Executive roundtable: Future of mobility

We need a paradigm change to organize future mobility: What is missing?

Urbanization has been growing continuously, and already today more than 50 percent of the global population is living in urban areas. How are conventional practices to organize mobility coping with this? In fact, urban mobility systems mostly reached their capacity limits long ago, and demand will further increase. We face a massive challenge. Initiatives aimed at helping to improve the system are often ineffective. The result is endless traffic jams, unreliable inner-city transportation and congestion. Simple additions to existing capacity will soon hit spatial and financial limits – a system is at its end. So what are the options now? What can we do to push innovation forward to quickly relieve our mobility systems? What will drive potential disruption? Arthur D. Little, passionate about change and innovation, invited major stakeholders in urban mobility to an executive roundtable in Frankfurt.

The problem: A traffic infarct

"We have reached a point, which is harmful." With this clear statement, Ralf Baron, Partner and Global Leader of Arthur D. Little's Travel & Transportation Practice, opened the executive roundtable in Frankfurt. It was not surprising that some participants arrived late. Flights were cancelled, long traffic jams arose in the Rhein-Main area, and train services suffered from a point failure. This was a normal morning here – and also for other metropolitan areas in Germany. And despite possibilities for decentralized working and communication, indicators suggest further growth in mobility.

Our transportation system is at the edge of what it can provide for us – and considering the outlook, mobility providers are looking ahead at bleak times. But somehow, it still is working and surprisingly tolerated by German commuters, since they still get from A to B. The situation is different, though, regarding megacities in other countries. When a bus ride in Istanbul takes hours for two kilometers, it is clear that the system does not work anymore. In many countries, the population suffers from a traffic infarct – and it is only a matter of time until we will have the same problem in Germany. Do we have anything to oppose? In fact, in times of digitalization, converging industries and technological innovation, we can actually build on numerous possibilities that could contribute to improving our systems. A wide range of progressive initiatives have already been implemented across the country – but rarely with relevant improvements, and often barely noticed by the public. The impression that little has changed in the last decades remains. What, or who, is to blame for the lack of progress? In fact, it does not make sense to look for single culprits, because in the
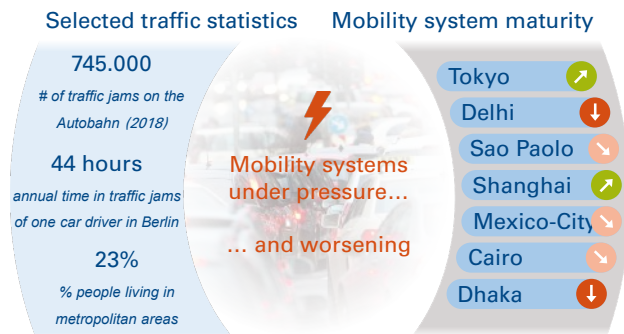
end there are many influencers. Technological advancements and mobility solutions are the foundation for progress. But these can only work when there are customers using them, legislators providing favorable regulatory conditions, and all other relevant businesses and parties are aligned – which would be a highly complex environment.

However, there is no reason for pessimism, since examples such as China prove that the transformation of mobility systems is possible. The state has created favorable regulatory conditions and set the course for new mobility, which has resulted in large-scale and systematic expansion of smart initiatives. In Germany, we are still far from achieving this. Which hurdles do we have to take? What can we do to prevent an infarct? And – at the end of the day – what will lead to disruption and the future of mobility in Germany?

The executive roundtable, organized in a format combining impulse speeches with lively debates between influential industry experts, aimed to find answers to those questions. Among the speakers was Gunnar Heipp, a well-known expert in urban mobility specifically and smart cities in general. Through his former activities as director of strategic planning at Stadtwerke München and his time as chairman of the sustainable development commission at UITP, he has experienced the mobility system in its entirety, and developed a vision of how it is likely to develop in the future. A crucial element of urban mobility are railway services, as represented by Simon Daum. Having spent most of his lifetime in the railway industry, he is responsible for digital collaboration and products for Siemens Mobility. He knows the significance of digitalization and how it can transform the industry. The third speaker was

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Nikolas Rössler from the start-up S O NAH that pushes forward technological innovations for improving urban road traffic and more. He gave insight into how collaboration with external parties had worked out in the past based on various projects.

Mobility systems under pressure

Selected traffic statistics   Mobility system maturity

745.000
# of traffic jams on the Autobahn (2018)

44 hours
annual time in traffic jams of one car driver in Berlin

23%
% people living in metropolitan areas

Mobility systems under pressure…
… and worsening

Tokyo
Delhi
Sao Paolo
Shanghai
Mexico-City
Cairo
Dhaka

Source: Arthur D. Little (2018), ADAC (2019), INRIX (2018), Handelsblatt (2018)

Mobility solutions and technology: There are enough

It sounds obvious, but a transformation for the better requires innovative and effective solutions based on modern technology. It was agreed that technologies and solutions exist – and are ready to be implemented. In fact, the variety of possibilities seem endless. The start-up S O NAH has developed optical sensors that can be installed in barely visible locations, such as street lights and canopies. This not only enables data to be collected on traffic flow and parking spaces to be freed up, it also facilitates live analyses of road conditions, notifications about wrong parking, warnings of children playing on the streets, and automatic control of street lights, as required by traffic. The benefits are significant: In addition to increased traffic safety and less time spent searching for parking spaces, a reduction of urban car traffic by 30 percent can be expected.

Simon Daum then drew attention to rail transportation. Digitalization will provide considerable cost-saving potential for energy and general operations, but also significantly increases availability and capacity utilization in the very asset-intense railway industry. For instance, bogie and door faults can be predicted and repaired before they fail in operation. In addition, infrastructure, such as points and signals, becomes much more reliable. The result: improved punctuality, safety, comfort, and customer information.
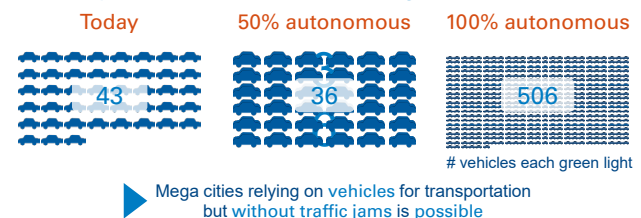
Looking into the future, the participants complemented the view with further developments. Tomorrow's city would enable road infrastructure elements to communicate with each other and vehicles themselves. Live data pools originating from intelligent traffic lights, vehicles and other numerous elements would allow real-time optimization of urban traffic. For instance, optimal speeds could be recommended to drivers to enable the green wave, traffic jams or dangerous situations could be avoided, and the next free parking lot could be reserved and directly navigated towards.

In addition, new mobility business models gained a lot of attention in the group, as further options for preventing a traffic infarct. Besides well-known car-sharing services such as DriveNow and Car2Go, mobility integrators such as Moovel and Qixxit are putting together intermodal, door-to-door connections – ideally with direct-booking functionality and ticketing. A significant extension of this idea, mobility-as-a-service (MaaS), shifts the focus from the transport medium to travelers themselves. Projects such as "Whim" and "UbiGo" open up the entire spectrum of urban mobility (e.g., buses, rail, taxi, bicycle) to users, and make it available on their own platforms via flat-rate or pay-per-use models.

Finally, autonomy in rail and road transportation was discussed and declared a special enabler of the future of mobility. A recent ADL study, in which the influence of autonomous passenger cars on the capacity of an inner-city main road was investigated, provided arguments. The astonishing result: assuming the traffic was fully autonomous, the street capacity increased 10-fold.

So what are the learnings? Not only are technologies, solutions and business models available to significantly improve today's system, but we are also equipped with well-thought-out concepts that enable the mobility of the future. Getting to the heart of it: technically, we can do everything – that's not the problem. The rest is more difficult.

Street capacity with autonomous driving

Today	50% autonomous	100% autonomous
43	36	506

vehicles each green light

▶ Mega cities relying on vehicles for transportation but without traffic jams is possible
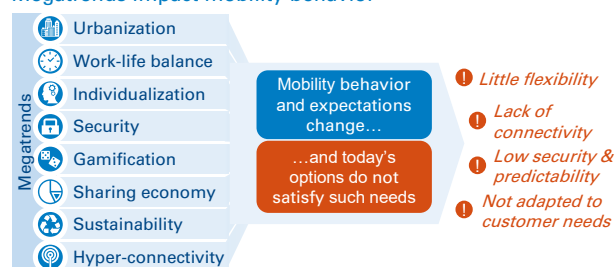
Source: Arthur D. Little (2018)

The users: Subconscious tolerance and readiness for alternatives

Another crucial, if not the most important element in the system of mobility, is the traveler. People do not use transportation just for entertainment. It "only" allows its users to perform certain other activities. But still, people have specific expectations of transportation that must not be neglected when designing the future of mobility. The roundtable agreed that the system is far from user-centric. In fact, millions of people in Germany suffer from traffic jams, disruptions or congestion every day.

Quite paradoxically though, it seems that such inadequacies are still being subconsciously tolerated or taken as normality. Bad attitudes towards public transportation have not stopped people from using them. Some participants reported that alternative mobility offerings have not stimulated great enthusiasm in their target users. Engagement with new forms of mobility is often limited, sometimes yielding wrong knowledge or even refusal. This, combined with subconscious tolerance of the current mobility situation, has created little pull for something new.

But how to succeed? Suggestions from the participants led to the conclusion that one central problem could be the lack of education about new possibilities. Creating enthusiasm and, likewise, demand was found to be a key enabler for adoption of new solutions. Some participants commented that societal trends, including megatrends, additionally impact the pressure on the actors involved. The point, at which the currently offered security, reliability and sustainability will fall below the acceptance limit of the users, is likely to be reached soon. Particularly in cities, where CO_2 emissions amount to a societal problem, the call for environmentally friendly alternatives is high – as China has demonstrated.

Megatrends impact mobility behavior

Source: Arthur D. Little (2018)

Regulation and bureaucracy: The core of stagnation?

There is no doubt that mobility is a regulatory-driven market. In the discussions, regulation was suspected of being the central source of development stagnation in the mobility sector – for multiple reasons. Gunnar Heipp explained: "The methodologies used to plan traffic are more than outdated." Static and ineffective models are still used to calculate transport capacities, leading to ineffective measures. Visioning, development and implementation of new mobility projects are made more difficult by regulation. The participants made this clear by pointing to sluggish political decision-making combined with alarming degrees of complexity. Even the mere creation of a target image is often close to impossible. Political planning processes that take decades are no longer unusual. Complex micro-work leads to endless discussions with different decision-makers.

An example how static legal requirements prevent the positive effect of new technologies are the regulations on maintenance intervals, which have been static at all times. "Our sensors and materials would not only allow longer running performance; they would also allow variable maintenance intervals without any loss in safety", says Simon Daum. Introducing variable permissible-limit values seems difficult to implement. Despite the existing technological possibilities, neither the operator nor the train manufacturer can currently benefit from it. Innovations developed in Germany are increasingly piloted abroad, sold, and then brought home when favorable legal conditions are created.

But what are the ways out? A consensus among the group was that "over-regulation" could only be countered by radical rethinking. One participant suggested, "The pain is simply not yet big enough. But we are already in the atrium of the heart." What happens when the "pain" gets bigger can be seen in

London. Here authorities had vehemently tried to ban vehicles from the city center by using camera systems and penalties. The diesel bans in German cities are also increasing. In the end, however, both measures can be considered as drops in the ocean. In contrast, a meaningful example for future-oriented regulation could be market adapted pricing for the use of public infrastructures of roads. Prices that take permanent capacity restrictions into account could foster innovation and effectiveness of transportation.

But is regulatory reorientation the only solution to new mobility in Germany, and will it have the power to bring about a radical change in the system? One participant referred to China: "The traffic infarct is one of the biggest there. If new technologies are mature enough, a simple prohibition can cause a system jump." Soon there might be no combustion engines in large Chinese cities at any time. For sure, regulation is needed to stimulate development. But one thing was also clear: it is not the only card in the game.

Interdisciplinary collaboration: When enemies become friends

We must deal with much more if we want to succeed with mobility. In his impulse speech, Gunnar Heipp focused on a topic, which, in his view, was one of the root causes of the lack of transformation in mobility: cooperation between friend and foe. Current and future mobility addressed many more areas that historically had little overlap. For example, comprehensive and sustainable charging infrastructure for electric vehicles could only be achieved by involving real estate owners. Traffic-generating entities such as schools, event businesses and retailers with delivery services would need to be involved in traffic planning. Municipal administrations and politicians would need to provide appropriate regulations and facilitation to make development possible. In practice, however, roles are unclear and there is still little cooperation, which risks friction losses if the singular channels are not brought together.

Indeed, some participants provided evidence from personal experiences. Due to the large number of people with own interests, it was considered very difficult to reach a consensus with both public and private parties. A huge variety of egoistic interests, endless bureaucracy, serious financial issues and intensive alignment rounds not only have delayed or prevented new initiatives, but also often led to the achievement of only the lowest common denominator, with projects rarely reaching the envisaged innovative power.

How to resolve? First of all, it was considered important that mobility is understood as a cross-sectional task, articulated in a common approach – a target image – regardless of self-interests. A new form of collaboration building on new (digital) methodologies, would need to function across all relevant parties, and also encourage thinking through all interdisciplinary process chains – without taking the classical detour via

backroom politics. This approach would create a basis for simultaneous change of the individual systems – in the interest of new mobility.

Although the participants agreed with this hypothesis, many doubted that participating players would be incentivized strongly enough to overcome the rules of the market and competition. On the other hand, they agreed that it was also conceivable that companies underestimated the commercial potential of new mobility. Strong and courageous players are needed to actively and openly approach the "enemies" in order to find common sources of revenue, as well as common ground for more open and intensive collaboration. Although regulations could facilitate such cooperation, companies will need to learn how to deploy their radar in uncomfortable areas.

In addition to the format of cooperation, the large number of small pilots and the little scaling of good initiatives was criticized. Too often, entirely new things are tried instead of advancing available ones. Existing projects including the large number of pilots in Germany would therefore need to be further developed and expanded. Only this would create a critical mass of case numbers and experience over time, which would be fundamental for the implementation of large-scale mobility solutions in the future.

The search for disruption

The current mobility system lags behind our capabilities – especially in Germany. Innovative technologies and solutions are available, but they are not implemented on a large scale. The question of what is missing to drive the mobility of the future has many answers:

- The narrow leading regulation is often seen as a large obstacle to development and implementation. Radical reorientation of regulations is required so new mobility initiatives will have lower hurdles to being rolled out successfully with envisaged targets. However, eliminating regulatory barriers alone will not lead to sure-fire success.

- In addition, new types of cooperation between different disciplines and industries are required. Mobility of the future must be understood as an interdisciplinary task – rather than simple transportation services from A to B. Parties such as city planners, real estate owners, traffic-generating entities and other businesses must think openly across individual system boundaries, striving for common goals and implementing them simultaneously. Regulations can also help here as an initial spark.

- Finally, travelers themselves do not exercise a strong enough pull for new developments, as the current situation is still subconsciously tolerated. New initiatives should therefore aim at stimulating the user's enthusiasm to use innovative solutions and, in the long run, adapt to new mobility behavior. The missing pull, however, must not discourage other mobility stakeholders from driving new initiatives forward.

Considering the above-mentioned recommendations will ease the emergence of effective solutions and take us forward on the path to future mobility. A central challenge, however, remains. Although in the near future an increasing number of initiatives that will lead to improvements is expected, most enable better utilization of existing transportation capacities. Recalling that the current system is at a physical limit, the potential for further improvements is narrow. A change of paradigm – a disruption – is required to make mobility of the future a reality. But what will be the missing card in the game? Referring back to the findings about the potential of autonomous operations in new mobility, it is conceivable that autonomy will be one game changer in the industry. At the end of the roundtable, all participants agreed: an autonomous system, constantly learning and optimizing itself, would bring about a paradigm shift. Effects on available capacities of rail and road, user-friendliness and operational performance would be far-reaching.

Together with seamless interdisciplinary cooperation, favorable regulatory conditions and technological excellence, we at Arthur D. Little believe that the next generation of mobility can be made possible and we feel obliged to contribute and drive the transformation to urban mobility of the future.

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Arthur D. Little

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