

# CONCEPT

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## Deepening Connections and Generating Value for the Future of Mobility

### Part of the Super Smart Society

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Work on the IoT-based Society 5.0 is proceeding in a variety of fields with the aim of creating a “Super Smart Society,” a sophisticated fusion of the cyber and physical worlds centered on humans. One of the key fields is smart mobility, which aims to provide optimal control of vehicles, as well as the overall transportation system, through developments such as autonomous driving and connected cars. Moves toward achieving this aim are accelerating.

How does Hitachi view these new trends that are changing the role that vehicles play, and how will it operate its automotive business to develop the future of mobility? This article discusses these questions with key people from three different fields: the automotive industry itself, its supporting industries, and service industries with a deep connection to vehicles.

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#### Accelerating Change in the Automotive Environment

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**Watanabe:** Recently, along with electrification that is changing vehicles themselves, technologies and services that will transform the role of vehicles as a form of mobility, including connectivity, sharing, and autonomous driving are beginning to flourish. Today’s discussion will consider the vehicle-centric future of mobility, and I would like to start by asking for your views on these trends.

**Nukui:** While vehicles are a convenient form of mobility, they also bring problems for society that include the economic costs of congestion, the environmental impact, and traffic accidents. It could also be said that personal vehicles are underutilized. It seems likely that the current changes in the automotive environment will undoubtedly continue to accelerate because they are driven not only by technical advances, but also by moves to resolve the issues that vehicles bring with them.



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**Yamaashi:** Electrification has made great strides in the last year, and there is also the prospect that milestones in autonomous driving will be achieved earlier than predicted by the current roadmap, which is based on automation levels 0 to 5 defined by SAE International, and which predicts that level 3 will be reached by around 2020, and level 4 not until 2026 or later. With information technology (IT) companies from outside the automotive industry also entering the market, the pace of change is accelerating across the board. In business terms, I believe strongly that we need to factor these changes into our response.

**Tsuda:** An important consideration when thinking about mobility is that, while it is part of the infrastructure of society in its own right, it cannot be separated from roads, communications, and other parts of the social infrastructure. In particular, as we move toward the widespread adoption of autonomous driving, we also need to have a vision for the sort of road infrastructure that should accompany it. Prompted by this, it may be that society as a whole needs to reappraise what it wants from mobility.

**Yamaashi:** In the case of road infrastructure, intelligent transport systems (ITSs) are being implemented steadily. However, from a technical aspect,

the question of how to connect vehicles and infrastructure will be an important consideration for the future. Work is progressing on preparations for the rollout of fifth-generation (5G) communications and on the development of the devices required for “C2X” communication techniques [such as car-to-car (C2C) and car-to-infrastructure (C2I)], with the expectation of new functions and services emerging in the future.

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### Targeting the Expansion of Data Utilization and Service Businesses

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**Watanabe:** With reference to these changes, please tell me about the actual business developments that Hitachi is pursuing, both now and in its vision for the future.

**Yamaashi:** Whereas the focus of Hitachi Automotive Systems, Ltd. in the past has been on its parts business, recently we have increasingly been called on to undertake system integration (SI) of connected services as well as parts, and we plan to expand the services we offer to vehicle manufacturers in the future.

We also put a lot of effort into parts, a field where we can utilize our strengths to good effect, including components such as electric motors

and inverters that are used for electrification, and actuators that are also increasingly electrically operated as autonomous driving becomes more advanced. Software, too, is growing in importance as vehicles and IT become increasingly intertwined due to trends such as those toward autonomous driving and connectivity. This is another area we are working to strengthen. We already have been making our parts business more global, and the intention is to do the same in areas like services and software in the future.

**Tsuda:** The Mobility and Manufacturing Systems Division of Hitachi’s Industry & Distribution Business Unit works with Hitachi Automotive Systems and Clarion Co., Ltd. to develop solutions that utilize vehicle data collected using the Internet of Things (IoT) and the associated analytics, with a major focus on helping the automotive industry innovate in the fields of design and manufacturing, as well as in prototyping, and research and development (see Figure 1).

This includes, for example, the development of solutions that help make manufacturing smarter by collecting and analyzing data on parts operation and driving data to provide vehicle manufacturers with feedback for design and production lines. Recognizing that driving records and data from electronic control units (ECUs) and other devices have potential uses not only in the automotive industry, but also for the creation of new services in support industries such as insurance, we are currently exploring a variety of possibilities.

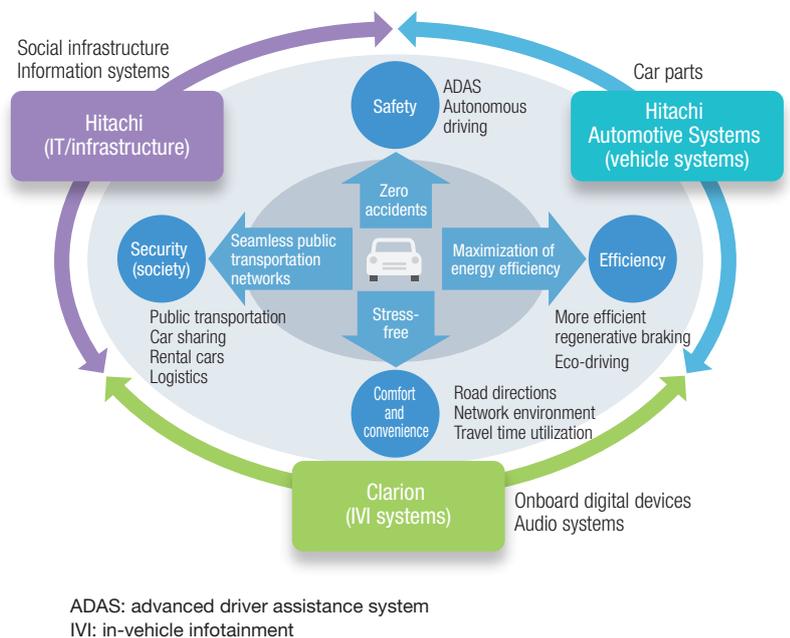
**Nukui:** My mission at the Future Investment Division is to establish new digital solution businesses. In anticipation of a future of genuinely autonomous driving and connectivity, and approaching things from a different angle to Mr. Tsuda, I am currently working on delivering solutions for using data that are based on such technologies as big data analytics and artificial

intelligence (AI). In one example where we are working with truck leasing and other companies in the USA, the aim is to reduce maintenance costs by analyzing driving records from the companies’ approximately 540,000 trucks and maintenance data from approximately 600 service depots around the country. We hope to deliver even greater value in the future through the transfer of maintenance know-how and improvements in utilization and safety. Along with this collaborative creation of solutions, we are also seeking to build businesses that will facilitate the next generation of mobility.

### Ensuring Optimal Use of Commercial Vehicles is Key

**Watanabe:** Smart mobility achieved through autonomous driving and connectivity plays a

Figure 1 | Developing Solutions through Group Collaboration



major role in the Society 5.0 initiative currently being pursued by the Japanese government with the aim of creating a Super Smart Society. What factors do you see as being important for the next generation of mobility, which will involve the connection of vehicles via the cloud to traffic and other social infrastructure, and the creation of new businesses and other forms of value?

**Tsuda:** One area that I believe deserves attention when considering the future of mobility is that of commercial vehicles. Total global production is currently around 90 million vehicles, of which approximately 60 million are cars and 30 million are commercial vehicles. One industry forecast has this increasing to 120 million vehicles by 2035, but with cars remaining at 60 million, while commercial vehicles double to 60 million. A rapid increase is anticipated in the sort of vehicles referred to as “new mobility,” including small cars for shared use and delivery vehicles for short trips. If so, then the challenge will be operating these in the best possible way to provide trouble-free transportation. The key question is expected to be how to go about providing seamless integration of all forms of mobility, including trains and buses, by utilizing technologies such as autonomous driving and connectivity.

**Nukui:** Thinking in terms of commercial vehicles, at present these mainly consist of vehicles such as buses, for which the route and schedule are fixed, and vehicles such as taxis, for which the route and schedule are flexible. However, mobility based on fixed routes and flexible schedules may become increasingly important in the future, such as in communities that are experiencing depopulation. I suppose that we also need to consider services that provide a means of transportation, but keep costs down by having community buses that carry both people and goods or that are also used to collect items for recycling plastic bottles, etc.

**Tsuda:** Since the Ministry of Land, Infrastructure, Transport and Tourism loosened regulations covering the carrying of both passengers and goods on the same vehicle in depopulated regions in September 2017, this should, depending on how it is done, lead to more efficient transportation across entire regions and the creation of new business models.

**Nukui:** One model that draws on the strengths of Hitachi is that of connecting systems to create value. There remains considerable scope for connecting people and things to boost efficiency, such as connecting a mobility service with a fixed route and flexible schedule to the appointments system of the local hospital so that people can get picked up when a consultation time is available, for example. It is in areas like this that the key to opening up the future of mobility can be found.

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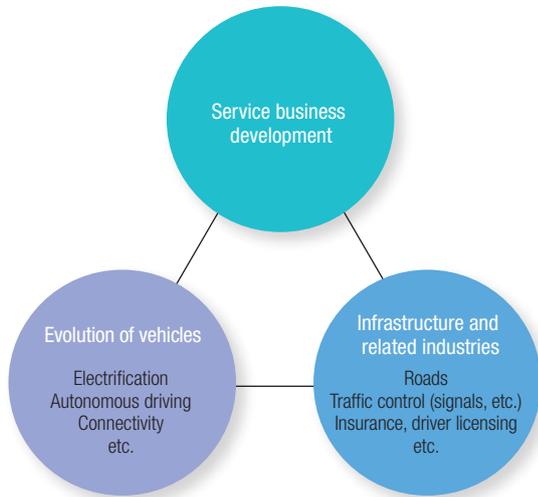
### Building Teams that Can Transcend Boundaries

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**Tsuda:** To utilize strengths like this, we also need to do more to share information and technology within Hitachi. Rather than just responding to customer orders, I believe it will be important to have a long-term vision of how best to think about and build the future of mobility at Hitachi. This will include a vision of how to use this as a basis for organizing, coordinating, and combining our technologies and services, and for scalable deployment of technologies based on our Lumada IoT platform, for example.

A broader view of mobility encompasses not only vehicles, but also railways and other forms of infrastructure. I believe that creating forums where people from related fields, including the younger generation, can engage in the discussion of specifics, will also increase the possibility of creating something new.

Figure 2 | Three Axes of Automotive Technology and Business



**Yamaashi:** One example of this scalable deployment is the application to factory equipment of a technique for over-the-air (OTA) updating of vehicle software, and I believe the same sort of thing is possible in other areas. I hope to see more internal collaboration between Hitachi Automotive Systems and other parts of Hitachi, including the Industry & Distribution Business Unit.

**Nukui:** Automotive technology and businesses have three main axes (see Figure 2). Technologies such as autonomous driving and electrification

that apply to the vehicles themselves; related industries and infrastructure in the wider sense of the term that encompasses things like insurance and driver licensing as well as roads, traffic signals, and communications; and service businesses that are based on these and that also utilize new technologies such as connectivity. The achievement of smarter mobility will come about through the mutual interaction of these elements, and we will also see more examples of industry participants who transcend business boundaries, such as the involvement recently of retailers in distribution. As Hitachi, too, must be able to follow when customers transcend boundaries, I am conscious of the need to build cross-boundary teams at Hitachi with a focus on mobility.

**Watanabe:** Thinking about the Super Smart Society and the future of mobility, it is clear that technologies and techniques that connect people to things and systems will become even more important. At Hitachi, too, it is by connecting our wide range of technologies and businesses that we can demonstrate our strengths, so let's all work to help create smart mobility. Thank you for your time today.