights change to match your mood, the seat warms up to your preferred comfort level, and your favorite playlist fades in right where you left off.
> The car already knows you are tired as it has read the busy schedule you had at work that day and it automatically switches to a calming driving mode. On your usual route home, it suggests a detour to your favorite coffee spot, knowing you tend to stop there on days like this. It may even remind you to stop for groceries based on your weekly routine.

This level of intelligent, seamless personalization is no longer science fiction. Leading automakers are now rethinking their personalization strategies, turning the car into a space that not only reacts to your preferences but anticipates your needs and accompanies you on each journey.

Just like our example above, the development of fully integrated systems is one of the most promising opportunities. Brands like Tesla are already pioneering this type of dynamic, personalized approach with their driver profiles, where the car recognizes who's driving and adjusts accordingly. Moving forward, this will evolve to anticipate more than just basic preferences, offering a truly intuitive driving experience. Together with driver profiles, the ability to sync vehicles with a broader digital ecosystem will be key to taking personalization to the next level. Consumers already expect their devices to communicate seamlessly, whether that means syncing calendars, controlling smart home devices or streaming music. Cars are expected to follow through as well. The ability for vehicles to connect with a smartphone will enable a context-aware experience.

For example, a car could adjust its temperature based on data from your smart thermostat, or it could suggest the fastest route to a meeting based on the time and location from your calendar. BMW's ConnectedDrive is already experimenting with syncing calendars to suggest routes. In the future, these systems will evolve, learning not just about your preferences but also about your daily routines and moods, offering hyper-personalized experiences that include everything from driving styles to entertainment choices, making your car feel like a natural extension of your life.

Moving beyond reactive personalization, the next step is for vehicles to become predictive and proactive. Instead of waiting for the driver to manually input commands, cars will learn from past behavior, real-time data, and external factors like weather or traffic to anticipate a driver's needs. For example, the car could pre-adjust the seat and temperature before the driver enters, or suggest alternative routes based on historical traffic patterns and current conditions. This level of intelligent anticipation is already being explored in some Tesla models, but the future promises even greater sophistication in that it allows vehicles to adapt in real time without needing explicit commands.

Future vehicles will also move towards more multimodal interfaces—a combination of voice, touch, gesture, and biometrics. Imagine asking the car, "Make it cozy," and having it adjust the temperature, lighting, and seat settings all at once, using natural language. This kind of interaction could go beyond voice commands to include gestures (for example, adjusting the seat or mirrors with a hand movement) or biometric sensors that detect stress levels and respond by playing calming music or adjusting the driving mode. Mercedes-Benz is already experimenting with such features, integrating voice, touch, and gesture controls to reduce driver distraction and create a more effortless experience. The idea behind this is to reduce manual input as much as possible to alleviate the driver from distractions, unnecessary tasks and allow them to enjoy themselves in the ride as much as humanly possible.

With all these features implemented, the trend towards autonomy is inevitable – cars will be more and more responsible for the drive, which is currently only a luxury and a wish. But with that autonomy, the focus will no longer be on driving but on creating a comforting, engaging experience for all passengers in the vehicle. Imagine a self-driving car that adjusts the seat, activates the preferred entertainment, and even suggests activities for the journey ahead. With full autonomy, the car could become a personalized space where users are free to relax, work, or engage in entertainment without worrying about driving. Ultimately, this will change the way consumers think not only about personalization, but about the driving experience, which turns the car into a dynamic environment that adapts to both moods and needs.

4.

Business Impact

4.1. Business Models and Revenue Generation

Within the last years OEMs are re-thinking their business models and applying new approaches in accordance with the advanced digitization of in-car experience systems.

In today's automotive world there is huge competition around innovative business approaches, which ensure higher profitability, scalability and long-term customer loyalty. Some OEMs appear in public as Software-as-a-Service (SaaS) providers rather than manufacturers of vehicles.

The integration of Artificial Intelligence (AI) into in-car personalization systems will amplify this trend. Those systems require suitable business models in order to ensure long-term success and return on investment. It is projected that services enabled by connected and personalized cars will increase OEM revenue from vehicle sales by up to 30%[8]. Beyond cars sales, personalization creates ongoing opportunities for automakers to generate recurring income through subscription services, feature upgrades, and data-driven offerings.

In general, suitable business models for such systems are either direct or indirect monetization approaches (see table below). The choice of the implemented monetization approach depends on various internal and external factors.

Monetization Approach	Examples	Revenue Type	Characteristics
Direct Monetization (Pay-per-use or Subscription)	Tesla Autopilot, BMW Connected Drive	One-time payment, subscription	Par for advanced features like self-upgrades post-purchase.
Subscription for AI Services	Mercedes-Benz MBUX, BMW ConnectedDrive	Subscription (monthly/yearly)	Acces to premium services like navigation, updates, and entertainment.
Data-Based Models	Usage-based insurance, Smart City Data	Data sales, partnerships	Sell anonymized data to third parties for traffic management, insurance, or city planning
Personalized Services & Advertising	In-car commerce, Targeted advertising	Commission, advertising, revenue	Ads and offers tailored to individual user preferences, in-car purchases, and promotions.
Marketplaces and Third-Party Integration	App stores for vehicles, AI apps	Commission on app sales/subscriptions	Open platforms for third-party apps, charging a fee for usage or sales
Improved Customer Experience & Services	OnStar diagnostics, predictive maintenance	Subscription or one-time payment	Premium diagnostics, maintenance alerts, and real-time vehicle health updates.

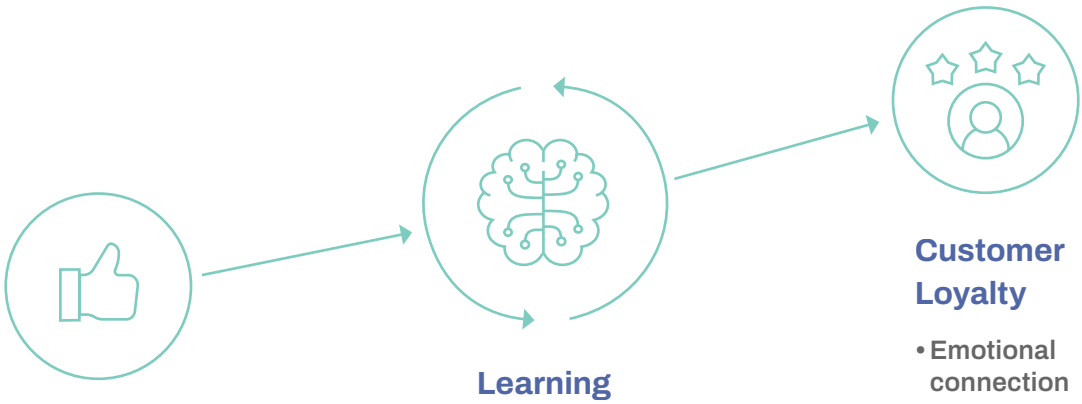
4.2. Customer Loyalty and Competitive Advantage through AI-Driven Experiences

Consumers value the ability to multitask during travel time, such as watching movies or engaging in social media, further underlining the significance of personalization in enhancing the value of travel time [17]. As consumers look for ways to maximize their time on the road, the automotive industry is adapting by offering personalized experiences that make driving not just a means of transport but a seamlessly integrated part of their lifestyle. This personalization is particularly valuable in improving customer satisfaction, as it increases driver satisfaction and anticipates needs before the driver even asks, making the experience feel effortless and tailored. Moreover, personalized driving tasks, such as AI-driven route planning, fuel consumption optimization, and payment suggestions, further elevate the experience by reducing cognitive load for the driver. For example, a vehicle may suggest the most efficient route based on the driver's historical preferences, real-time traffic data, and even weather conditions. As these systems learn and adapt to the driver's style, they create a deeper connection between the driver and the vehicle, increasing the likelihood of customer loyalty.

When a car "understands" its driver, offering customized experiences at each step, it fosters emotional attachment to the brand, raising the switching barrier for consumers.

This emotional connection is backed by psychological principles, as customers tend to stay loyal to brands that acknowledge their unique preferences. AI-driven personalization makes this recognition possible, ensuring the car continually adapts to the individual, which reduces the effort required for users to adjust.

Additionally, habit formation plays a significant role. Once consumers become accustomed to the personalized features, they begin to rely on them more, creating habitual usage that strengthens the emotional bond. Furthermore, trust is a critical psychological driver – when customers feel their vehicles proactively support their needs, they develop a sense of reliability and confidence in the brand, which makes it harder for them to switch to a competitor [3].



Customer Satisfaction

- Personalization experiences
- Travel time value
- Lifestyle integration

Learning Systems

- Tailored experience
- Anticipates needs
- Continually adapts to the individual

Customer Loyalty

- Emotional connection
- Stronger brand attachment
- Higher switching barrier

In addition to fostering loyalty, AI-driven personalization serves as a key differentiator in an increasingly competitive market. OEMs that offer unique personalized experiences set themselves apart from competitors that rely on more generic, one-size-fits-all solutions.

Today, consumers expect a high level of personalization in nearly every aspect of their lives. As such, incorporating similar personalized, AI-powered experiences in cars feels not only natural but also essential. The learning curve for these features has also diminished significantly over time. Consumers are already accustomed to digital interfaces and personalization through their smartphones and apps. This ease of use in other areas of life makes the transition to personalized in-car experiences far smoother, eliminating much of the previous complexity or resistance to new technology.

By providing these personalized, intuitive experiences, OEMs not only attract new customers but also retain existing ones, giving them a significant competitive advantage in a market that is increasingly focused on customer-centric innovation [3].

A prime example of this approach is Tesla, which has successfully integrated AI-driven personalization into its vehicles. Tesla's adaptive driving experience is designed around the user. User profiles allow the car to adjust seat positions, mirror angles, and climate settings automatically based on the driver's preferences. Learning algorithms enable the vehicle to adapt its navigation, music playlists, and even driving dynamics to suit the driver's behavior. Over-the-air (OTA) updates ensure that the car continues to improve and evolve in line with user feedback, keeping the vehicle fresh and aligned with the customer's needs. Tesla's personalized support and direct-to-consumer sales model further enhance customer experience. By offering tailored maintenance reminders and proactive service notifications, Tesla reduces friction and builds trust. Customers feel that Tesla is continuously improving their experience, which fosters emotional attachment and reinforces their loyalty to the brand. Another proof of this success is their industry-leading Net Promoter Score (NPS) which reaches consistently above 90, far exceeding the automotive industry average. It has even been reported that 91% of Tesla owners would repurchase the same vehicle, again underscoring how deeply Tesla has embedded itself into the lives of its customers through personalization [16].

Tesla: AI-Driven personalization in action



User profiles

Automatically adjust seat, mirrors, climate and more based on driver preferences.



Learning algorithms

Adapts navigation, music playlist and driving dynamics to driver behaviour.



Over-the-air updates

Continuously improves features and adds new capabilities.



Personalized support

Proactive maintenance alerts and tailored support reduce friction and build trust.



Direct-to-consumer

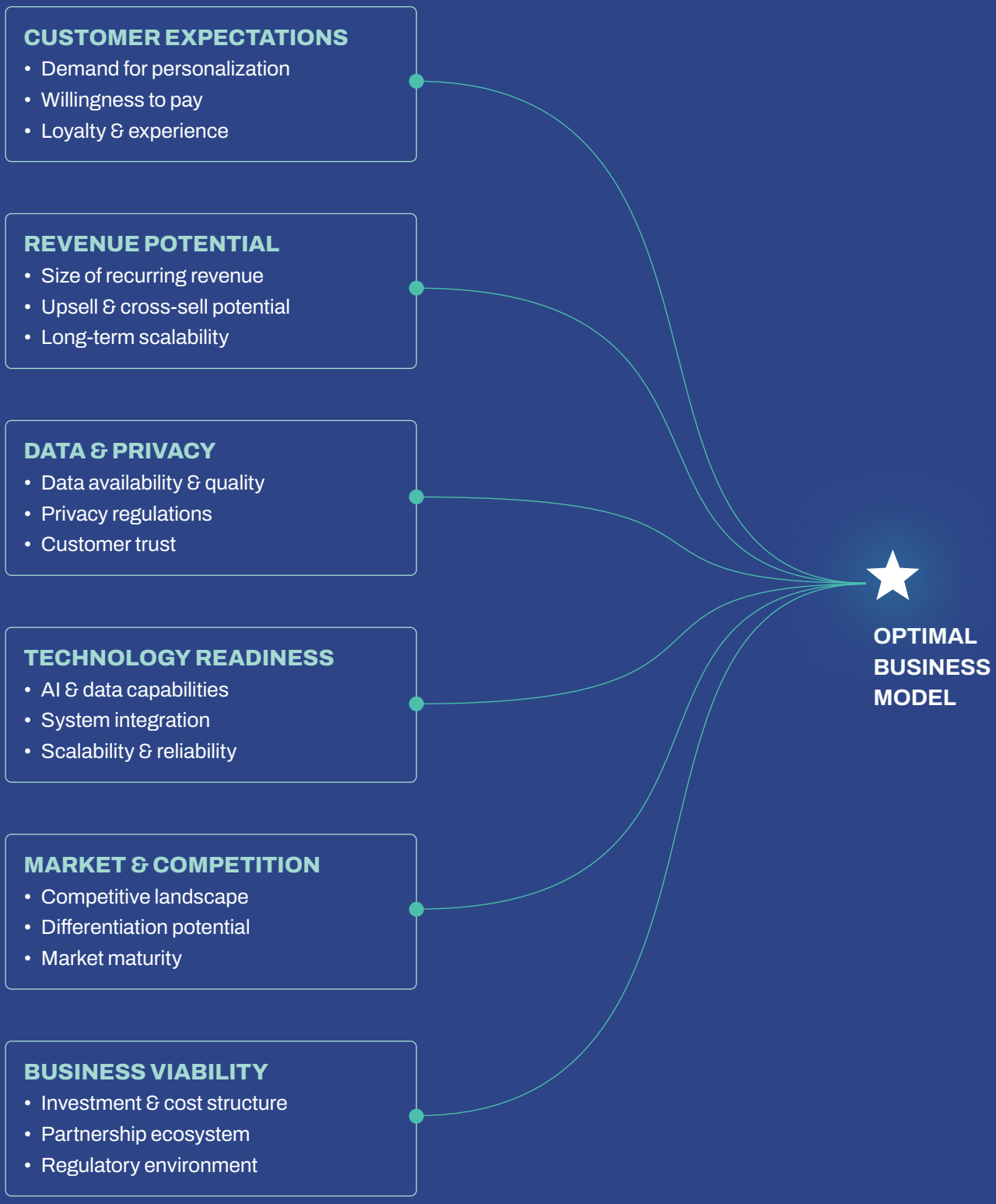
Seamless ownershipp experience from purchase to service.

PROVEN IMPACT

90% Industry-leading Net Promoter Score (NPS)

91% of Tesla owners would repurchase the same vehicle

There is no “one suits all” approach. Each OEM has to strategically assess all options and choose the best approach.



5.

Challenges

AI-Powered In-Car Personalization: Key Challenges

TECHNICAL

Building a robust, integrated technical backbone is complex.

- Legacy architecture
- Fragmented tech stacks
- Unclear AI strategy
- Integration complexity & latency

REGULATORY & DATA PROTECTION

Strict regulations and data privacy shape what's possible.

- Complex global regulations
- Data consent, storage & cross-border restrictions
- Balancing personalization with privacy and user trust

ORGANIZATIONAL

New capabilities demand new ways of working.

- Disruption of traditional development cycles
- Skills gap & shortage of AI talent
- Vendor dependence vs. control
- Strategic ownership & investment decisions

CULTURAL & TRUST

Consumer trust is fragile and earns or loses a brand.

- Privacy concerns & fear of misuse
- Lack of transparency & user control
- Regional trust gaps
- Risk of eroding loyalty

5.1. Technical Challenges

AI-powered in-car personalization relies on a solid technical backbone and yet for most OEMs, that foundation is fragile. Delivering real-time, context-aware personalization requires deeply integrated systems that can process user data, adapt interfaces, and coordinate across hardware and software layers. But legacy architectures, fragmented tech stacks, and unclear AI strategies pose serious barriers. A key question many OEMs face is how to approach AI development – should they build in-house for full control and brand coherence, partner with tech giants like Google or Amazon for speed and capability, or outsource to modular suppliers, trading flexibility for time-to-market. Each approach brings trade-offs.

BMW, for example, invested in its proprietary OS and assistant, ensuring tight integration but requiring long development cycles. Meanwhile, Mercedes-Benz partnered with Google, accelerating personalization features yet trading in some data control and brand visibility. The risks become clear when looking at Volkswagen. Its software arm, Cariad, was tasked with building a unified software platform for in-car personalization and infotainment across brands. Repeated delays and internal coordination issues have cost the group years of progress and leadership credibility. What was meant to be VW's software backbone turned into one of its most public execution failures. Even hybrid approaches can strain technical teams. Integrating AI modules from multiple sources increases modularity complexity, where voice assistants, personalization engines, and infotainment systems must coordinate in real time. The result is often latency, glitches, or inconsistent behavior, which is exactly the kind of experience that erodes user trust.

To put it simply, without a robust, future-proof AI architecture, every personalization effort is at risk of falling apart under the hood.

5.2. Regulatory and Data Protection Challenges

As AI personalization advances, regulatory and data protection challenges have become a defining barrier and not just a legal formality. From GDPR to state-specific laws in the U.S., compliance now shapes what is technically possible and how data-driven features are rolled out. AI in in-car personalization relies on collecting and analyzing highly sensitive user data, such as driving behavior, voice inputs, biometric identifiers and location history. But in regions like the EU, regulations such as GDPR enforce strict rules around data consent, directly influencing system architecture and feature design.

A relevant example is General Motors, which faced backlash for its OnStar data-sharing practices. In 2023, it was revealed that driver data was shared with insurance companies without explicit consent, triggering both legal and reputational consequences. The incident forced GM to revisit its data governance model as it severely undermined consumer trust. Globally, OEMs must now adapt to a patchwork of privacy laws. In the U.S., California's CCPA, Virginia's CDPA, and other state-level acts impose varying standards, complicating compliance for nationwide rollouts. In China, the Personal Information Protection Law (PIPL) introduces yet another layer of restrictions, especially affecting international brands. These constraints have a rather strategic implication alongside a legal one. Compliance decisions directly affect AI model training, data storage locations and even the feasibility of cross-border vehicle features. Companies like Volkswagen have responded by investing in localized data centers and federated learning models, which allow AI to learn from decentralized data without exporting personal information.

The challenge does not simply revolve around the question as to "how can we personalize," but how can we personalize while staying compliant and earning trust region by region, market by market.

To ensure the regulation challenge is resolved, OEMs must proactively embed privacy-by-design into their personalization architectures, supported by cross-functional data governance teams and transparent user controls to alleviate any bad thoughts users may have surrounding in-car personalization with AI.

5.3 Organizational Challenges

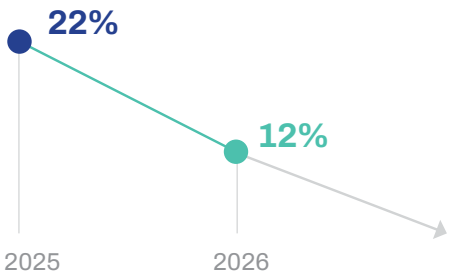
While AI-powered in-car personalization promises differentiated user experiences and potential revenue streams, translating these capabilities from prototype to production poses significant organizational hurdles. For legacy carmakers in particular, the challenge is not just technological but rather structural.

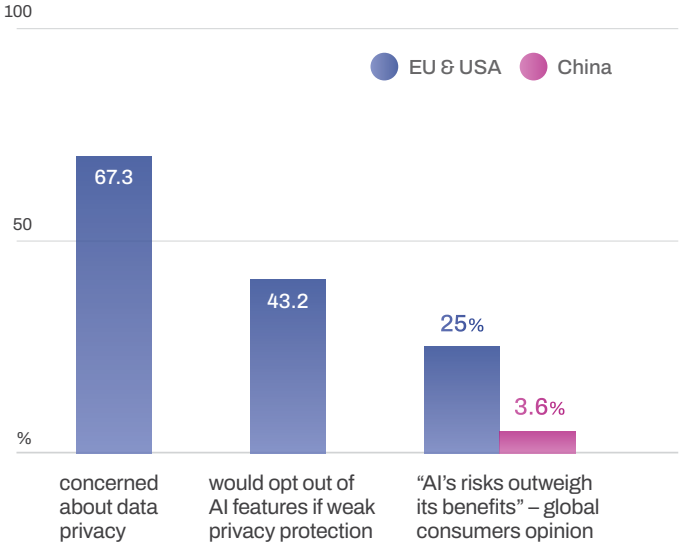
First, AI personalization disrupts traditional product development cycles. Whereas automotive features have historically followed linear, year-long development pipelines, AI solutions require iterative deployment, data-driven updates, and cross-functional integration across hardware, software, and cloud teams. European organizations and the German automakers in particular are trying to overcome the slower pace of adoption of disruptive technologies [15]. It is harder for them owing to regulations, greater costs of operation, and a mindset of following well-defined processes. Meanwhile, agile EV players like NIO or Rivian are experimenting with flatter structures and tighter integration between hardware and software teams. For legacy OEMs, unlocking personalization may require not just new tools, but new ways of working.

Second, workforce capabilities remain a major bottleneck. Only 12% of auto executives said they felt extremely well prepared for advanced technologies such as AI, down from 22% the year before [13]. This decline reflects the rapid pace of innovation, particularly around generative AI, which is forcing automakers to upskill their workforce while competing with tech and other sectors for scarce AI talent. As a result, many automakers rely on third-party AI vendors for modules such as voice personalization, recommendation systems, or emotional detection. While effective in the short term, this outsourcing can introduce vendor lock-in and data governance issues.

Third, there is growing tension around AI strategy ownership. Should automakers build proprietary personalization platforms to differentiate their brand experience, like BMW is doing with its iDrive 9 stack, or rely on established platforms like Google Android Automotive OS with pre-integrated AI features? This decision has deep organizational consequences, shaping investment priorities, vendor partnerships, and control over user data. Ultimately, the organizational transformation required to implement AI personalization at scale is as complex as the technology itself. It demands not just digital tools, but a new operating model that is agile, interdisciplinary, and built around user-centric software thinking.

Only 12% of auto executives said they felt extremely well prepared for advanced technologies such as AI, down from 22% the year before.





5.4. Cultural Challenges and Mistrust in AI-Powered Car Personalization

As artificial intelligence becomes integral to in-car personalization, automakers face a growing paradox: the very data that enables tailored user experiences also fuels consumer concerns. Personalization requires access to sensitive behavioral data which, if misused or poorly explained, can erode user trust. To illustrate, the Texas Attorney General alleged that General Motors, through its OnStar Smart Driver program, collected detailed driving behavior from over 1.5 million users in 2024 without meaningful consent and shared it with insurers, resulting in increased premiums and breach of trust among its users and the public [1]. Key consumer objections to automotive AI appear to be loss of control, insufficient data protection, and overall security risks [15]. Sentiment surveys reinforce this discomfort – 67.3% of respondents express concerns about data privacy in modern vehicles, while 43.2% say they would opt out of AI features if privacy protections were lacking [12]. Notably, these concerns vary by region. While only 3.6% of Chinese consumers believe AI’s risks outweigh its benefits, the figure rises to around 25% in Europe and the U.S., reflecting cultural differences in how trust is formed. This trust gap is not merely about isolated incidents of data misuse. It reflects a broader unease with how AI systems make decisions and interact with users, especially when those systems act autonomously or lack transparency. The Technology Acceptance Model (TAM) [6] helps explain this.

According to TAM, adoption depends on two perceived factors: usefulness and ease of use. But in the case of AI-powered personalization, these are increasingly mediated by whether users feel informed and in control. Even when features technically function well, users may reject them if they are perceived as intrusive. For example, a recommendation system that adapts routes or in-car content might be accurate, but if drivers do not understand why certain suggestions are made, or worse, discover that their driving behavior is being monetized without consent, the system’s ease of use is undermined by emotional and ethical friction. That way, both perceived usefulness and long-term engagement are compromised. Experts extend this view by arguing that trust, transparency, and user agency are critical in shaping attitudes toward AI [9]. When users clearly understand how AI adds value and can influence its operation, they are more open to it. This is particularly important in automotive contexts, where AI often operates behind the scenes and influences decisions without user input. In short, skepticism toward in-car AI is not just about privacy. It stems from a deeper discomfort with the perceived imbalance of power between user and system. As personalization systems become more advanced and data-hungry, automakers must recognize that technical innovation alone is not enough. In the new era of intelligent mobility ahead of us, trust must be designed into the system from the ground up.

6.

Conclusion: Outlook on AI within In-Car Personalization

The rapid integration of artificial intelligence (AI) into in-car personalization marks a pivotal moment in the evolution of the automotive industry, redefining not only how we interact with vehicles but also the very nature of mobility itself.

As AI-driven systems become increasingly adept at understanding and anticipating driver's needs, they are transforming cars from tools of transportation into dynamic, empathetic extensions of our personal and digital lives. This profound evolution carries implications that extend beyond convenience, opening new markets, reshaping consumer perceptions, and fundamentally altering the relationship between individuals and their vehicles. The future of in-car personalization is not just about smarter cars, but also about reimagining mobility as a deeply integrated, intuitive, and transformative experience that challenges conventional boundaries and invites us to rethink what a car is to us and what it can be. The true potential of AI in cars goes beyond simply responding to commands; it lies in making the driving experience deeply connected to the rest of our digital lives. Cars are no longer just vehicles, but rather these intelligent companions that understand our habits, moods, and routines. This transformation also reshapes consumers' perceptions of cars, moving them from mechanical assets to trusted companions. AI's ability to learn and adapt fosters an emotional bond, where vehicles feel less like products and more like partners that understand and evolve with their drivers. When a car anticipates a driver's needs, suggesting a calming playlist during a stressful commute or optimizing energy use for an electric vehicle based on driving habits, it creates a sense of reliability and intimacy that deepens brand loyalty. As cars become more intuitive, they challenge the traditional view of ownership, raising provocative questions: Will consumers begin to see cars as subscription-based services rather than one-time purchases? Could the emotional attachment to a personalized vehicle rival that of personal devices like smartphones? The implications extend to societal and cultural dimensions, as AI-driven personalization redefines the role of cars in our lives. In a future where autonomous vehicles dominate, the focus shifts from driving to experiencing, turning cars into mobile living spaces that cater to work, relaxation, or social interaction. This opens markets for in-car entertainment, productivity tools, and wellness services, where vehicles become platforms for immersive experiences tailored to individual preferences. However, this hyper-personalized future also introduces complexities. The reliance on vast amounts of personal data raises ethical questions about privacy and consent, as seen in incidents like General Motors' OnStar controversy. Automakers must navigate these challenges by ensuring consumers feel in control. Moreover, cultural differences in AI acceptance, such as China's embrace versus Europe's skepticism, highlight the need for region-specific strategies to align with local values and expectations.

Ultimately, AI-driven in-car personalization is not just a technological leap; it is a paradigm shift that reimagines mobility as a deeply personal, connected, and adaptive experience. It challenges automakers to rethink their role, not as manufacturers of vehicles, but as architects of intelligent, empathetic ecosystems that integrate seamlessly into our lives. For consumers, it transforms the car into a space that anticipates, adapts, and evolves, creating a new form of relationship that feels less transactional and more human. As we stand on the cusp of this revolution, one question lingers: If cars can understand us better than we understand ourselves, what does that mean for the future of mobility and for the way we define our own identities in a world where machines know us so well? This is the bold, uncharted frontier of AI in automotive personalization, where the journey is no longer just about the destination, but about the deep personal experience of getting there.

A New Era of Mobility



MORE PERSONAL

Understands, adapts and anticipates your needs.



MORE THAN DRIVING

A space for work, relaxation and well-being.





STRONGER CONNECTION

Understands, adapts and anticipates your needs.



NEW OPPORTUNITIES

New markets, services and business models.



A BROADER IMPACT

A more connected, inclusive and sustainable future of mobility.

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