Disruptive Technology in the Transport Sector

Full Description

Recent years have seen many technological developments that will have profound impacts on the transportation sector. It is anticipated that disruptive technologies (described in Appendix A, such as big data, machine learning, AI, IoT, 5G, and battery storage systems), the rise of the shared economy, and global pressure to lower carbon emissions will transform urban and long-distance passenger transport as well as transportation of goods and logistics. The transport systems of tomorrow will be more connected and data-driven, digitalized, shared and on-demand, cleaner, highly automated, and decentralized.[1]

Disruptive technology is transforming the transport sector in a variety of ways. To give a broad overview of the developments in the sector, five of the most prominent trends are summarized below.[2]

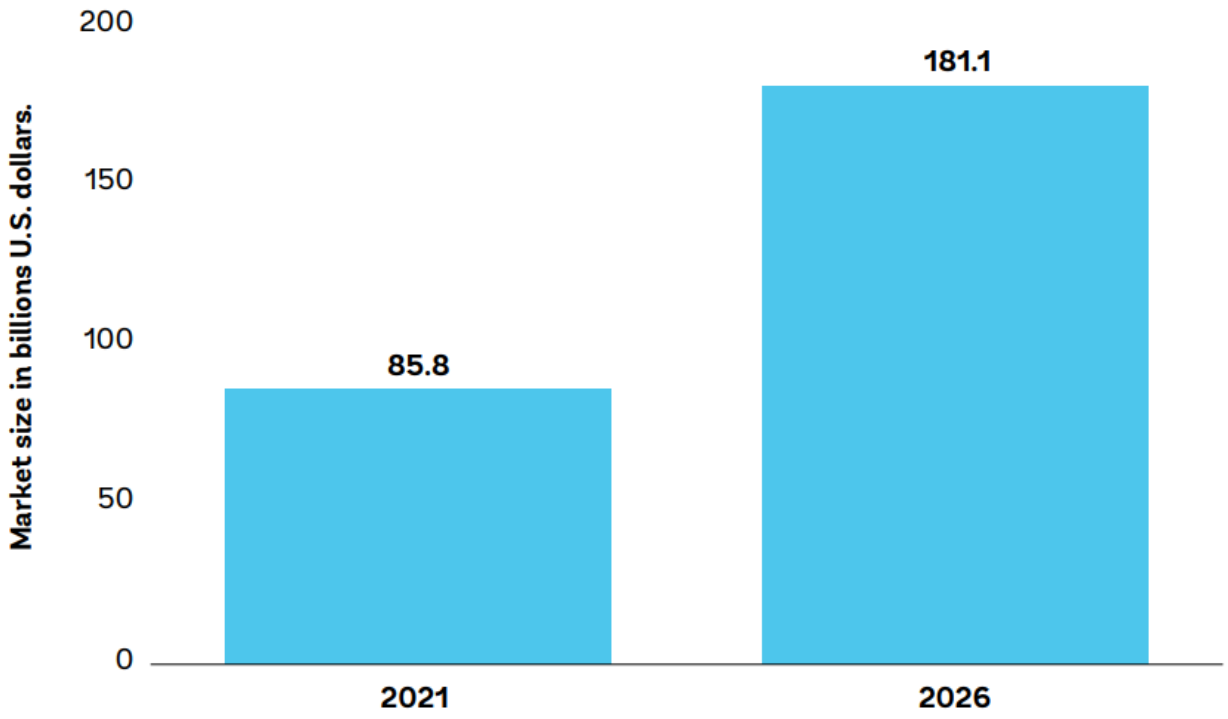
Digital Connectivity and Cooperative Intelligent Transport Systems (C-ITS):

It is expected that digital connectivity and the utilization of cooperative intelligent transport systems are going to transform the transport sector. C-ITS are emerging technologies that allow for the generation, collection, and exchange of data among transportation system users (e.g., cars, trucks, ships, and locomotives) and other parts of the transportation infrastructure (e.g., roads, ports, and containers). The digital connectivity between these elements can make traffic and traffic management more efficient, safer, and cleaner. Vehicle-to-vehicle (V2V) connectivity refers to wireless data exchanges between vehicles about their locations, speed, or headings; vehicle-to-infrastructure (V2I) connectivity captures infrastructure-related data, such as traffic congestion and weather warnings, and transmits all relevant data to drivers; vehicle-to-everything (V2X) connectivity encompasses both V2V and V2I connectivity. V2X supports the transfer of information from a vehicle to all other moving parts of the traffic system that may affect the vehicle, as well as other parts of the transportation system, and allows, for example, for dynamic pricing of roadways and parking spaces. In the freight sector, connectivity enables fleet optimization and increased productivity, efficiency, safety and compliance, because it makes it possible to track the performance of transport assets in real time, including their locations.[3] One example is shipping containers used in freight and logistics that are integrated with IoT, sensors, GPS tracking, and solar panels. These smart containers can regulate internal conditions (e.g., temperature) to reduce cargo loss and provide real-time GPS tracking to optimize supply chain logistics.[4]

Sharing

In the transport sector, the shared use as well as shared ownership of cars, bicycles, scooters, and trucks continues to grow in popularity. The integration of disruptive technology (such as AI, big data, and IoT) into sharing systems facilitates smart booking and the development of new business models, and contributes to this trend. Sharing of vehicles has already led to a more efficient, easy, door-to-door and low-carbon method of transport. Among the various business models, the popularity of ride sharing has surged in recent years. Ride sharing is a car service in which the passenger travels in a privately owned vehicle against a fee based on an agreement between the owner of the car and the passenger, typically arranged with the help of online sites and smartphone applications. After a plunge in 2020 due to COVID-19, the global ride- sharing market is now expected to grow by more than 115 percent from 2021 to 2026, according to the online portal Statistica. The market value is expected to amount to about US$185 billion in 2026. Other forms of sharing are bike-sharing programs, inner-city on-demand transportation through e-bicycles or e- scooters, and business-to-consumer car sharing, where vehicles are rented out by customers from a service provider.

Figure A.4: Ride Sharing Market Size Worldwide in 2021 and 2026



Source: Statistica. https://www.statista.com/statistics/1155981/ride-sharing-market-ize-worldwide/.

‘Greener’ transport

Growing concern about climate change has created global pressure to reduce carbon emissions in the transport sector. To end the dependence on fossil fuels, alternative fuels like hydrogen are being explored. At the same time, vehicles that run by using electricity instead of fossil fuels are being developed and promoted. EVs are powered by electric motors and receive electricity by plugging into the grid. Hybrid electrical vehicles (HEVs) rely on a petroleum-based or an alternative fuel for power and are not plugged in to charge.[5] HEV batteries are charged by the internal combustion engine (ICE) or other propulsion source and during regenerative braking.[6] The use of electric vehicles is growing, including fully electric cars and hybrids, trucks, two- and three-wheelers, and bus rapid transit (BRT) lines. According to Bloomberg,[7] by June 2022, 20 million plug-in vehicles were expected to be on the road globally, compared with 1 million in 2016; that number is expected to reach 26 million by the end of 2022 (see “Autonomous Vehicles/Electric Vehicles” in Appendix A).

Although shipping and aviation were initially excluded from greenhouse-gas emission reduction targets, both are coming under increasing pressure to reduce their significant greenhouse gas emissions and other pollutants. As a consequence, the aviation industry has been experimenting with biofuels, and electric and hybrid electric-conventional aircrafts. Similarly, the maritime industry and vessel operators are adopting and developing technologies to help make vessels more efficient, including fuel cells and electric batteries with the capacity to power vessels over long distances.[8] Hyperloop is a proposed fast and carbon-neutral mode of ground transport for passenger and freight transportation between cities.[9]

Automation

Automation that is enabled through disruptive technology is applied in various ways in the transportation sector, ranging from online booking systems to drones and autonomous vehicles (including passenger cars, taxis, trucks, buses, and trains), and there is also automation at roads, terminals, and logistic centers. Self-flying taxis that are currently being trialed in Dubai also belong in this category. The level of automation for

vehicles has been subject to categorization ranging from level 0 (no automation) to level 5 (full automation).[10] By 2040, autonomous vehicles are expected to comprise about 25 percent of the global market.[11] (See also “Autonomous Vehicles” and “Drones” in Appendix A.)

Decentralization

As in the power sector, disruptive technology will likely also result in more decentralization in the transport sector. The availability of ride-sharing systems and autonomous vehicles may, for example, lead to a shift from public transportation systems to individual transport.

Footnote 1: Muzira, Stephen, and Tatiana Peralta Quiros. 2018. “The future of transport is here. Are you ready?” Transport for Development (blog), World Bank, April 26, 2018.

Footnote 2: Twinn, Ian. 2019. “Innovations in Transport.” In Reinventing Business through Disruptive Technology. Washington, DC: International Finance Corporation.

Footnote 3: Twinn, Ian. 2019. “Innovations in Transport.” In Reinventing Business through Disruptive Technology. Washington, DC: International Finance Corporation; Global Infrastructure Hub. 2020. Vehicle to Infrastructure (V2I) Connectivity and Smart Motorways.

Footnote 4: World Bank Group. 2020. Infratech Value Drivers.

Footnote 5: United States Department of Energy. 2012. Plug-In Electric Vehicle Handbook.

Footnote 6: Regenerative braking refers to the generation of electricity from some of the energy that is normally lost when braking.

Footnote 7: McKerracher, Colin. 2022. “The World's Electric Vehicle Fleet Will Soon Surpass 20 Million.” Bloomberg, April 8, 2022.

Footnote 8: Twinn, Ian. 2019. “Innovations in Transport.” In Reinventing Business through Disruptive Technology. Washington, DC: International Finance Corporation.

Footnote 9: Global Infrastructure Hub. 2020. “Hyperloop for High-Speed Passenger Transport. ” (Last accessed September 13, 2022.)

Footnote 10: Rodrigue, Jean-Paul. 2020. “Forms of Transport Automation.” The Geography of Transport Systems, Fifth Edition (section of book reproduced on personal website, from Chapter 10: “Challenges for Transport Geography”). New York: Routledge.

Footnote 11: MIT Technology Review Insights (blog). 2017. “Autonomous Vehicles: Are You Ready for the New Ride?” November 9, 2017. (Last visited September 13, 2022.)

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