MHP
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White Paper

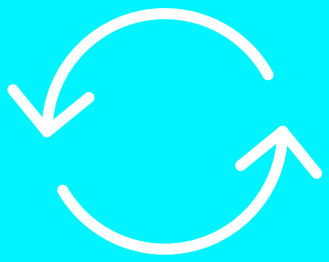
Close the Autonomous Gap

03 2023

8 Guidelines for Successful Autonomous Mobility and Logistic Systems

we talk data

8 building blocks for success



Successful only in Ecosystems

1. Autonomous systems function solely as an ecosystem.

2. Ecosystems are necessarily region-specific.

3. The traditional automotive industry must integrate itself into established (digital) ecosystems.

Sharpening Strategy and Competence within the Industry

4. The own competences for an ecosystem-oriented business model logic are mostly unclear.

5. Current corporate strategies do not consistently lead to holistic autonomous systems.

6. Current approaches fail to meet demand: autonomous vehicle concepts are being developed that miss the mark.

Partnerships as a critical factor

7. Establishing cross-sector partnerships is a core competency to remain relevant at all.

8. To this day, the actors underestimate the variance per region - local partnerships are decisive.

CLOSE THE AUTONOMOUS GAP

Let’s talk Data

Content

1. Autonomous Systems are the next Disruption

The expectations of autonomous mobility and transport systems are immense. In addition to reducing traffic and emissions, users and experts expect autonomous systems to lead to lower mobility costs and significantly lower-threshold access to mobility.

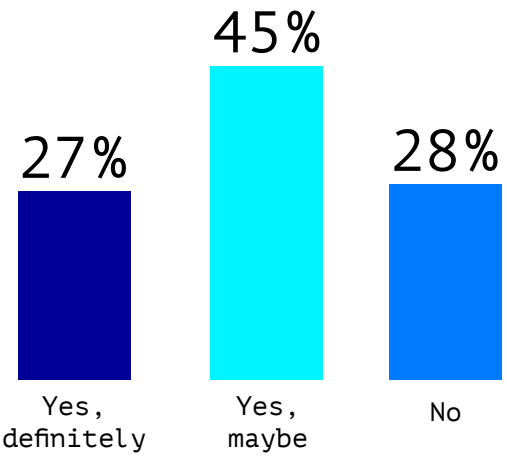
The opinion of the nearly 5,000 users interviewed in an international survey is clear: As Figure 1 shows, 72 per cent of respondents can imagine replacing their private car with autonomous mobility. Among active car-sharing users, as many as 87 per cent report that they will not return to private cars following the introduction of autonomous services. This means traditional automotive OEMs need to rethink their existing business models and their role in the mobility ecosystem. Developing region-specific vehicle types and new business models is becoming key to success. Acquiring the expertise to establish partnerships at eye level is now essential for survival.

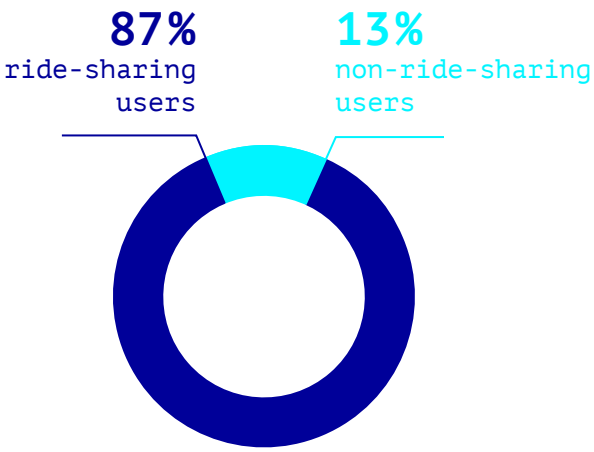
Stakeholders in the field of mobility are at a turning point in the commercial scaling of autonomous systems: The billions invested by venture capital investors, technology companies, automotive manufacturers and private equity companies over the last ten years have made enormous progress toward autonomous systems. However, the stakeholders involved are struggling with the fact that this has led to early expectations that have so far not been met. At the height of these (in part exaggerated) announcements was a prediction that mass use of autonomous vehicles would take off between "2020 and 2025". After the hype comes consolidation: The stakeholders involved work at full stretch to develop realistic pathways for the industrialization of autonomous vehicles. The number of stakeholders with ambitions for autonomous systems has reduced significantly, and the remaining companies are clear that the commercialization that they are working toward will require further investments in the billions.

[1] More than 200 billion dollars have been invested globally in Autonomous Driving and Shared Mobility since 2010 S&P Capital, McKinsey, PitchBook (2021).

… of the respondents can imagine replacing their private car

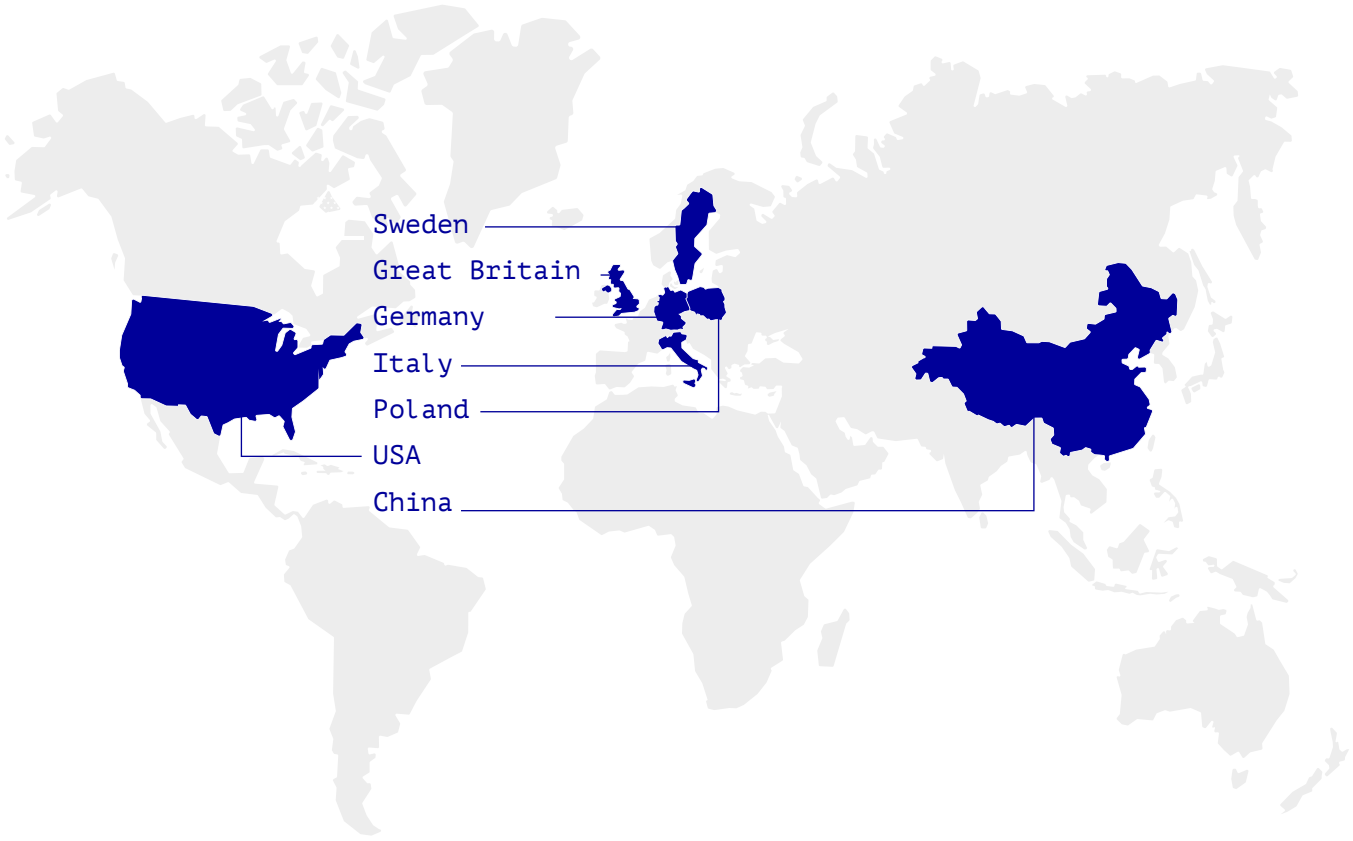
Could you imagine completely doing without a car of your own once autonomous vehicles have established themselves enough to meet your expectations?





Automotive manufacturers and suppliers need to prepare themselves for a future with fewer car sales and develop new business models for shared autonomous mobility.

Figure 1: Expected user behavior in relation to autonomous mobility
n=4,016 (car owners)



Global Investment in billion USD (2010-2021)

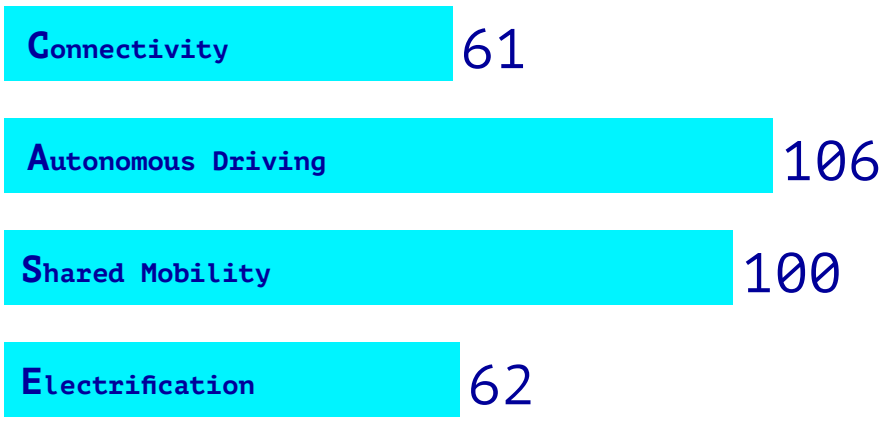


Figure 2: Investments in CASE areas from 2010 to 2021

S&P Capital, McKinsey, PitchBook (2021)

Autonomous mobility and transport solutions are currently being used in China, Europe, and the U.S., albeit under specific conditions and in selected geographic areas. Although some travel fees are charged, these systems are not yet profitable. The main objective of these projects is to validate and further develop the technology and use cases. In China, these projects benefit from close collaboration between authorities and businesses. Autonomous mobility is offered today under commercial conditions in major cities, such as Shenzhen, Beijing, and Wuhan. In Europe, there is a progressive regulatory environment, and countries like Germany have already implemented comprehensive and forward-thinking legislation. Multiple stakeholders are collaborating to bring next-generation autonomous systems to the streets. Major players like Sixt and Deutsche Bahn are working with Mobileye, while suppliers like Bosch, Continental, and ZF are more likely to be involved as investors and partners. the USA, autonomous systems are already in use in cities like San Francisco, Phoenix, and Austin, and some are operating commercially. Industry leaders, such as Waymo, WeRide, Cruise, and Baidu, are expanding their operations to multiple regions.

This **white paper** offers decision-makers across all industries a concise overview of pressing challenges and provides answers to key questions, such as which problems need to be solved over the next five years and how stakeholders in the mobility ecosystem need to position themselves to remain relevant and close the Autonomous Gaps. For more detailed information, please see our comprehensive study, "The Autonomous Gap," which can be requested here.

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2. Success in Autonomous Mobility requires a Focus on Ecosystems

Autonomous mobility and transport solutions must be designed as customer-centric ecosystems to succeed. Collaborative efforts from partners and stakeholders with various capabilities are essential to create services that meet customer needs. The complexity of the individual areas of the ecosystems is too high for any single company to manage alone.

Successful autonomous mobility systems require synchronization of individual systems for customer access (customer and demand management), digital ecosystems for use during the journey (holistic user experience), suitable autonomous vehicles (autonomous vehicles and systems), and fleet operation (autonomous fleet operation). The focus is on creating end-to-end systems that maximize added value for both users and stakeholders, rather than finding optimized individual solutions. Figure 3 illustrates this model of "successful autonomous mobility systems".

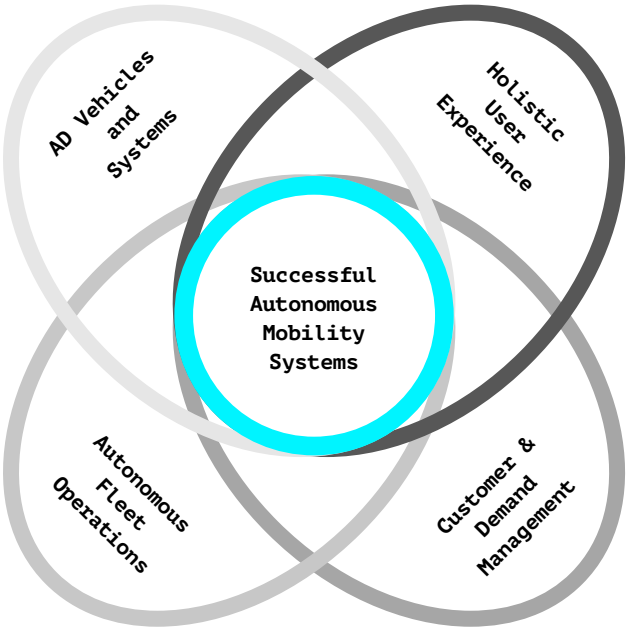


Figure 3: Successful Autonomous Mobility Systems must be thought holistically

In successful autonomous mobility systems, each stakeholder must find a role for which they have expertise and the capabilities to meet existing customer expectations. This means that vehicle manufacturers, fleet operators, stakeholders with comprehensive customer access and management, and leading operators of digital ecosystems must collaborate to establish successful business models for autonomous mobility and transport. None of these stakeholders can cover the entire value chain alone. To build sustainable and successful systems via network effects, new partnerships and additional investments are necessary in all areas.

A global trend has emerged as Uber and Lyft have abandoned their autonomous driving system development. Uber sold its corresponding autonomous driving development departments to the tech startup Aurora, while Toyota took over Lyft's autonomous driving unit. Motional, a joint venture between the Hyundai Motor Group and Aptiv, has established multi-year partnerships with both Uber and Lyft to secure direct customer. In turn, Uber and Lyft will have direct access to autonomous fleets as mobility platforms.

Also, automotive OEMs are increasingly shifting towards partnerships and ecosystem roles rather than solely focusing on internal development of a holistic autonomous driving technologies. Ford has, for the time being, put a stop to its internal development activities in the area of autonomous driving (level 4) and openly asked the question of whether an OEM needs to develop this technology itself or whether it would be better to wait and purchase it at a later stage. It has discontinued its partnership, Argo.AI, with Volkswagen. Similarly, Stellantis and other OEMS have emphasized partnerships and ecosystem roles from the outset. We can also see similar trends in the fields of long-distance logistics and last-mile delivery.

When we look at the global map of autonomous systems, a heterogeneous picture emerges, with different stakeholders playing different roles in the ecosystem, depending on the market. To successfully deploy autonomous systems, stakeholders must adapt to the market's unique characteristics and find their own place for value creation. This includes adapting vehicle specifications, such as size, design, and equipment, to fit the region. However, there is a notable gap between the aspiration and reality of offering suitable vehicles for each region. Cooperation and collaboration will be critical, but the approach to partnerships will differ depending on the region, such as in Europe, China, or the USA.

Established mobility players must locate their place within the new value network of autonomous mobility systems and enter into region-specific partnerships.

3. Knowing the Gaps – Autonomous Mobility between Aspiration and Reality

Significant gaps exist on the innovation pathway towards scaled use of autonomous systems, stemming from discrepancies between user expectations and emerging technology and services. These gaps, which occur in individual systems and at their interfaces, need to be filled for comprehensive autonomous mobility and transport systems to be created. The gaps themselves are the result of discrepancies between user expectations and emerging developments in technology and services. On the one hand, there are user expectations regarding use cases, usage, costs, impact on sustainability aspects and other factors. While on the other sit current developments, and the plans and strategies of the stakeholders that are necessary for the operation of autonomous systems. User expectations do not always match stakeholder plans and strategies. These mismatches are referred to in the white paper as gaps and can be addressed and resolved in the coming years through partnerships.

Creating autonomous mobility and transport systems requires the capabilities of a range of different stakeholders and the orchestration and synchronization of individual systems. This white paper focuses on the following stakeholders:

- **Automotive OEMs** develop, manufacture and distribute the vehicle systems required for autonomous mobility and transport systems.
- **Fleet operators** are responsible for operating the autonomous fleets.
- **Mobility platforms** are primarily designed for coordinating supply and demand through digital platforms. These platforms act as the customer interface for booking and invoicing.
- **Local public transport** operators hold a special role. They are usually both fleet operators and the customer interface.
- **Digital ecosystems** are used by customers before, during and after the journey for communication, entertainment or work. These digital ecosystems include social networks, video and music streaming services, cloud-based business tools, cloud gaming services, and in the future, metaverse applications

In total, eight gaps in the various areas and interfaces between the areas have been identified, as shown in Figure 4. More information on the identified gaps is available in the study “The Autonomous Gap”.

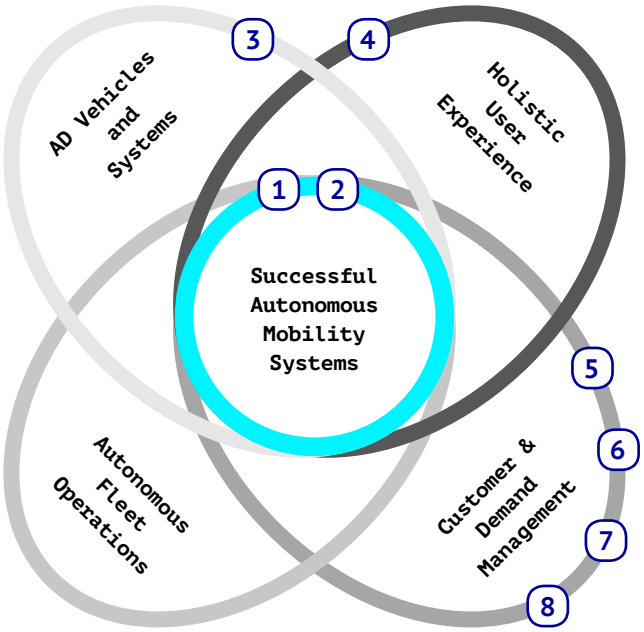


Figure 4: Location of the identified gaps

1 System Gaps

User expectations

- Homogeneous integration into existing and well-known transport systems with stops and timetables
- Autonomous services as individual solutions and additional offers

Status quo in current system design

- Demand-based usage, regardless of timetables and stops
- Maximum potential through incorporation into complete systems
- Fleets optimized for multiple use cases

Potential options for closing the gap

- Communication narrative with focus on potentials and benefits
- Convince customers of demand-based solutions
- Create complete systems

“Creating the right ecosystem and partnerships are the key. […] Partner with public transport operators, as they know how to run fleets efficiently.”

Amit Rosenzweig, CEO Ottopia

2 Sustainability Gaps

User expectations

- Sustainability effects for users regarding usage and operation of autonomous mobility and transport systems are expected

Status quo in current system design

- Aspects of sustainability: included in communication from stakeholders but not yet the focus of business activities

Potential options for closing the gap

- From "Talk the Talk" to "Walk the Talk": Establish sustainability activities as a core part of business activities

"Sustainability is important but the most important target for stakeholders is industrial leadership, not sustainability. Global leadership is preferred, but it's difficult to be significant outside China for local players and for US players in China."

Venture Capitalist focusing on China and Asia

3 Technology Gaps

User expectations

- Expectation of widespread and universal use of autonomous systems

Status quo in current system design

- Overestimation of technical and economic capabilities by stakeholders
- No all-round solutions available that can be reliably and comprehensively scaled

Potential options for closing the gap

- Raising significant financial resources to drive technologies forward
- Consolidation and partnerships
- Realistic communication without overestimation

“[…] But the other problem is also that today in China, we think some OEMs are making an over-promise to the autonomous driving system: to the performance and the safety, the security and reliability.”

Hao Fei, CEO Banma Network Technologies

4 Business Case Gaps

User expectations

- Stakeholders involved in the delivery of the services expect TCOs that allow them to offer cost-effective services to users in urban and suburban areas

Status quo in current system design

- Vehicle costs and competition through subsidized driver-based offers do not allow for cost-effective services

Potential options for closing the gap

- Reduction of TCO by scaling technical systems
- Application of subsidies to autonomous mobility and transport systems
- Incorporate additional revenue streams into the business model

5 Subsidies Gaps

User expectations

- Homogeneous price points for using autonomous mobility and transport systems
- A mix of private mobility platforms and local public transport providers

Status quo in current system design

- Subsidizing publicly operated services leads to market distortion
- Private operators avoid competition with subsidized operators

Potential options for closing the gap

- Incorporate private mobility platforms into subsidy programs
- Make regulations open and non-discriminatory

6 Utilization Gaps

User expectations

- Around-the-clock availability in sufficiently high capacities causes empty runs
- Reduced vehicle utilization through "single use case" approach, separation between fleets for mobility and transport

Status quo in current system design

- Concepts for "multi-use case" fleets, covering mobility and transport with a single fleet
- Use of vehicles for additional use cases, e.g., V2G applications or Edge computing

Potential options for closing the gap

- Implement ecosystems instead of single solutions
- Comprehensive, high-performance, and automated control platforms to optimize ecosystems and use cases

7 Trust Gaps

User expectations

- Cities, municipalities, and local public transport providers enjoy the highest confidence in terms of operating autonomous fleets

Status quo in current system design

- Technology companies and platforms dominate the development and scaling of autonomous mobility and transport systems

Potential options for closing the gap

- Bring local public transport providers for autonomous mobility and transport systems on par with technology companies
- Strengthen trust in technology companies and platforms

“[…] the ministry of industry and the information ministries announce state policies like an intelligent vehicle development strategy. And with this strategy comes a clear state roadmap for the future application of autonomous driving.”

Hao Fei, CEO Banma Network Technologies

8 Pay Price Gaps

User expectations

- Users expect travel costs to be between the current costs of local public transport and taxis

Status quo in current system design

- Mobility with specific vehicle types and in specific service categories (mini vehicles, premium) will not be feasible at low costs
- Technology and vehicle costs are on a similar level globally, which means the discrepancy widens in regions with expectations of low fares

Potential options for closing the gap

- Raising awareness of different price levels according to service category and vehicle type
- Reduction of system costs through scaling and standardization

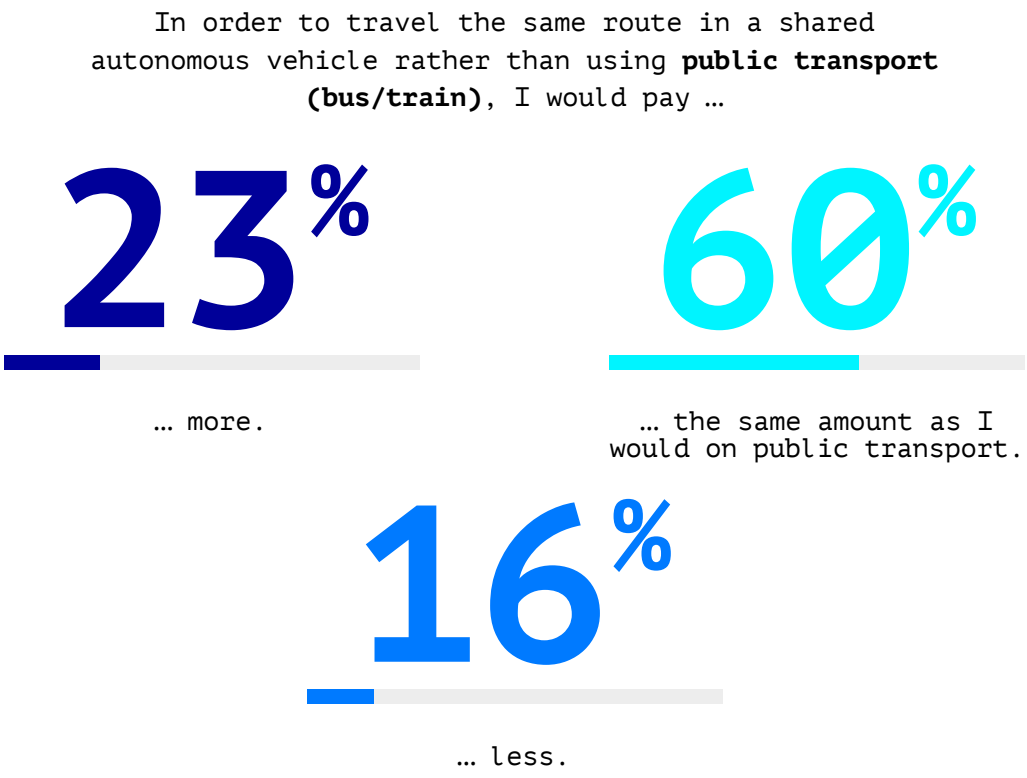


Figure 4: Willingness to pay for shared autonomous vehicles compared to public transport n=4,868 (CN/EU/US)

- By eliminating the need for human drivers in autonomous vehicles, fundamentally lower fares can be offered. According to our study, prices that are comparable to public transportation or lower are possible.
- Across all countries, most respondents stated their willingness to pay for autonomous vehicles at an equivalent level to current public transport rates.
- Nearly one quarter are even willing to pay more for shared autonomous mobility than for public transport.
- Shared autonomous mobility can be made available to the entire population at a public transport price level (social sustainability).

4. Close the Gap: Understanding Complexity and Setting a Strategic Course

The potential of shared autonomous mobility is significant, as is the complexity and variation from region to region. The transition from proprietary individual transport to shared autonomous systems results in a completely new network of value creation, which presents opportunities for established automotive companies as well as new actors. In our survey, 72 per cent of users could imagine replacing their own vehicle with autonomous mobility solutions in the future. Among today's car-sharing users, as many as 87 per cent say that they do not want to return to a private car that they have to drive themselves.

Traditional mobility stakeholders and regions like Europe face challenges to play a strong role in autonomous ecosystems. New entrants from the U.S. and China have an advantage in development. These tech companies, including Alphabet, Tencent, Baidu, and Amazon, provide significant financial resources for technical system development, as well as a training ground for top digital talent and experts, who are crucial for autonomous system development. Moreover, established technology companies already occupy regional customer interfaces and are omnipresent in people's digital daily lives. Therefore, traditional mobility stakeholders need to strategically position themselves to compete in future autonomous mobility ecosystems. So, how do traditional mobility stakeholders need to position themselves to be part of future ecosystems?

Pick your Battle: How to Use Core Competencies Strategically

To be successful in the development and operation of autonomous systems, all stakeholders must assess their existing expertise, set realistic goals, and allocate resources accordingly. This process is a critical part of our "Successful Autonomous Mobility Systems" model, which is illustrated in Figure 6. The model shows that a company's core competencies may not cover all levels of value creation, emphasizing the importance of strategic cooperation among stakeholders define the future of autonomous mobility systems.

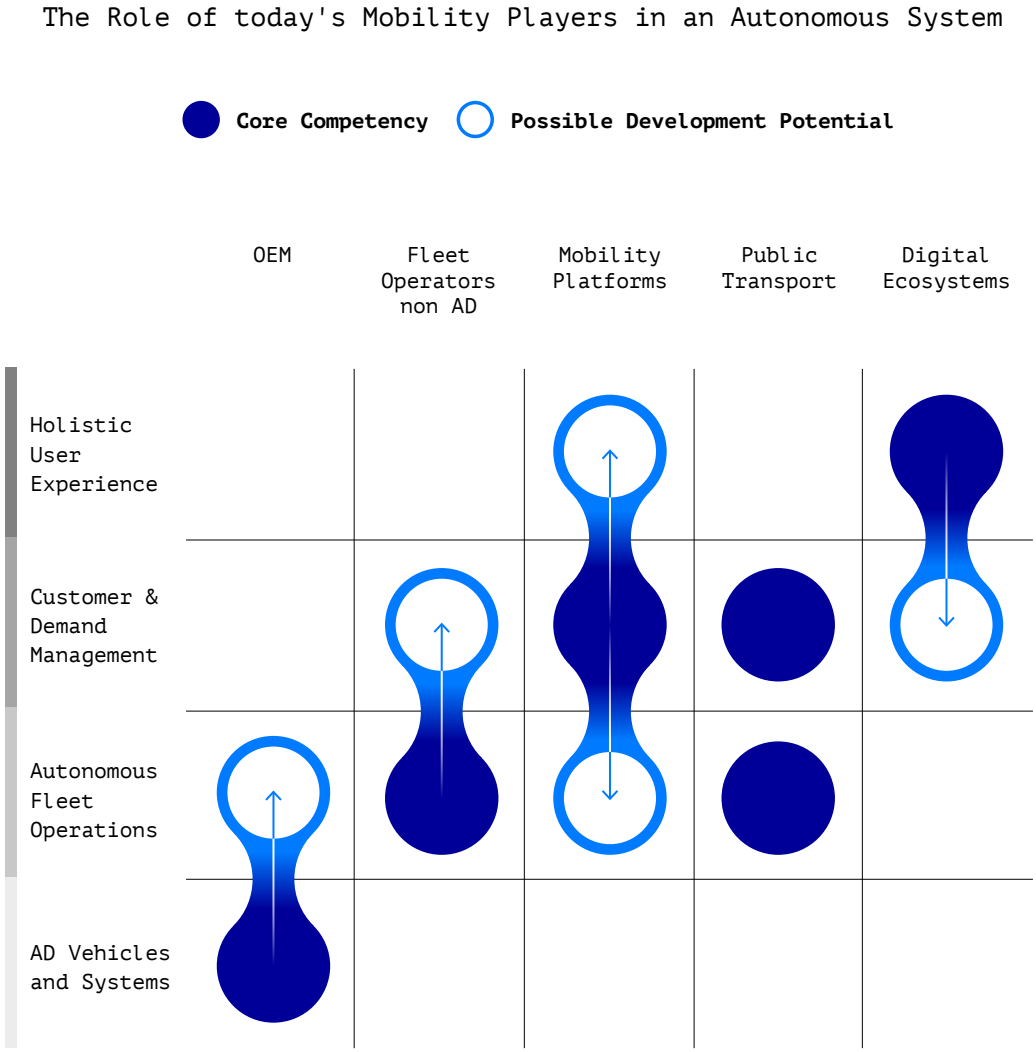


Figure 6: Potential areas for development for today's stakeholders in relation to autonomous mobility systems

Vehicle manufacturers have the opportunity to become operators of autonomous fleets in addition to developing and providing vehicles. Based on our study results, however, we do not see any economically sustainable possibility for automotive OEMs of occupying the customer interface. Nevertheless, current fleet operators can at least make the leap to customer and demand management. Established mobility platforms can, for their part, expand the services they offer to include digital value-added services and a holistic user experience, while also taking over the operation of autonomous fleets. This would result in automotive manufacturers becoming pure hardware suppliers. In addition to mobility platforms, it is primarily the current public transport operators that are already well positioned for future autonomous mobility service offerings. They also enjoy a high level of trust among the users surveyed across all markets (Figure 7). Public transport operators know their core competencies and will continue to focus on them in the future.

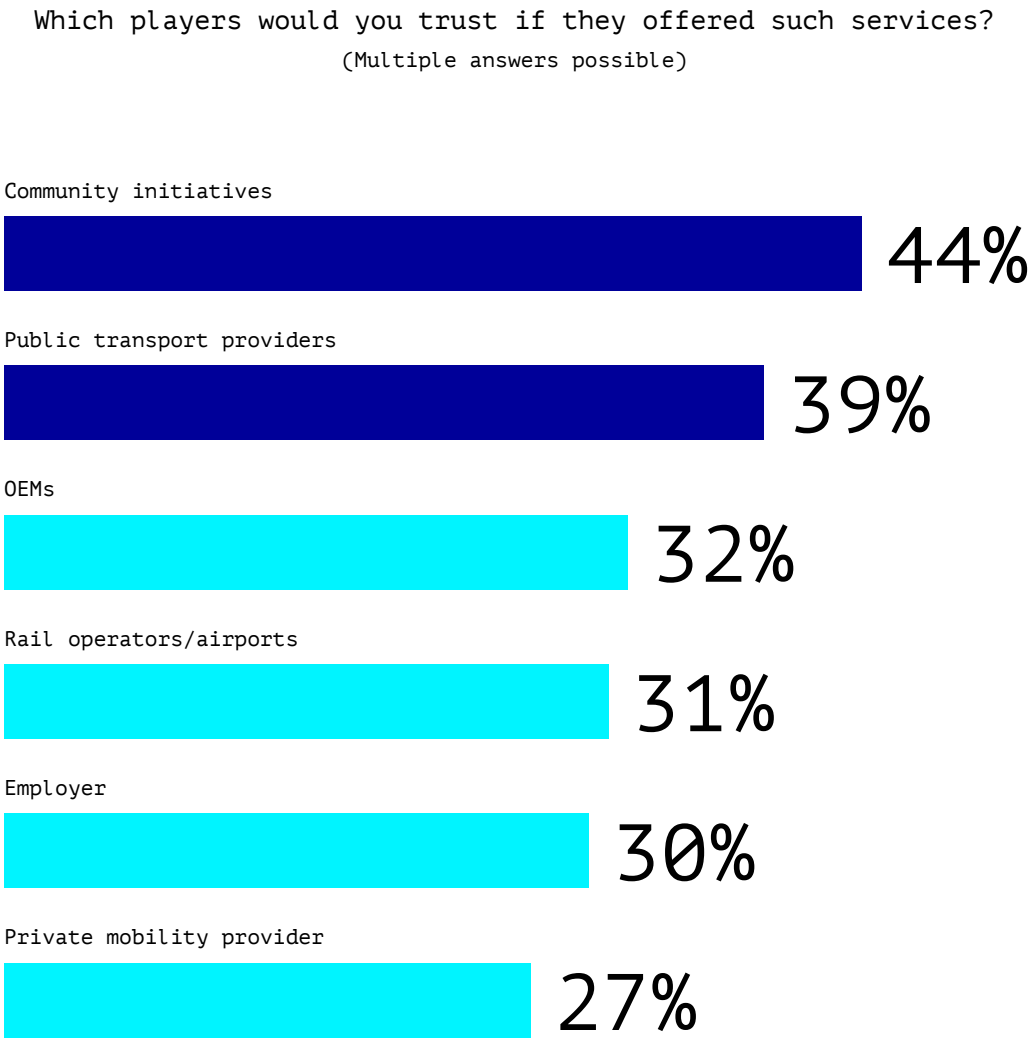


Figure 7: Municipalities and public transport with the highest trust in their role as operators n=4,868 (CN/EU/US)

- Overall, cities and municipalities enjoy the greatest trust as operators of autonomous mobility across all markets.
- The reasons for this are complex. They range from the great influence that these institutions have on societal life (especially in China), a high level of basic trust and personal identification with them to their solid financing options.

Digital ecosystems of today already offer a holistic user experience and can be relatively easily integrated into customer and demand management layers for autonomous mobility. It's expected that local digital ecosystems and customer demand management platforms will join forces to create the benefits for the users. These strategic alliances, collaborations or acquisitions are becoming critical to success and even vital for survival for some stakeholders. Strategic goals can be derived by discussing following questions:

- For which part of the value creation in autonomous systems does your company have (sufficient) expertise?
- What skills gaps do you have and what strategy is needed to close these gaps?
- What strategic alliances, cooperations or acquisitions should be targeted?
- In which neighboring areas can the company build up its own expertise that is competitive and can be used economically and sustainably?

Roadmap: Several Roads Leading to Autonomous Systems

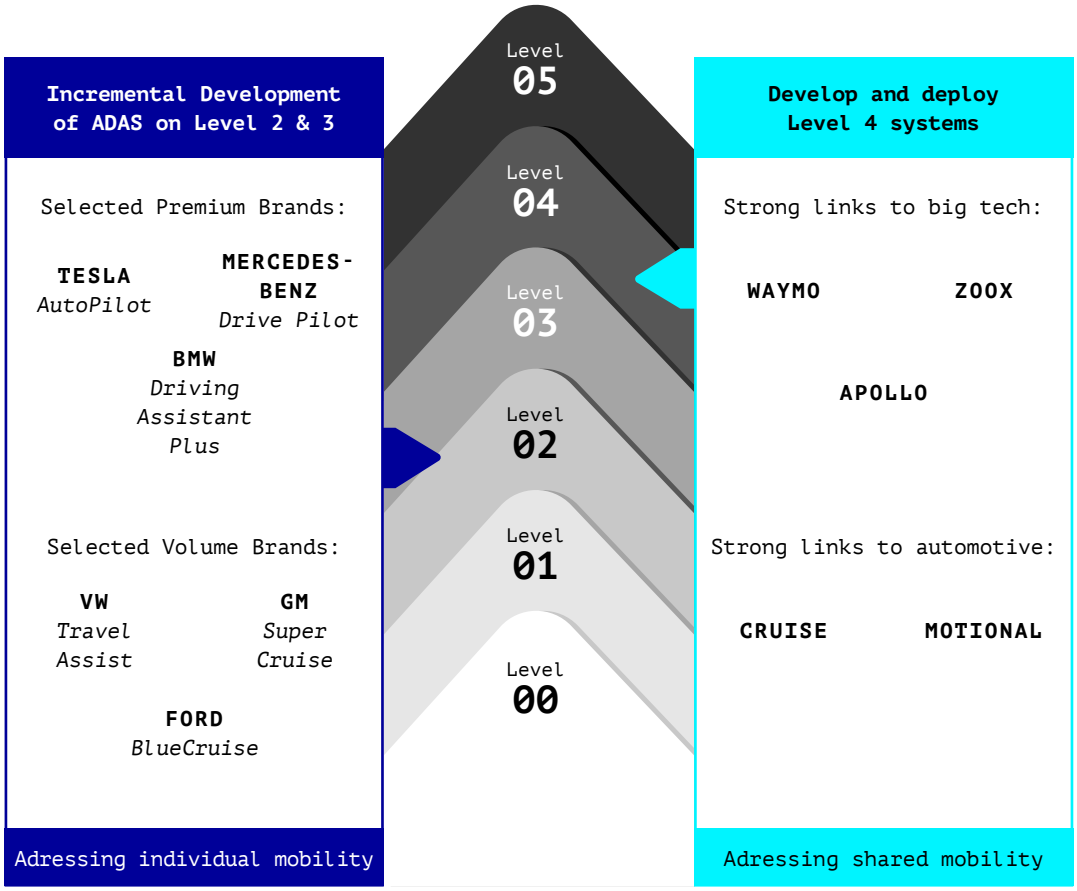


Figure 8: Continuous development of ADAS systems at OEMs compared to Level 4 systems at technology companies

Traditional automotive manufacturers and innovation leaders in the automotive industry are taking incremental approaches towards highly automated and autonomous driving. SAE level 2 and 3 solutions are already available on the market, with the aim to improve their features to achieve level 4 within the next decade (refer to Figure 8). In contrast, leading technology companies are ambitiously developing complex solutions for level 4 from the outset.

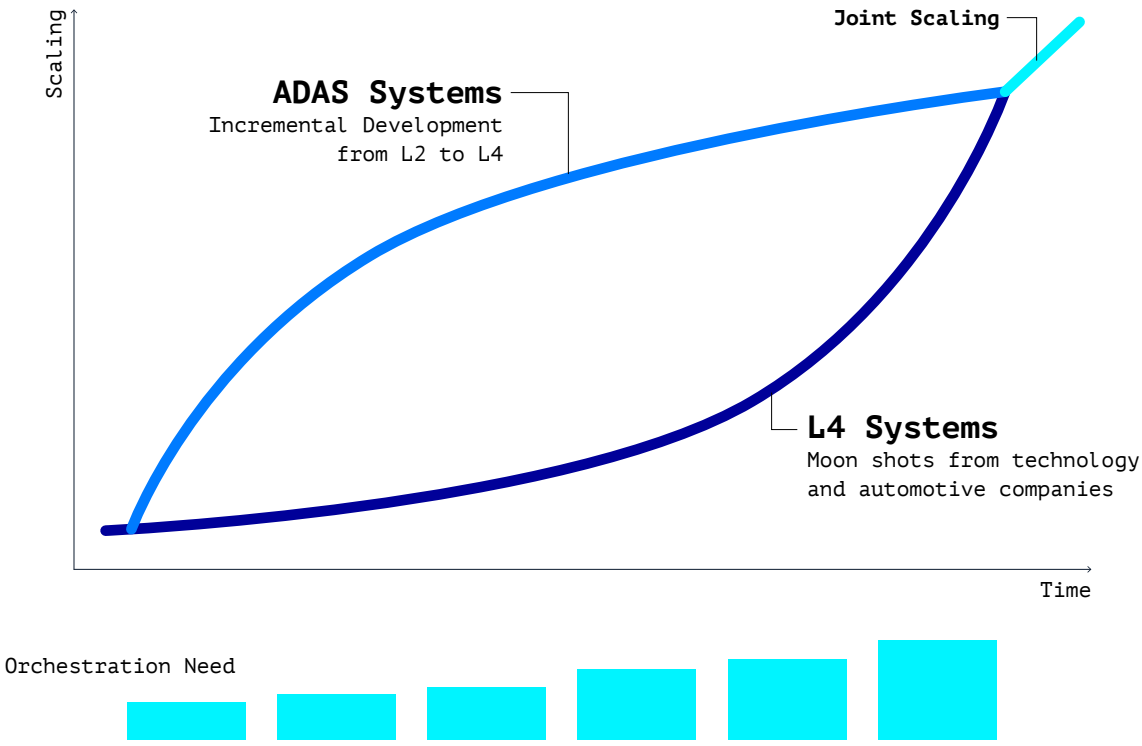


Figure 9: Scaling curves of ADAS and L4 systems

ADAS systems will see a rapid scaling in the next years. In contrast, the scaling of Level 4 systems is expected to be slow in the upcoming years (refer to Figure 9). However, once technical robustness is achieved, it is anticipated that scaling will happen rapidly. In the long run, the various scaling paths will eventually converge and merge.

Adjusting Product Strategy: Avoid Vehicles that No One Asked For

Our market research findings suggest that European automotive manufacturers prioritize the private use cases (Level 4 for car owners) in their current product strategies, although the initial breakthroughs in autonomous systems are expected to be autonomous shuttles in Europe, China and the U.S. and as a result, the focus needs to shift to developing other vehicle concepts and sizes, while automotive manufacturers also need to concentrate on fleet operations. This implies a need for manufacturers to shift their business models from scale-oriented vehicle sales for end customers to the B2B business with smaller sales volumes, or even the independent operation of vehicle fleets. The success of such a repositioning effort depends on the willingness of companies to question existing structures and the specific market opportunities available.

Equal Partnerships: A Possible Lifeline

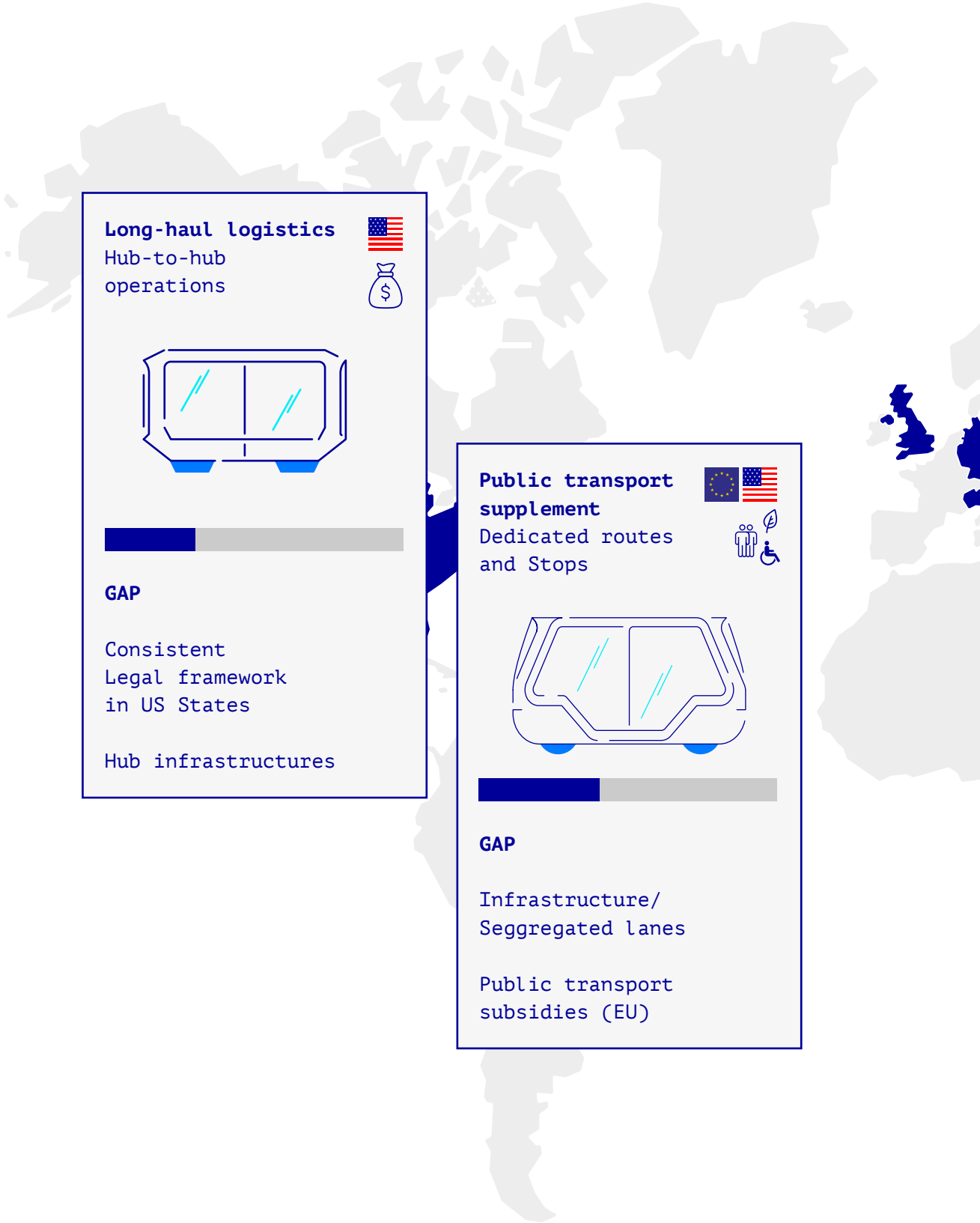
Strategic partnerships among stakeholders are crucial for the success of autonomous mobility and transport systems, as no single company can provide all the necessary value creation. Establishing and implementing equal partnerships is a key success factor for companies.

Partnerships for operating autonomous fleets: One area where partnerships can be particularly beneficial is in the operation of autonomous fleets, where new profit pools can be created for automotive manufacturers and related companies. Existing fleet operators, such as car rental companies or local public transport operators, can extend their expertise to cover autonomous fleets and thus become an important part of the value chain.

Customer access through partnerships: Another important area for partnerships is customer access, as direct customer access is essential for maximizing the use of autonomous mobility and transport systems. Local public transport operators and global mobility platforms are already strong in terms of user access, making them ideal partners for vehicle and system manufacturers as well as digital ecosystems seeking to leverage existing customer networks.

Autonomous Mobility Systems are first of all Cooperation Systems.

Close the Gap!



Long-haul logistics
Hub-to-hub
operations

GAP

Consistent
Legal framework
in US States

Hub infrastructures

Public transport supplement
Dedicated routes
and Stops

GAP

Infrastructure/
Seggregated lanes

Public transport
subsidies (EU)

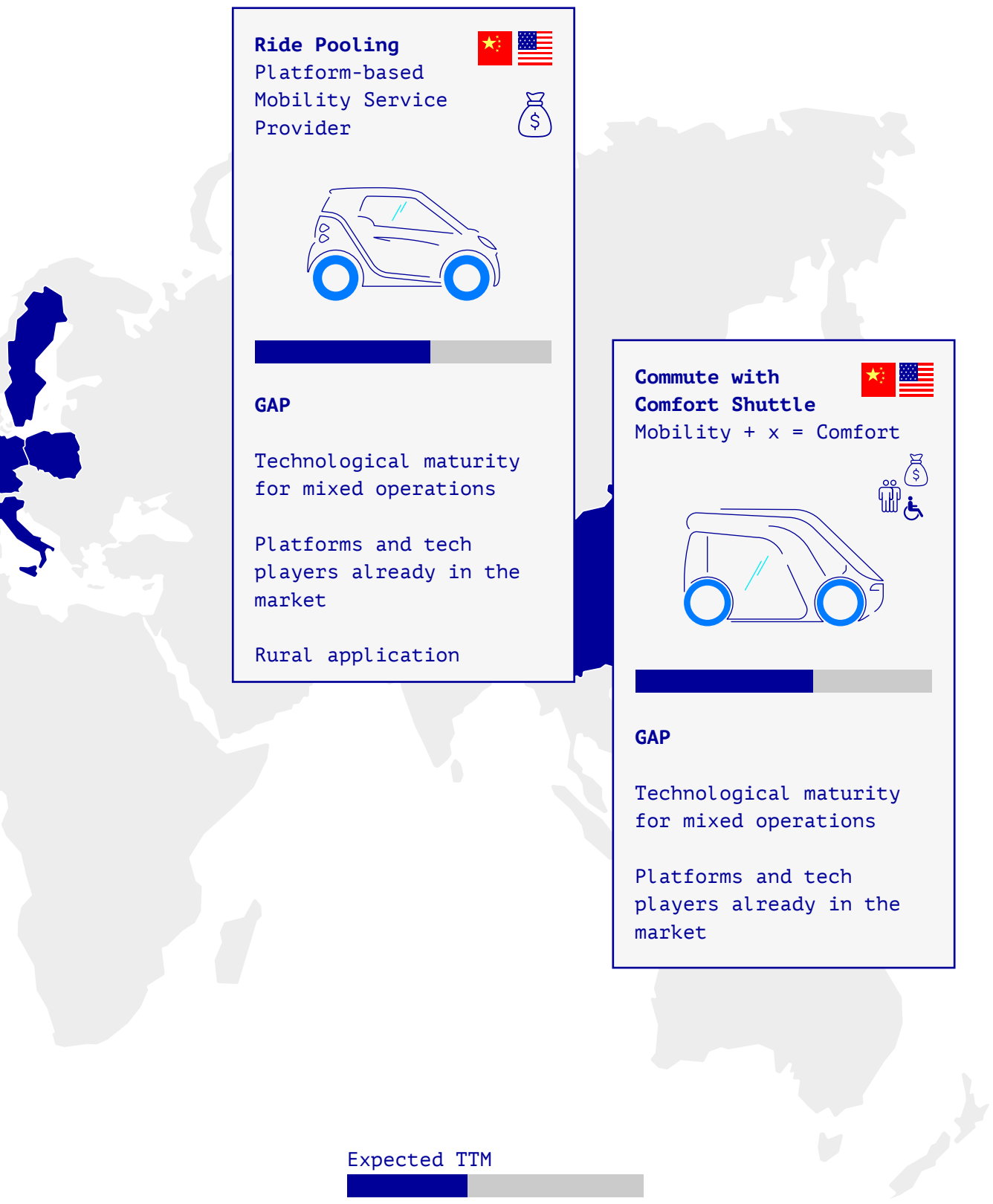


Figure 10: Vehicle types and use cases by region including identified gaps, that need to be closed

5. Region-Specific Use Cases are Key: There is no One-Size-Fits-All Solution

There is no one-size-fits-all solution when it comes to vehicle types, technical systems, partnerships in ecosystems, and use cases. The development and deployment of digital mobility with autonomous systems will be hyperlocal. User requirements and the expected mobility use cases are inherently different from region to region. Furthermore, the stakeholders also differ between regions, starting with platforms and digital ecosystems that users use to book mobility and to make the time before, during and after their journey as pleasant as possible. Furthermore, there are also regional differences between stakeholders in fleet operation and suppliers of vehicles and autonomous systems.

The digitization of mobility significantly increases this regional specificity. Users expect maximum individualization and flexibility from digital ecosystems. Digital consumption has long been associated with digital design, which forms the basis for developing requirements for vehicle types, equipment, and the ecosystem they are integrated into. These hardware and software requirements must be physically (in terms of infrastructure), digitally (in terms of interfaces), and legally (in terms of legislation) integrated into local settings. Locally established stakeholders play a central role in this process. They define the development and scaling pathways and shield the market from external competitors. For instance, in China, authorities and cities have a strong interest in implementing autonomous mobility and logistics, relying on domestic companies with foreign players rarely being involved.

To define the strategic focus of each region, stakeholders must answer the following questions:

- What are the core competencies that I can establish based on the previous successes of the company?
- Which products and services will give me access to the respective market and customers?
- Who are the preferred and key stakeholders to ensure customer access?
- Which market entry barriers are existent that influence the business development?
- Which vehicle types are in demand in which region and in what quantities can they be brought onto the market?
- Which stakeholders are ideal for fleet operation?
- Which stakeholders and which systems are responsible for coordinating and managing the autonomous fleets?
- What partnerships are necessary to maximize the user experience?

Based on our analysis of each region, we can draw the following conclusions regarding market entry:

CHINA: BUILDING LOCAL STRENGTH

In terms of vehicle and system suppliers and platforms for customer access and user experience, the Chinese market is dominated by domestic companies. Local authorities and policymakers support the development of industry through direct investments in infrastructure and progressive regulation. This emphasis on strengthening local stakeholders makes market access more challenging for foreign companies.

However, the strong customer demand for individual premium mobility in China may be an opportunity for foreign traditional premium manufacturers. Autonomous, comfortable vehicles with fewer seats are preferred in this market by certain user groups. Established foreign premium brands are highly valued by Chinese customers , and foreign stakeholders could potentially realize sustainable revenue streams through local partnerships and integration into existing ecosystems.

EUROPE: RIDE SHARING AS THE BASIS FOR HYBRID VALUE CREATION

In Europe, larger people movers and autonomous ride-sharing vans are expected to complement local public transport in the future. As people movers differ significantly from traditional passenger cars related to purchasing/financing, maintenance, operation, and user access. People mover can be largely integrated into public transport structures, this creates opportunities for commercial vehicle manufacturers and public transport operators in Europe. European users are looking for shared autonomous mobility and the experts surveyed also assume that autonomous driving in individual transport solutions will be a niche market in Europe.

However, the current strategies of the leading European automotive manufacturers are focused on integrating autonomous driving functionalities into private vehicles. This strategic direction must be reconsidered if significant revenue streams are to be realized from autonomous mobility on the European market.

USA: MOBILITY PLATFORMS TAKE CENTER STAGE

In the USA, there is currently no comprehensive local public transportation service. Therefore, it will be private stakeholders who occupy the customer interface and organize fleet operations. Mobility service providers such as Uber or Lyft have already established a market-leading position and are on their way to becoming dominant providers of autonomous services. However, they need support not only in the development and provision of the vehicles themselves, but also in the operation, coordination, and management of the fleets - an opportunity for experienced automotive manufacturers. In the USA, autonomous small vehicles, comfort shuttles, and large (tram-like) public transport vessels offer the greatest potential. Established manufacturers expect demand to be highest for comfort shuttles. For commercial vehicle manufacturers, the greatest potential in the USA lies in the scaling of autonomous minibuses.

GLOBALLY, THE FIRST APPLICATION SCENARIO FOR AUTONOMOUS VEHICLES IS EXPECTED TO BE LONG-DISTANCE LOGISTICS

A significant global market is emerging for autonomous long-distance logistics, which is expected to have a higher priority in the USA and Europe than in China due to the aging population and the importance of truck-based transport chains. The experts surveyed and companies active in this segment also speak of a "lower complexity" compared with urban, autonomous solutions – which means a reduced time-to-market of technical solutions.

In the urban setting, however, those experts are critical in their view of autonomous short-haul logistics. Even small autonomous delivery bots have higher system costs than the revenues that can be realized and therefore fail to meet their potential economic sustainability effects.

"American truck drivers are old, rare, and expensive – autonomous trucks will be necessary to cover the logistics requirements. The conditions for their use are good and business models are plausible."

Quote from automotive OEM

Truck manufacturers and suppliers should define in concrete terms the areas of application and use cases for which their technologies should be designed and develop supporting Transportation-as-a-Service concepts.

“IT companies could take on the role of public transport operators in the USA and completely reshape public mobility.”

Business model expert

6. Summary

Autonomous driving is set to revolutionize the mobility industry, affecting users, stakeholders, and partnerships. With a shift towards autonomous systems, users will benefit from time savings. The role of vehicle manufacturers in the value chain will become less prominent, with some becoming mere hardware suppliers. This will impact the relevance of individual automotive brands and result in the emergence of new players. The leading digital platform brands are expected to dominate the customer interface for mobility. It is expected that the leading digital ecosystem and mobility platform brands will move into the mobility sector in the future and occupy most of the customer interface for mobility. Today's vehicle manufacturers and their brands must come to terms with finding new, expanded roles in existing ecosystems. Vehicle manufacturers and fleet operators must adapt to stay economically viable. They must analyze their core competencies and identify opportunities within their business. If necessary, they should form strategic partnerships to implement successful autonomous systems. This requires traditional companies to make bold, future-oriented decisions and develop the required software expertise. Digital ecosystems will try to expand their business model by integrating mobility services into their own software and platform infrastructure, leading to increased user loyalty and a stronger offering. Not only does this allow the services offered to be strengthened, the company's own services can also be provided via defined interfaces, enabling integration into vehicle architectures and systems. For example, Alphabet has already begun to make mobility digitally consumable and affordable via Google Maps – a further step toward achieving a market-dominant super app. Political stakeholders and authorities will play a role in promoting autonomous mobility and logistics by investing in supporting infrastructure, such as connectivity and smart cities. This also includes expanding and guaranteeing the necessary bandwidths and network coverage as well as regulatory measures. Recent years have shown that the development pathway of autonomous systems is highly volatile. The market environment and stage of development are constantly changing. After the hype comes consolidation. Activities that were previously the reserve of traditional companies in the mobility sector will see the emergence of new competitors. To succeed, companies must form robust partnerships, offer user-centered vehicle concepts, and establish a socially sustainable and economically viable business model.

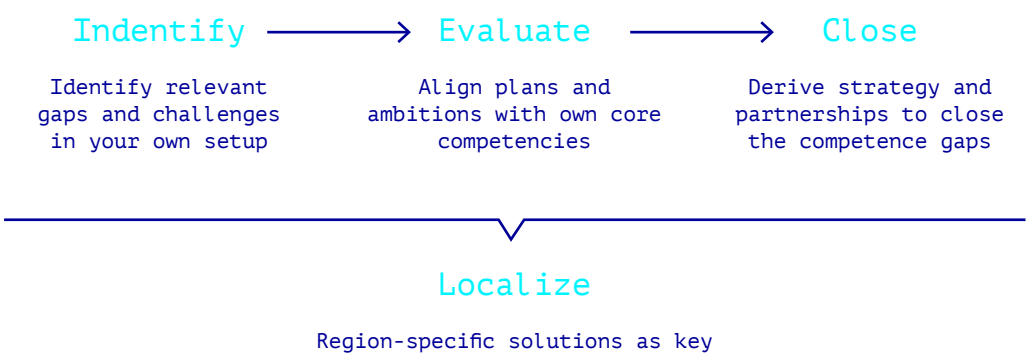


Figure 11: Deriving your own strategy and approach in four steps

Glossary

Automotive OEMs define the vehicle segments via the product strategy. Within the segments, the vehicles are designed, developed, produced and sold. Ideally, they should try to make the vehicles as user- and operator-friendly as possible. They are responsible for the integration of the technologies and functions of the suppliers and thus the capabilities of the vehicles with regard to automated driving.

Fleet operators are responsible for operating the fleets. They are responsible for procurement and insurance as well as the maintenance and cleaning of the vehicles and for the availability of the fleets in service operations. Fleet operation includes the monitoring of vehicles in operation. If necessary, remote interventions are performed to prevent hazardous situations and rectify errors. Fleet operators are expected to bear the financial risk for the fleet and have an interest in maximizing revenues through travel revenues and other revenue channels.

Mobility platforms are primarily designed for coordinating supply and demand via digital platforms. They represent the interface with the end customer. They provide app-based services that can be used to book, manage, and charge for travel. In addition, their algorithms enable the most efficient combination of different driving requests in the case of ride sharing, taking into account the customer's comfort.

Local public transport operators play a special role. They are usually both fleet operators and the customer interface. Local public transport operators are often supported through subsidies to ensure basic mobility services.

Digital ecosystems offer value-added services for users during their journey. Currently, these may include social networks, cloud gaming services, business tools, and streaming. In future, metaverse applications may also play a role here. Service providers integrate their end-customer-related services that go beyond the actual mobility solution into the complete service bundle. This can take two forms: digital ecosystems can either offer their own services in the vehicle or connect these with route information, or mobility services can be integrated into their own service platform.

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