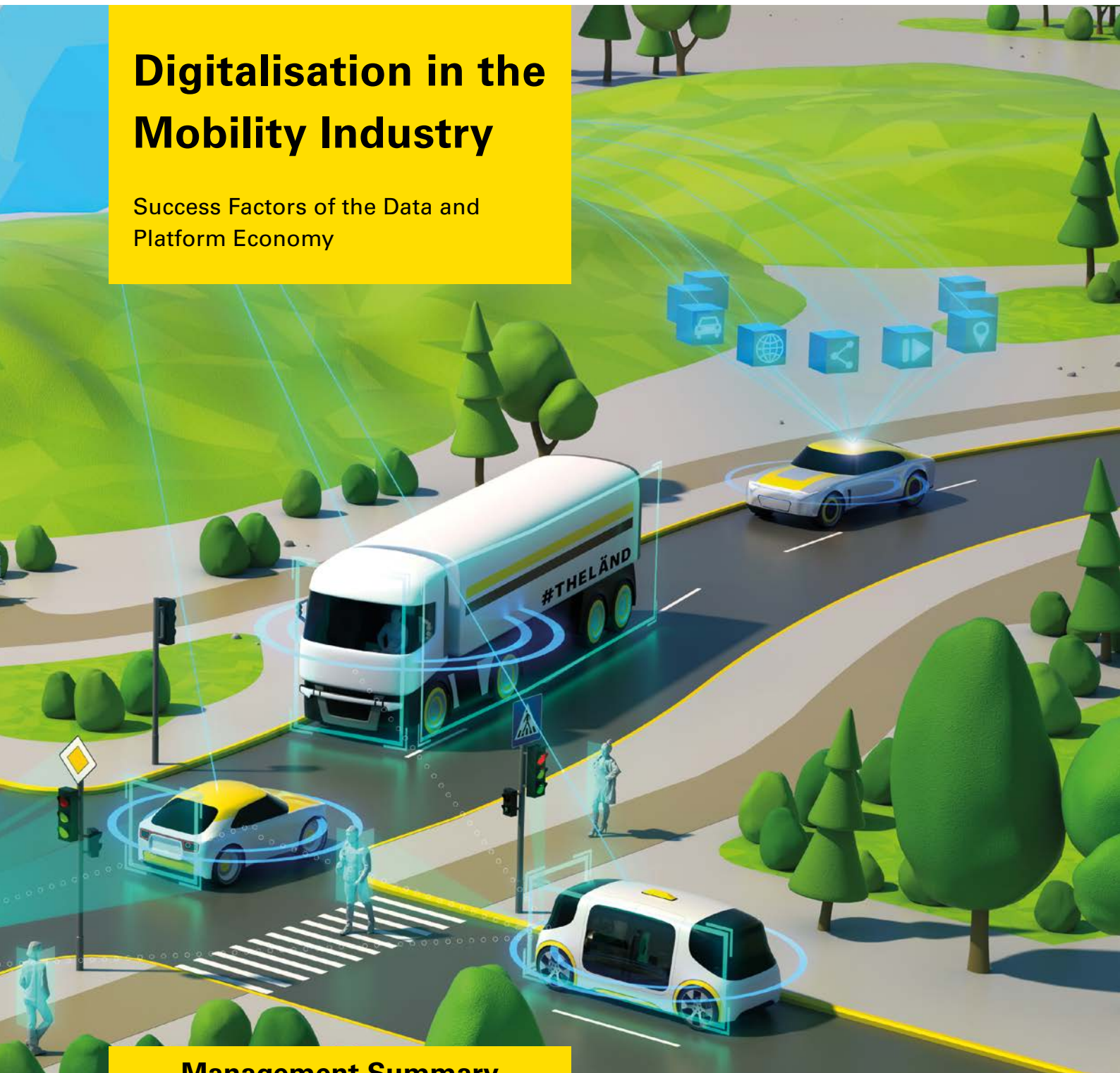


# Digitalisation in the Mobility Industry

Success Factors of the Data and  
Platform Economy



Management Summary

e-mobil 

State Agency for New Mobility Solutions  
and Automotive Baden-Württemberg

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# Management Summary

In view of digitalisation, the mobility industry is currently experiencing the most significant transformation in its history. Data-bound information that can be accessed at any time and digital platforms are not only changing long-established player landscapes, but are also prompting a reorganisation of entire value chains. For established organisations, nothing less than the future viability of their existing business models and their role in the mobility ecosystem of the future is at stake. Against this backdrop, the study examines the impact and success factors of the data and platform economy on the German mobility industry. It analyses the relevance and complexity of digitalisation in the context of mobility, evaluates the state of digital development of key stakeholders in the mobility sector and identifies possible options for action. In terms of the methodology, the study is based on a broad mix of company and statistical data, the analysis of relevant literature, and in-depth guideline-based interviews with industry experts.

Key findings:

- Data is the key resource of the 21st century. Its unique properties enable diverse value creation concepts in the mobility industry.
- Digital platforms are revolutionising the interaction between supply and demand. Network effects and economies of scale are paving the way for data-based mobility ecosystems.
- On the global data and platform market, Germany is confronted with companies from China and the USA that have dominated to date. Domestically, individual lighthouse projects demonstrate the innovative capabilities of German mobility players.
- Overall, the “digital fitness” of German companies varies considerably depending on the size of the company, group of players, position in the supply or value chain, and individual product and service portfolio. The success factors of skills, collaboration, culture and organisation play a key role in determining their future viability and competitiveness.
- The public sector must assert its important orchestrator function more. Greater assertiveness and decision-making power in conflicts of interest could significantly accelerate digital progress in the mobility industry.

# 01

## Introduction

Digital technologies, data and platforms will permanently transform the automotive industry and the entire overarching mobility ecosystem (see Figure 1). They open up considerable potential for value creation and form the basis for more efficient processes, new business models, improved customer benefits and lower costs. Digital skills are a necessary, however not always a sufficient, condition for success. Companies that do not address these topics intensively are likely to be among the losers of the digital transformation. These theses outline the initial situation that is the subject of this report.

Digital technologies and data-based platforms have already permanently changed value creation and competitive structures in industries such as communication (WhatsApp, Facebook, TikTok), retail (Amazon, Alibaba), music (Spotify, iTunes) and film/television (Netflix, YouTube). Today, the majority of these platforms generate profit margins in the double digits every year, and the companies are among the most valuable companies in the world in terms of their market capitalisation. The automotive and mobility industries, which are characterised by investment-intensive plants and infrastructure as well as lengthy product development cycles, still have most of this radical transformation ahead of them.



Figure 1: Players in the mobility ecosystem

Source: own illustration

The following also applies to the industry in focus here: “Software is eating the world”<sup>1</sup> and “Everything that can be digitized will be digitized”<sup>2</sup>. In the key future trends of electric mobility, connectivity, autonomous driving, mobility services as well as process and production automation, software, data and platforms form the new, critical core of future value pools. Elements of such software- and data-based value creation are, for example, the new vehicle architectures/operating systems, networked services or functions on demand (infotainment, e-commerce, charging, etc.) or autonomous driving systems/ride service platforms.<sup>3</sup>

On the one hand, the shifting skill requirements result in new value creation opportunities for established players in the automotive and mobility industries. On the other hand, many existing elements of value creation and profit pools are eroding, melting away or disappearing completely. In addition, new players with broad software, data and platform skills are joining the future mobility universe as competitors. These, above all, include financially strong tech companies such as Alphabet/Google, Apple or Amazon (or Tencent, Baidu, Alibaba in China), which are expanding the business success of their digital ecosystems from consumer electronics to the automotive and mobility industries. Specialised digital companies and start-ups that offer software and data services or platform-based mobility solutions such as car subscriptions, car sharing and ride services should also not be underestimated. In the course of the digital transformation, the entire automotive and mobility universe is changing accordingly, along with the paradigms and the value creation and player structures.

Against this backdrop, the study published entirely in German discusses the fundamental importance and complexity of digitalisation in the context of the mobility ecosystem. It aims to motivate and encourage players in the mobility industry to recognise the relevance of the data and platform economy as an element of value creation and to use this to their benefit. In particular, the following issues are discussed:

- How is data different from traditional resources?  
What steps are necessary to derive added value from it?
- What are the distinguishing features of digital platforms?  
What do companies need to consider when setting up and using these?
- For which applications are data and digital platforms already being used in the mobility context?
- How digital is the German and Baden-Württemberg mobility industry at present? What are the current challenges for automotive manufacturers and suppliers and the motor vehicle retail, repair and aftermarket trades as well as for public transport operators and other mobility providers?  
Which skills do industry players already have?  
What are the motives for entering into collaborations or restructuring the corporate culture and organisation?
- What can companies do now to handle the digital transformation and secure their strategic competitive position? What role does the political sphere play in this?

The study begins with an introduction to the topic before moving on to discuss these questions in four sections using a mix of different methods.

1 | Andreessen, M. (2011).

2 | Fiorina, C. (2000): “To refresh your memory, e-services are any process, any application, any asset that can be digitized and delivered over the Web. Believe me, if it can be digitized, it will be.” and “In the new world, everything will be intelligent, everything will be connected and literally everything can be considered as a platform for the delivery of services.”

3 | Cf. Bratzel, S.; Tellermann, R. (2022a), p. 87 ff.

# 02

## Recommendations for action for a digital mobility industry

The data and platform economy will fundamentally change the mobility ecosystem of the future. The analysis of the different groups of players has shown that companies and organisations are at different stages in their digital development. While established large enterprises and start-ups tend to be further along in the process, public enterprises and SMEs are often still in the early stages of their digital transformation. In addition, the political and infrastructural framework conditions in Europe, and especially in Germany, exhibit some major weaknesses in the international comparison. In view of the transformation pressure, companies must implement short-, medium- and long-term measures and optimise external framework conditions.

### Options for action within the company

Automation, the use of AI and the networking of machines, products and services are gaining in importance and are permanently changing the interaction with customers. Projects such as Catena-X and regiomove also show that the interaction between players at different stages along the value chain is intensifying. There is also no way around the data and platform economy in the automotive and mobility industries: against this backdrop, companies must ask themselves what role they want to and can play in the industry in the future. Above all, the dynamic transformation of the competitive environment must be taken into account. The development of a future-proof data and platform strategy is based on a comprehensive review that considers both internal and external perspectives. The company-internal review must consider how the provision of services to cooperation partners and customers has been structured to date and how this could change in the future through the use of data and platforms. In the industrial context,

for example, the connecting of machines and implementing IoT platforms can be sensible measures. The examination of external aspects primarily involves analysing current and future service offers. The extent to which existing products and services can either be supplemented with or replaced by digital components must be evaluated accordingly.<sup>4</sup>

The critical review grants insights into the gap that exists between the desired future competitive position and the actual state of digitalisation. Sometimes, it also reveals how urgently transformation is needed within the respective organisation. Action is required on three fronts for companies active in the mobility industry to remain competitive in the data and platform economy in the future:

- Build and expand skills
- Adapt/readjust the cooperation environment
- Change the corporate culture and organisation.

The measures within each field of action can be divided (and potentially also prioritised) into perspectives to plan in the short term (within two years) and medium to long term.

<sup>4</sup> | Cf. Luckert, M. et al. (2018), p. 38 f.

	Build and expand skills	Adapt/readjust cooperation environment	Change culture and organisation
Short term	<ul style="list-style-type: none"> <li>– Basic skills</li> <li>– Cybersecurity</li> </ul>		<ul style="list-style-type: none"> <li>– IT skills at management level</li> </ul>
Medium to long term	<ul style="list-style-type: none"> <li>– Digitalise and network processes and products</li> <li>– Standardise and automate processes</li> </ul>	<ul style="list-style-type: none"> <li>– Strategic partnerships</li> <li>– Mergers and acquisitions (M&amp;A)</li> <li>– Public-private collaboration</li> <li>– Presence in ecosystems,</li> <li>– B2X platforms</li> </ul>	<ul style="list-style-type: none"> <li>– Change the mindset of the entire company</li> <li>– Democratise IT skills</li> <li>– Appeal for (young) professionals</li> <li>– Adjust hierarchical levels, team structures, etc.</li> <li>– Consistent customer orientation</li> </ul>

Source: own illustration

Table 1: Options for action for a future-proof competitive positioning in the data and platform economy

Depending on the company’s respective state of digital development, it is advisable to begin by building up (basic) skills in the data and platform economy. In particular, this includes gaining a basic understanding of the characteristics, advantages and disadvantages as well as the (legal aspects of the) handling of data as a key resource. It also includes essential knowledge of the structure, operating principles, success factors and risks of digital platforms. This knowledge must be available or built up within the company, as it serves as the basis for further tactical and strategic considerations – as confirmed by the experts interviewed. Within this, it is equally important to address the need to protect personal and business-relevant data. Ensuring data security and availability (for example through the use of redundant system architectures) is not only a legal requirement. In an increasingly connected world threatened by cybercrime, it is already becoming a focus early on. In the medium to long term, digital skills must be developed further in order to prompt an adjustment of company processes and the product and service portfolio. These components form the core of future-proof (digital) business models and enable companies to participate in the data and platform economy. Exactly which measures should be implemented depends on the company-specific case. The results

of the Digitalisation Index for Germany imply that processes must first be digitalised (internal perspective) before digital products and services can be offered (external perspective). It should be noted that a digital product portfolio is not a blanket solution for every company.<sup>5</sup> Likewise, it is not enough to simply digitalise existing processes. Rather, it is necessary to take into account the overall context and to pursue an increase in efficiency.

For automotive manufacturers, major Tier 1 suppliers, public transport operators and mobility service providers, the trend toward digitalisation is going in both directions, i.e. both inward (service creation) and outward (service offers). Logical approaches to company processes are needed in the development of complex projects such as operating systems, zonal vehicle architectures or multimodal platforms. For other companies (e.g. Tier 2/n suppliers or automotive repair shops), however, a differentiated approach is recommended. Companies that, despite intensive deliberation, see no possibility or need for (extensive) digitalisation of their products or services should instead primarily focus on optimising their service offers. This includes companies that manufacture simple mechanical components (e.g. screws, door handles or rubber seals) with little

5 | Cf. Büchel, J. et al. (2022), p. 34.

potential for digitalisation. In addition, it may make sense to expand the product portfolio to include urgently needed hardware components (e.g. power electronics, semiconductors) or to focus on other industries.<sup>6</sup>

Additional measures that contribute to the standardisation of data formats and process flows are recommended when digitalising and networking services, especially in industrial contexts. Use cases from the supplier industry serve as a blueprint for other companies. Standardising production processes and logistics not only enhances the scalability of the system landscape to additional locations. It also provides a better basis for the use of AI. According to the business experts interviewed, companies must also address the topic of standardisation sufficiently outside their own sector and beyond the boundaries of their own company. Especially in public transport and mobility services, a lack of national standards still hinders the commercial dissemination of innovative service offers. Policy-makers should devote themselves more to defining standards and serve at least as coordinators. Cooperation is considered the second fundamental component and a game changer on the way to future-proof competitive positioning in the data and platform economy. Digitalised products and services, networked machines, new legal frameworks and demanding customers increase the complexity of performance and production processes and make isolated solo efforts increasingly unattractive. Regardless of the size of the company and the group of players, cooperation is essential in order to keep up with these growing demands and the global competition. In corporate practice, different cooperation patterns can be discerned depending on the current competitive position. They can also be applied in parallel:

- Strategic partnerships
- Mergers
- Acquisitions and other forms of cooperation

Strategic partnerships on an equal footing can take various forms and should generally be considered for both internal and external perspectives. Looking inwards, the extent to which cooperation can help to accelerate or optimise the quality of service provision or reduce costs must be clarified. Improvements can be achieved, for example, by implementing IoT platforms, digital twins, cloud computing infrastructure or analytics software from well-known vendors. The competence

boost realised through cooperation also speeds product development (e.g. vehicle architectures) and improves the range of services for (end) customers. Mergers and acquisitions (M&A) typically take place to achieve necessary economies of scale or to vertically (re-)integrate upstream or downstream steps in the value chain. Measures to increase economies of scale and network effects play a particularly crucial role for the success of digital platforms and are especially widespread among mobility service providers. For smaller companies in particular, mergers can be a sensible option to share any necessary investments in the digitalisation of hardware and software among several partners. This helps them to pool their existing expertise legally and expand their market share – and thus also their negotiating power. Mergers are therefore as likely in the automotive industry as they are among small supplier companies. Other forms of cooperation, such as more intensive public-private collaboration and an increased presence in ecosystems or on B2X platforms, should be considered complementary measures that depend on the specific situation of the company. According to the experts, collaborations with towns/cities and regional administrations are particularly advisable when setting up multimodal and intermodal platforms. Publicly organised research or pilot schemes (e.g. regiomove) serve as trustworthy test environments with low entry barriers for commercial mobility service providers and foster the understanding of cross-company data sharing. Collaborations dedicated to improving traffic safety (e.g. in densely populated metropolitan areas) are equally relevant.

The involvement in data- and platform-based ecosystems should be closely aligned with the company strategy and take the existing framework conditions into account. Prioritising individual projects is particularly advisable for SMEs, as they have only limited access to the necessary human and financial resources. Legal aspects should also be considered when weighing up the expected (economic) benefits against the effort required. The adoption of the German Act on Corporate Due Diligence Obligations in Supply Chains (Lieferkettensorgfaltspflichtengesetz, LkSG) is considered a decisive driver for establishing the Catena-X data ecosystem. Participation in B2X platforms and marketplaces is advisable, for example, if additional customer groups can be reached with a reasonable amount of effort or if required information (or products or services) can be accessed more easily.

6 | Cf. Luckert, M. et al. (2018), p. 39 f.



Efficient and effective internal structures are critical to the successful implementation of a long-term digital strategy. The analysis has shown that in terms of corporate culture and organisation, particularly traditional, industry-related and public companies exhibit history-related deficits compared to young digital companies and start-ups. Various change management measures are advisable to tackle the necessary transformation. The shift toward a digitally savvy corporate culture must primarily come from the management level and be represented and supported by it. Expertise in and responsibility for the principles of the data and platform economy can already be pooled at the management level in the short term. Institutionalising digitalisation within companies, for example by appointing a digital officer at the management level, can also be a sensible solution for medium-sized companies. According to a survey by Germany's digital association Bitkom, 19% of German companies with more than 20 employees (n = 604) have already created such a position. Just under one in five companies (18%) plan to deploy a digital officer in the near future.<sup>7</sup> Change management workshops and seminars that trigger a change in mindset in the workforce and reduce mistrust and pessimism about digital business models are also advisable short-term solutions.

Since a company's success depends largely on its employees' skills, in the medium to long term it is the managers' task to transfer the acquired understanding and know-how to the individual departments. In terms of measures, the aim is to create the optimal conditions for existing employees on the one hand and to increase the attractiveness for new skilled workers on the other. The former can be achieved, for example, through IT training and practical advanced and further training. These qualification measures enable people to use digital technologies effectively and responsibly and ensure the democratisation of IT skills. Building up in-house skills automatically reduces the dependence on external service providers and increases flexibility within the company.<sup>8</sup>

Both hard and soft factors can be used to recruit young professionals. Due to the extensive (in some cases voluntary) collective wage agreements, most companies in the automotive sector differ only slightly from one another in terms of the pay, holiday leave and working hours they offer. Public trans-

port operators are also often bound by municipal income regulations. Attractive soft factors, such as team structures, the working environment or the designation of responsibility can make a difference and attract young talent. Beside the relationship with the workforce, the way customers are treated should also be reconsidered. The computer and smartphone industries, for example, show that digital ecosystems depend on the commitment of and feedback from their users. With this in mind, organisations in the mobility industry would be well advised to actively involve customers in the development and optimisation of digital products and services, and to focus consistently on meeting their needs. Some experts believe that a loyal user community will become increasingly important in the future.

### External framework conditions and success factors

In light of the global competitive environment, the digital transformation in Germany in general and in Baden-Württemberg in particular will be decisive to the future of companies in the mobility industry. The analysis showed that in an international comparison, Germany still has potential to optimise infrastructural, organisational and legal factors. To ensure that Germany and Baden-Württemberg remain significant as industrial locations in terms of value creation in the data and platform economy, the policymakers at the EU and federal as well as at the state and local levels must orchestrate and devise clear and reliable framework conditions.<sup>9</sup> Overall, four fields of action can be identified (cf. Figure 22):

- Digitalisation of (transport) infrastructure
- Development of skills and resources in public administration
- Adjustment of the regulatory framework
- Targeted support for players and projects

A modern and efficient digital infrastructure forms the foundation for the successful digitalisation of companies, state and society and must therefore be considered absolutely critical to success.<sup>10</sup> In view of the existing technological deficit, accelerated development and expansion of the broadband and digital transport infrastructure is urgently needed. According to

7 | Cf. Bitkom (2022).

8 | Cf. Büchel, J. et al. (2022), p. 48.

9 | Cf. EFI (2022), p. 92, and Luckert, M. et al. (2018), p. 51.

10 | Cf. Demary, V. et al. (2021), p. 45.

the state of Baden-Württemberg, it is a pioneer in this field compared with other federal states in Germany, having invested more than EUR 800 million (2021) in the expansion of the municipal broadband network. However, in addition to state investments, there is also a need to speed up the sometimes very lengthy planning and approval processes. After all, given the growing data volumes and technological advances, the development and expansion of the digital infrastructure must be regarded as an ongoing modernisation process.

### Support services for the digitalisation of public administration using the example of Baden-Württemberg

The state of Baden-Württemberg supports its municipalities in the digitalisation of administration in a variety of ways. The Online Access Act (Onlinezugangsgesetz, OZG), for example, legally obliges the federal, state and local governments to also make their administrative services available via online portals by the end of 2022. The federal state is providing each of its 35 rural districts with “e-government coordinators” for a period of two years, who will support them in the implementation of the OZG as well as in other digitalisation and change management challenges. In addition, municipalities can develop their own services using a digital rapid toolkit, which can then be made available to other municipalities for subsequent use via the state’s online portal service-bw. This approach leverages

synergies and saves resources.<sup>11</sup> Another element of the municipalities’ approach to promoting skills and culture is the Digitalakademie@bw. As a public contact point, it supports municipalities, districts and regions in Baden-Württemberg in their digital transformation and encourages qualification, innovation and knowledge transfer through appropriate offers. These include consulting services, qualification programmes and the development of solutions in joint workshops.<sup>12</sup> According to the state government, the success of the Digitalakademie@bw can be seen in the rising number of trained “municipal digital pilots” and the high take-up of its services.

In the context of mobility, there are two major demands: the consistent availability of the 5G mobile communications standard and the digital mapping of the transport infrastructure elements.<sup>13</sup> The 5G standard serves as the basis for real-time applications such as autonomous driving and is also the foundation of the digital ETCS system for rail traffic. Digitalising transport will allow smart mobility management and increase capacities without having to build more new roads or railway lines. To provide the required dynamic data, upgrading existing traffic signals, variable message signs, parking guidance systems and railroad crossings is recommended. In order for the policymakers to fulfil their frequently demanded role of orchestrator, particularly public administration requires the resources and skills needed to do so. Similar to companies, public authorities must also build up their basic skills in the data and

11 | Cf. Baden-Württemberg (2022).  
 12 | Cf. Digitalakademie@bw (2022).  
 13 | Cf. NPM (2020), p. 4; VDA (2022); VDV (2022).

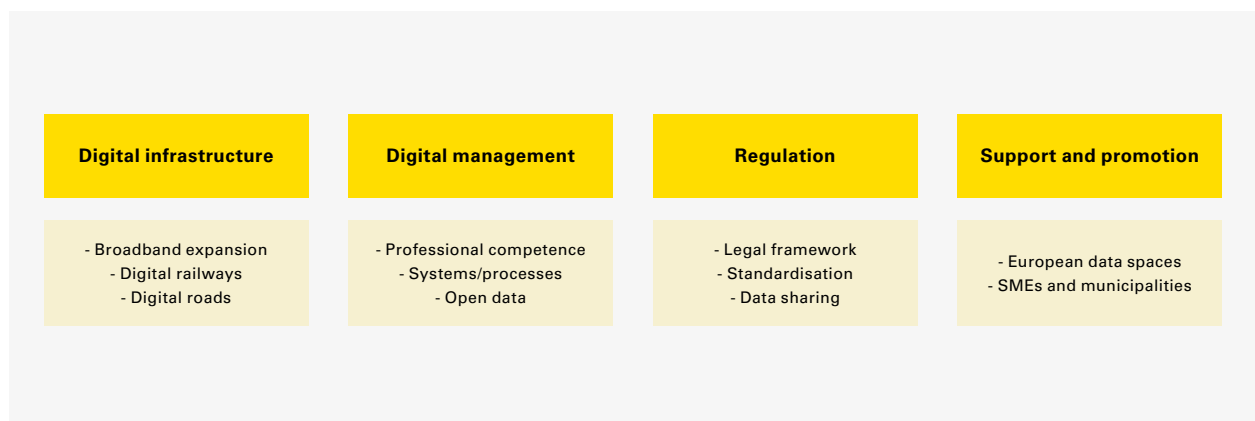


Figure 2: Political fields of action

Source: own illustration

platform economy, digitalise relevant processes, enter into collaborations, adapt internal organisational structures, and engage in cultural change management. However, the federal structure of the political authorities and the corresponding legislation at federal, state and local level remain an obstacle to the digitalisation of administration and transport infrastructure.<sup>14</sup> To achieve a holistic approach to digitalisation, greater coordination of authorities should be pursued, for example through intermunicipal cooperation or associations of local authorities. An exchange compliant with the data protection regulations and the adoption of best practices could accelerate the implementation of innovative and practical approaches and also save resources (see info box). One essential component of digital administration is the consistent provision of public administration, research and transport data as part of a comprehensive open data strategy. Even if isolated efforts are being made in this direction in the mobility context (e.g. *MobiData BW* and *Mobilithek*), there is still potential for further expansion. All the more important is therefore the resolution adopted in the coalition agreement of the current state government in Baden-Württemberg (2021–2026) to set up an openly accessible database for all publicly relevant and machine-readable data, including the necessary interfaces.<sup>15</sup> It is also advisable to pool activities within a few lighthouse projects, which serve as a blueprint for use cases that relate closely to everyday life and encourage greater harmonisation and coordination of the individual instances. Publicly operated innovation platforms and competence centres (e.g. *Digitalakademie@bw*) are ideally suited to this purpose. The widespread use of data and platforms is hampered by at times outdated and ambiguous legal framework. Various studies and business associations are calling for the elimination of existing grey areas and advocating regulations conducive to innovation.<sup>16</sup> According to experts, for example, the General Data Protection Regulation does not make sufficiently clear which vehicle data may be shared and which may not. Uncertainty thus prevails in marketplaces that specialise in the trade in such information (e.g. *Caruso*) as to whether the vehicle identification number should be classified as personal or non-personal data, for instance. Such adjustments to the existing framework conditions could significantly spur the development of data-based business models. The private mobility industry is at an impasse when

it comes to the standardisation of data formats and interoperability. Many players are trying to impose their approaches (e.g. in the networking of vehicles, charging stations or modes of transport) on competitors and smaller companies as universal tools, which not only increases the overall complexity but also limits innovations. Unsurprisingly, dominant players tend to oppose government intervention on account of their own economic interests, while other companies and associations favour sector-specific regulation. Policy intervention is seen as necessary to make progress on existing challenges (e.g. in-car communication standards, linking mobility services with public transport). Ideally, this should be coordinated across the board and internationally in order to strengthen the European digital space.<sup>17</sup> Standards provide the basis for cross-actor, international and non-discriminatory access and exchange of data. Although this represents a major future field for companies, due to mistrust and a lack of communication and data standards, data sharing only takes place sporadically apart from a few exceptions. In order to further increase data sharing within data and platform-based ecosystems and digital platforms, either data sharing obligations can be agreed or incentive schemes can be developed. According to experts, obligations such as the German Act on Mobility Data (*Mobilitätsdatenverordnung, MDV*) harbour the risk that smaller companies (e.g. rural taxi or bus companies) will not yet be able to provide the required data or that companies will only make information of an insufficient quality available. Data sharing concepts must enable equal access for all relevant groups of players. If an ecosystem approach is to be taken, proprietary approaches that do not allow independent workshops neutral access to vehicle data, for example, should not be pursued further. The establishment and expansion of European data spaces and architectures (e.g. *Mobility Data Space, Gaia-X, Catena-X*) can boost the sovereignty of the European Single Market and enhance its standing in the international competition of the data and platform economy. Against this backdrop, (financial) support for these projects should be continued, provided that data sharing ecosystems and concrete use cases come into being at an appropriate pace. In order to increase awareness and acceptance of the projects and to serve as a role model, the provision of public data and services based on the *Gaia-X* architecture is advisable in addition to awareness-

14 | Cf. NPM (2020), p. 14.

15 | Cf. Baden-Württemberg (2021), p. 20.

16 | Cf. Demary, V. et al. (2021), p. 45; VDA (2022).

17 | Cf. VDA (2022).



raising campaigns.<sup>18</sup> SMEs and municipalities are in many ways the backbone of the mobility ecosystem. However, their often severely limited personnel and financial capacities give rise to a separate need for external support, for example to build up data and platform skills or to participate in (European) ecosystems. The advice and support services already offered by the federal states and federal government to build up and expand in-depth digital skills<sup>19</sup> could be continued and expanded. Participation in data ecosystems such as Catena-X could be made as intuitive and cost-effective as possible, potentially with government support. Inter-municipal cooperation, associations of local authorities and publicly organised innovation platforms could support municipalities in their digitalisation measures.

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18 | Cf. EFI (2022), p. 92.

19 | Contact points include Baden-Württemberg's Mittelstand 4.0 competence centres and the national go-digital funding programme. Companies in Baden-Württemberg can also make use of the "Transformation Automotive Industry" consulting voucher or the scouting service of the Industry 4.0 BW alliance.

# 03

## Conclusions

Digital fitness, i.e. the qualitative state of development of an organisation or group of players in the definition and implementation of data and platform strategies appropriate to the target group, is a central success criterion for the future viability and competitiveness of companies in the mobility industry. Literature analyses and expert interviews have shown that skills, collaboration, culture and organisational structures are the key factors that have a decisive influence on and underlie the level of digital maturity. The word cloud makes this clear at a glance: it contains nearly 300 coded statements made by the experts, reduced to common keywords that are presented in a concise format (cf. Figure 3). Considerable attention – and thus great relevance – can be attributed to the development and expansion of digital skills for the future. In their statements, the vast majority of the experts interviewed mentioned the skills that will be needed by players in the data and platform economy, but which are often still lacking. Overall, the digital progress of German companies varies significantly, with established large companies and young start-ups in the information and communications technology and the automotive or mechanical engineering sectors tending to perform better. For many SMEs, however, even developing basic skills involves a great deal of effort. Their often severely limited financial and human resources hardly allow for broad-based digital strategies and thus inhibit the development of urgently needed future skills. The, at times, severe skills shortage in German companies has led them to play an almost insignificant role on the global data and platform market to date. Major digital corporations from the USA and China hold sway over large parts of the C2C and B2C business and are attempting to expand their exceptional position to other markets and industries (e.g. the mobility industry). Fragmented economic structures dominated by small and medium-sized enterprises and a complex, at times ambiguous legal framework are sometimes major obstacles to the transformation of German companies. The process of defining urgently needed data and communication standards (e.g. for connected cars, multimodal platforms and charging infrastructure) is mostly slow and inconclusive. Conflicts of interest or

disagreements between players as well as a lack of political resolve and/or leadership increase the dependence on dominant companies. Due to a lack of resources and existing skills shortages, the public sector mostly – with just a few exceptions – still fails to sufficiently exercise its important orchestrator function in the digital transformation of the mobility industry at the federal, state or local levels. The experts interviewed repeatedly emphasise the importance of neutral and public interest-oriented state bodies when building and managing data-based ecosystems and platforms. As a “guiding hand”, they can exert significant influence on the progress as well as the data quality and availability of specific projects, for example through bonus-malus systems or data sharing obligations. Many experts call for greater involvement of the political leaders in general, while some even argue for government settlements in particularly deadlocked discussions (e.g. determining consistent communication standards). According to the experts interviewed, an equally important success factor for the mobility industry is the establishment of a data- and platform-based cooperation environment. In an increasingly networked world, going it alone and data silos lead to a dead end, while data pools and the exchange of data across organisations are growing greatly in importance. Collaboration with other players offers clear benefits: complementary capabilities reduce individual skills shortages, access to enriched data platforms provides new insights for one’s own business activities, and mergers or acquisitions strengthen the overall market position. Interoperable, legally sound and sovereign architectures (e.g. GaiaX, Catena-X) are a fundamental component of successful collaborative (eco)systems of the data and platform economy. One important prerequisite for far-reaching cooperation is trust between the partners; this must be deepened and institutionalised through various forms of personal contact and exchange. In many cases, the cultural mindset of corporate management and the workforce as well as outdated and often inefficient organisational structures in companies hinder the development of data-based ecosystems. The experts interviewed also mentioned a lack of or need for a willingness to

change relating to organisational restructuring measures. They also call on companies to break old habits and establish a data-sharing-oriented mindset. The task of initiating this change, which is mostly urgent and vital to survival, falls to managers. As change agents, they must first build up their own skills and then share these with the workforce. In the longer term, regular continuing education and training activities focusing on the use of data and platforms will lead to a democratisation of relevant IT skills and strengthen the digital mindset in the company as a whole. The digital fitness of the groups of players considered and the companies assigned to these varies considerably in some cases, with considerably above-average digital development paths tending to be the exception (cf. Table 2). Overall, automotive manufacturers have a medium to high level of digital maturity. The importance of data and platforms and the associated digital and software skills has been recognised by these companies as an important future value pool. Implementing the corresponding digital strategies is proving very challenging, though. On the one hand, the creation of the new value pools first requires a software-defined vehicle architecture with stable operating systems. However, the realisation of such systems is very slow and tedious because the digital skills and corresponding software-savvy organisational cultures are still being developed. At the same time, there is a dynamic competition among the major digital players and their service ecosystems to occupy the central control points of the connected car. Time to market plays a central role for automotive manufacturers here. Digital companies are touting themselves as cooperation partners to the industry and quickly realising customer benefits and their own value creation through the rapid linking with their infotainment and e-commerce ecosystems. The German supplier industry faces similar challenges, although the level of digital fitness sometimes varies considerably. Due to different company sizes, different positions in the supply and value chain, and individual product portfolios, the level of digital development varies between “very low” and “high”. Large Tier 1 suppliers have, for the most part, already made considerable progress. In many cases, they already have digital strategies in place and are often building up new digital value creation areas in cooperation with the manufacturers. Medium-sized and small suppliers tend to be at an earlier stage of transformation. The future relevance and significance of data and platforms is often already known, but the necessary implementation skills are often lacking. A mindset among managers and staff that is often rooted in hardware sometimes exacerbates the need to catch up with tech suppliers with a digital DNA who previously operated outside the industry. Of all the groups of players considered, the auto-

motive industry has the greatest need to catch up in terms of the level of digital development. Many companies fall into the category of “digital beginners” with (very) low levels of digital fitness, while only a few large trade groups have achieved medium maturity. Acquisitions can often be observed, as they help companies to pool skills and streamline organisational structures. In many companies, the importance of data or the targeted use of digital platforms has not yet been sufficiently recognised or taken into account in the strategic positioning. And this although both manufacturers’ online sales systems and used/new car, accessories and spare parts platforms operated by other players are already having a massive impact on the future competitiveness of the automotive trade. Independent workshops face existential challenges in light of proprietary access models to vehicle data. For the most part, German public transport has only a low to medium level of digital fitness. The few municipal undertakings acting as digital role models (e.g. Karlsruhe, Hamburg) and national prestige projects (e.g. Stuttgart Digital Node) do little to change the sobering overall assessment. The potential of data and (multimodal/intermodal) platforms as enablers for more attractive and demand-driven public transport has not really been recognised yet, especially in rural areas. Cross-regional and cross-national collaborations to build national (or European) open data platforms (e.g. Mobilithek) lack attention and the necessary resources. The development of key digital skills and the centralisation of inefficient organisational structures are essential prerequisites for public transport to play a role as an integrator/orchestrator in a future mobility ecosystem. Predominantly private mobility service providers benefit from the at times creeping digitalisation of public transport companies and have a medium to (very) high level of digital fitness overall. Thanks to their predominantly young company history, they usually have a “data/platform DNA” that has a positive impact on the existing and future service portfolio. Due to inadequate networking with public mobility services and moderate acceptance of shared mobility, sustainable profitability is mostly still pending. Framework conditions beneficial to car owners (e.g. car purchase premiums, affordable parking for residents) and insufficient orchestration of public transport/mobility service activities by municipalities and regions often hinder a systemic overall view of mobility. Lacking or inconsistent standards have an additional negative impact on the cross-cutting exchange of digital information. As a whole, the players in the German automotive and mobility industry mostly no longer struggle to recognise the significance of the data and platform economy. However, the majority of companies are still in the early stages of a comprehensive digital transformation process. Digital

fitness, which is essentially based on skills and cooperation as well as culture and organisational structures, must be designed less for a sprint and more for a marathon.



Figure 3: Relevant keywords from the expert interviews

Source: own illustration

Player group	Status quo/challenges	Digital fitness
<b>Automotive manufacturers</b>	<ul style="list-style-type: none"> <li>– Widespread consensus on the importance of data and platforms as enablers for future automotive value creation</li> <li>– Highly dynamic competition with operating systems and ecosystems of large digital corporations (especially from China and the USA) over occupation of the central control points of connected vehicles</li> <li>– Development of centralised and cloud-based vehicle architectures as enablers for digital business models mostly underway, compensation for identified skills shortages in data/software, among others through strategic partnerships</li> <li>– Implementation of internal digital strategies, establishment of a digital mindset</li> <li>– Networking, standardisation and automation of business processes and production methods (e.g. smart factory, manufacturing platform)</li> <li>– Design of collaborative ecosystems (e.g. Catena-X) as a perspective for new business models and compliance with legal frameworks</li> </ul>	Medium to high
<b>Automotive suppliers</b>	<ul style="list-style-type: none"> <li>– Strikingly strong heterogeneity of the digital development status depending on the individual company situation and position in the supply chain</li> <li>– New competition from tech suppliers with a “data/software DNA” previously from outside the sector, in some cases threatening a company’s existence</li> <li>– Networking, standardisation and automation of business processes and production methods (e.g. smart factory, manufacturing platform)</li> <li>– Large Tier 1 suppliers: internal digital strategies already being implemented in many cases, testing of new digital value creation fields, increased focus on white labels</li> <li>– SMEs and Tier 2/n suppliers: importance of data/software usually known, but often still a workforce with a mindset rooted in hardware, frequently with low digital skills</li> </ul>	Very low to high
<b>Motor vehicle retail, repair and aftermarket trades</b>	<ul style="list-style-type: none"> <li>– Overall high proportion of “digital beginners”, larger trade groups tend to be more advanced in terms of their expertise and mindset</li> <li>– Importance of data and platforms as elements of value creation not yet sufficiently recognised or taken into account in the business strategy in many cases</li> <li>– Digital transformation of sales systems (e.g. online direct sales) and aftersales (e.g. remote maintenance, e-commerce) as a challenge</li> <li>– Struggle for a customer (data) interface, regulation of future access to data generated in vehicles critical to date, especially for independent workshops</li> <li>– Development of multi-/omnichannel concepts, centralisation of CRM systems, need for (digital) process innovations in sales and service</li> <li>– Consolidation trend with M&amp;A activities to bundle complementary skills and build future-proof organisational structures</li> </ul>	Very low to medium
<b>Public transport</b>	<ul style="list-style-type: none"> <li>– Predominantly expandable, but heterogeneously distributed digital fitness, municipal undertakings with partly digital role model function (e.g. Karlsruhe)</li> <li>– Relevance of data and platforms as enablers for more attractive public transport not yet recognised across the board, competences and digital mindset mostly still being developed</li> <li>– Data collection mostly manual and focused on the past, lack of knowledge about complete path chains, in part dilapidated and analogue infrastructure</li> <li>– Pooling or centralisation of historically grown organisational structures, digitalisation and simplification of tariff structures</li> <li>– Collaborative development and management of state/national open data platforms (e.g. MobiData BW, Mobility Inside, Mobilithek)</li> <li>– Distinct digital fitness as a prerequisite for assuming a role as integrator/orchestrator for the (regional/national) mobility ecosystem</li> </ul>	Low to medium
<b>Mobility service providers</b>	<ul style="list-style-type: none"> <li>– Increased progress in terms of the level of digital development, especially compared to other groups of players</li> <li>– Predominantly young companies with “data/platform DNA” and innovative mobility concepts or service ecosystems</li> <li>– Pooling and expansion of the service portfolio based on scalable system landscapes as a beacon of hope for lasting profitability</li> <li>– Only a moderate increase in the acceptance of shared mobility among the population, among others due to a lack of framework conditions that encourage sharing</li> <li>– Mostly still insufficient orchestration of public transport/mobility service activities by municipalities/regions</li> <li>– Frequent lack of networking with public transport, integration into publicly organised transport platforms as an opportunity and risk for previous business models</li> </ul>	Medium to very high

Source: own illustration

Table 2: Assessment of the digital fitness of German players in the market economy



To read the detailed study, please use the QR code.



German



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### **e-mobil BW GmbH – State Agency for New Mobility Solutions and Automotive Baden-Württemberg**

The State Agency for New Mobility Solutions and Automotive Baden-Württemberg, e-mobil BW, is the innovation agency and competence centre of the state of Baden-Württemberg for all matters relating to the mobility transition. Together with its large partner network from business, science and the public sector, it is shaping the transformation toward automated, networked and electric mobility in a sustainable energy system. e-mobil BW is an important body for providing advice, knowledge and impetus to the state government, thus strengthening Baden-Württemberg as a business and science location. At the same time, the State Agency is also active throughout Germany and at the European level, contributing its expertise to various committees.



### **Cluster Electric Mobility South-West**

The Cluster Electric Mobility South-West is one of the most important regional alliances in the field of electric mobility. It brings together all relevant players in electric mobility in Baden-Württemberg and advances industrialisation of the technology. The focus is on innovative approaches for vehicles, charging systems and forms of mobility. The Cluster Electric Mobility South-West is managed by the State Agency e-mobil BW.



### **Cluster Fuel Cell BW**

The Cluster Fuel Cell BW – managed by e-mobil BW – is working with science and industry to develop hydrogen and fuel cell technology in Baden-Württemberg. It brings together companies, research institutes, the public sector and associations, and aims to achieve market maturity for hydrogen mobility with marketable and customer-friendly series products.



### **Transformation of the Automotive Sector in Baden-Württemberg (in German)**

To support small and medium-sized enterprises in Baden-Württemberg, the Information Centre for the Transformation of the Automotive Sector in Baden-Württemberg is offering a new platform that provides orientation in the transformation process of the automotive industry. The State Agency for New Mobility Solutions and Automotive, e-mobil BW, coordinates the pilot office created as part of the Strategic Dialogue for the Automotive Sector in Baden-Württemberg.



### **Network Intelligent Move (in German)**

In the “Intelligent Move” network, managed by e-mobil BW, the potential and current challenges of digital mobility are analysed and discussed with stakeholders from research and industry in Baden-Württemberg. Various working formats are organised to shape the network and make the best possible use of the potential synergies and expertise in the field of digitalisation among its members.

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