The Present Situation and Future Prospect of Road Transportation in Disruptive Technology Environment

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Abstract. The advent of intelligent transportation has changed the development path of traditional road transportation. Thanks to the support of a series of disruptive technologies such as mobile Internet, Internet of things, big data, artificial intelligence and new energy, intelligent transportation has achieved rapid growth. The report analyses disruptive features of above technology, based on the changes in the way of life, the thinking mode and industrial development. Each technology is described in the application status of road transport industry. Meanwhile, the future blueprint of road transport industry will achieve to describe under the development of road transport industry closer combine with disruptive technologies.

Introduction

In the era of big data and artificial intelligence, the turning point of human civilization reappeared, intelligent transportation emerge as the time requirement. Intelligent transportation is to make full use of the Internet of things, spatial awareness and cloudy computation and other advanced technology, integrate application into the theory and tools such as transport science, system method, artificial intelligence (AI), knowledge mining, based on the comprehensive perception, deep integration, active service and scientific decision-making to achieve the goal in the whole transportation area. Through establishing the timely dynamic information service system, deeply dive relevant data about transportation to form the question analysis mode. As a result, it can promote road transportation become much safer, more efficient, more convenient, more economical, more environmentally friendly and more comfortable. Meanwhile, helping to make the transfer and upgrade for transportation relative industries. [1]

Among the new technologies, the most influential and disruptive technologies are mobile internet, Internet of things, big data, artificial intelligence and new energy. Their rapid development provides strong technical support for intelligent transportation.

Disruptive Characteristics of Technology

The emergence of new technology has brought about revolutionary and even disrupted influence on people's thinking patterns, behavior pattern and lifestyle habit. Mainly reflect in the following aspects:

People's Thinking Patterns Have Been Profoundly Changed

Internet thinking emphasizes experience, openness, transparency and sharing. The thinking of the Internet main characteristics including immediacy, integration, openness, altruism, experience, especially in the case of experiential focus on Internet and user interaction, allow the user to obtain sufficient experience in the interaction. All the Internet have brought significant changes in the human sense of space and time, distance, by a connectivity tool to deepen as a mode of thinking, a kind of behavior concept and profoundly change the world outlook and methodology of human civilization.
Professionally Changed the Way of Production

The emergence of the mobile internet has revolutionized the traditional industrial model and the traditional industrialized form. Such as electronic commerce through the chain of production, manufacture, sale, distribution and other business chain to realize online closed-loop type whole process reengineering, create a new sales terminals, become the internet's strong economic growth point.

Professionally Changed the Way of Life

The rapid development of mobile internet has maximized the use of fragmented time, which not only improves the quality and efficiency of life, but also shapes new habits and ways of life. People use Ctrip, Qunar to book air tickets and hotels to develop new travel habits, using the Amap, Didi dache to develop new driving habits. With the advent of mobile internet finance, people can not only manage their mobile money, but also pay and settle their mobile payment, which in turn provides users with a pleasing spiritual experience.

Professionally Changed the Industrial Development Form

The influence of mobile internet on the traditional industrial form is reflected in: firstly, the integration of industrial resources to form an intensive industry pattern. Shenzhou software (Car Inc) designed to integrate the taxi, car rental, and third party service company resources, changed the traditional car rental stores type of way to trade, to form the cross information services, rental cars, car rental industry's new formats. Secondly, online and offline interaction to create an integrated industrial chain. Thirdly, realize accurate supply and provide personalized service products. The development of mobile Internet, big data and cloud computing is realized by the production concept of consumer demand as the core. The basic information of the era of big data, with each customer and consumer behavior were recorded and digital, with the help of map navigation and so on software tailor the best transportation for daily travel plans, meet the travel needs of consumers personalized diversification.[2]

Professionally Changed the Way the Industry is Managed

One is on the management concept shows the characteristics of the three who: every industry based on information asymmetry will be the Internet, all based on asymmetric information link will be Internet to subvert, all based on the information asymmetry of clear vested interests will be the Internet. For example, a large number of existing cargo information distribution points, passenger ticket agents and information asymmetry service enterprises will shrink or even disappear. Secondly, in the management mode, the mobile Internet has broken the industrial boundary and made the industry develop cross-boundary cross integration trend. The rapid development of e-commerce has broken the boundary between postal express and zero-order transport, all of which require regulatory changes. The third is to make full use of Internet big data and Internet technology to realize real-time connectivity of people, cars and things, and promote the upgrading of traffic management through the implementation of fine management. Fourth, it is on the management effect of the fusion of mobile Internet and express, the completion of each single not only have good experience and after finish all by the evaluation of customer service, does not have how many disputes among them, the impact on the industry regulation mode and is revolutionary.[3,4]

Disruptive Technologies and the Application in the Road Transport Industry

Mobile Interconnection Technology

Mobile Internet is the interconnection between PC and mobile terminals. It is the product of integration of Internet, mobile terminal equipment and mobile communication technology. In recent years, the "Internet + traffic" based on the Internet platform has been extended to the passenger and freight transportation service, railway, parking, maintenance, bus, taxi, aviation and transportation industry.[5] Only during 2010-2014, transportation APP had appeared in hundreds of applications,
involving long distance travel, long-distance freight, urban freight, parking, navigation, car rental, or taking a taxi, vehicle maintenance, and other industries. In the aspect of freight and logistics, the connection of freight supply and demand information is realized based on the freight network of mobile internet, which promotes the innovation of logistics business model.

In the future, with the continuous improvement of mobile 5G technology, the application of intelligent mobile terminals will be widely applied, and information services will be personalized and customized.

Information service system and the information of the traffic elements interact more frequently, the system of the user's needs more timely and accurate tracking and recognition, to provide users with the whole process of transportation or goods transport planning, real-time navigation and ticketing services, location-based information services, and actively push the service level to improve greatly. This is conducive to the further integration of the Internet and communication networks, and is also an important aspect of fostering new drivers of transportation development, promoting new forms of transportation and raising the level of development.

**Internet of Things**

Internet of things is a huge network formed by the combination of internet which collects information at any time about any object or process that requires monitoring, connection, interaction, through a variety of information sensor, such as transducers, radio frequency identification (RFID) technology, global positioning system (GPS), infrared detectors, etc.

The Internet of Things has promoted the construction of smart roads in all provinces and cities across the country. Through RFID, road perception system and network dispatching system, real-time monitoring of road traffic conditions and real-time guidance of vehicle driving routes. Based on RFID and intelligent position trace system of GPS will be combined with smart logistics to achieve intelligent distribution. Railway system internet of things has been gradually upgraded, and digital railroad has made all-round progress. RFID technology can bring efficiency improvement and error rate reduction in various aspects of air cargo management. GPS technology is widely used in aircraft airspace command systems. Many waterway shipping port authorities have or are using GIS technology to establish a network-based basic information management system,
and to achieve dynamic monitoring of ships, using GIS data collection methods to establish vector electronic maps and underwater topographic maps. [6]

In the future, the Internet of things will face the miniaturization technology of RFID equipment, sixth edition of the network protocol (IPv6), to improve the throughput and latency of communication, real-time analysis, using the cloud technology development trend and safety, etc. This will help to explore the application potential of the Internet of things in the transportation industry. [7]

In the future, intelligent highway, intelligent navigation, intelligent railway, intelligent civil aviation goods, intelligent vehicle, smart, intelligent terminal will be rapid development, management of transport infrastructure, transportation equipment, terminal equipment technical operation and the external environment can be more comprehensive, timely and accurately.

**Big Data and Cloud Computing**

In the face of the rapid growth of mass data, a cloud computing and big data technology is needed to provide a powerful storage capacity and fast computing power and scientific analysis ability. The system simulation of the real world and predict judgment ability will be more outstanding, can extract the high value information from the vast amounts of data fast and accurately. Traffic management will be improved proactive, initiative, timeliness, collaborative and rationality.

According to incomplete statistics, the amount of data produced in the transportation industry is 100 petabytes per year, and the storage capacity is expected to reach dozens of petabytes.

Take Beijing traffic operation monitoring and dispatching center (TOCC) as an example, TOCC includes more than 6000 static dynamic data and more than 60,000 video currently. Its static and dynamic data storage reaches 20T, and the daily data increment reaches about 30G. In the face of the rapid growth of huge amounts of data in cloud computing, big data and other technical support,
powerful storage capacity and fast computing ability and scientific analysis of the capacity of traffic management system was developed.

In the future, with the improvement of big data and cloud computing capacity, the traffic management system will be able to simulate the real world and predict judgment better. It can quickly and accurately extract high value information from mass data, and provide the solution for management decision makers to change. As a result, the predictability, initiative, timeliness, synergy and rationality of traffic management will be greatly improved. The ultimate goal of future transportation is to make the "brain" transportation which manages traffic with artificial intelligence. All the people, vehicles, road information are accessed by system, and acquisition, scheduling, management and so on are performed by "brain" traffic. The vehicle is largely unmanned, the traffic management system is basically unmanned, and people can't feel it, just like there is no congestion.

**Comprehensive Transportation Intelligent Control and Coordinated Operation Key Technology Research and Development**

In view of the low efficiency and high cost of comprehensive transportation, intelligent control and coordinated operation will be carried out to provide convenient and efficient humanization and high quality service.

The research on basic frontier research, research and development of generic key technologies and demonstration of integrated application will be emphasized in the following aspects: Intelligent transportation infrastructure, traffic information interoperability, traffic regulation and coordination, large transport hub coordinated operation, car (ship) networking and intelligent vehicle road (ship shore) together, connecting intelligent transportation, regional comprehensive transportation services, etc.

As a subsystem of intelligent transportation system, car road collaborative system is also the current and future research emphasis, and all countries in the world in its invested a lot of manpower material resources and financial resources, also have distinguishing feature each results were obtained, such as American car networking technology, Japan's Smart Way project, e Safety plan in Europe, and China's ‘key technologies for Cooperative Vehicle Infrastructure system’.

Although different countries have different name for that system, it is sure that all of them have the vehicle-vehicle / vehicle-road telecommunication technology, safe transportation of Cooperative Vehicle Infrastructure system, transportation control of Cooperative Vehicle Infrastructure system technology as the hit and significant points.

**Artificial Intelligence**

Artificial Intelligence, also known as intelligent simulation, is just an information processing system that focuses on how to make computers work like human intelligence. It is a new technology science of research and development of theory, method and application system for simulating, extending and extending artificial intelligence. Artificial intelligence is a branch of computer science that attempts to understand the nature of intelligence and to produce a new intelligent machine capable of responding in a similar way to human intelligence.

Unmanned vehicles rely on artificial intelligence, visual computing, radar, surveillance devices, and global positioning systems to collaborate so that cars can ‘think’, ‘judge’, and ‘walk’. Meanwhile, the computer can be operated safely and safely without any human initiative. Thereby, solve the bottleneck of road traffic capacity caused by artificial driving reflection time, it is a subversive technological revolution in the automotive industry.

In the future, unmanned vehicles technology will promote the optimal allocation of urban space resources by combining vehicle and road coordination technologies. This puts forward new requirements for signal control, road design, plane-intersection design, parking lot layout and other areas. It can more accurately perceive the surrounding environment, optimize vehicle control algorithms, improve the driving safety and convenience of driverless vehicles, and rationally configure driving routes. In addition, unmanned vehicles do not require manual operation, there are no restrictions on working hours, work environment, etc. Vehicles can be used for a long period of
time, with high loads, and in an organized manner, changing the demand for labor in the transportation industry.

The Future Development Blueprint of Road Transport under Subversive Technology

The Internet will Penetrate Deeply into the Transportation Industry

In second session of the 12th of the CPPCC national committee, Premier Li keqiang proposed to formulate an "Internet +" action plan. This means that "Internet +" has officially risen as a national strategy. During the “Thirteenth Five-Year Plan” period, the Internet will be deeply integrated with the transportation industry, which will profoundly change the relevant links and will become an upgrade technology and important ideas for building smart transportation.

One is cross-boundary integration. The gradual integration of e-commerce and intelligent transportation enables people's travel experience to be combined with shopping, consumption and other services. Typical cases, such as Alibaba, China's largest e-commerce company, bought the company named AMAP and integrated its location service and travel route guidance with e-commerce services, giving users a new experience.

Secondly, free thinking. Thinking in the mode of profit, the introduction of the Internet profit idea, innovative project commercial operation mode, to strengthen can market-oriented project specific project feasibility study on business model, enhance project their own hematopoietic function, can continue to recover quickly after the completion of the project cost; Such as basic service free, value-added service charge, or short-term free, long-term charge, or to the common people free, transfer charge, etc.

Thirdly, the new business model is widespread. Internet company has the abundant technical, precipitation data and mature thinking, Internet will play a critical role in the development of intelligent transportation industry, will also have a significant impact on traffic industry business model innovation, the future will gradually popular, new to the traditional form the industry reshuflle.

The Future Traffic Regulation Model will Become Increasingly Digital and "Transboundary"

Under the background of Internet era, the future traffic regulation mode will present a new trend. First, traffic regulations are becoming increasingly digital. With the progress of technology, the Internet, mobile Internet and Internet of things car networking technology cost reduced and the related application of rapid popularization, the future of the urban traffic regulation work will enter the digital age.

Secondly, the content of traffic supervision is more abundant. In the Internet age, the regulation of urban traffic is higher. Government regulation to both traditional and innovative industry, public welfare protection industry and market-oriented industry as a whole, the fair distribution of resources, urban basic facilities construction supervision industry operation safety and traffic data security, maintain the fair competition market environment, maintain the stable development of the transportation sector, to foster innovation environment and guarantee the sustainable development of urban transportation system.

Thirdly, the focus of traffic regulation is to protect public welfare. With the rapid development of economy, people have been willing to spend more money to enjoy the refined and personalized travel service, which can be carried out by commercial market means. The government needs to pay more attention to the guarantee of public welfare travel, maintain the fair distribution of urban transportation infrastructure and guarantee the travel demand of vulnerable groups.

Fourthly, "cross-border" regulation has become the norm. With the development of "Internet +" traffic, more and more cross-border enterprises will be entered into the transportation industry in the future. Regulation of these companies often exceed regulatory category of transportation industry itself, its regulatory needs of various industries including finance, computer, the Internet works in harmony, the implementation of cross-border supervision and management.
The Information System on the Internet of Things is More Open to Traffic Factors

Firstly, the Internet of infrastructure has been gradually improved. Transport infrastructure such as roads, parking lot, as the basis of Internet + transportation resources and implementation conditions, has started from the traditional to the digital and Internet technology, low cost perception technology integration, gradually developing transport infrastructure of the Internet of things.

Secondly, information service system and traffic element information interaction more frequently. System to the user's needs more timely and accurate tracking and recognition, to provide users with the whole process of transportation or goods transport planning, real-time navigation and ticket service, information service based on location and active push service level greatly improved, and connection between factors of traffic information service system and information sharing more efficient, frequently. With ETC from new things to the national network, the number of users is expected to reach 125 million by 2020, the utilization rate of road bus ETC will reach 50%, and the application scope will be extended to the parking lot and other fields.

Thirdly, the transportation organization under the cooperative system is safer and faster and more efficient. Of the future, the Internet based on traffic data resource sharing, the principle of unified standard, build complete or quasi complete network traffic information environment, to achieve cross-regional, across a wide range of travel of regulation, and the linkage control induced network. Formed on the basis of traffic information platform of communication, such as highway, railway, civil aviation transportation system coordination operation system, strengthening the management of traffic operation of the overall function, through multiple traffic departments cooperate with each other, realize the coordinated management of conformity, for the transportation organization of efficient and orderly, safe and convenient to provide a more powerful safeguard. At the same time, the car road collaborative system make full use of advanced information and communication technology, through the car a car, car all the way to the interaction and sharing of information, effectively assess potential risk, improve road traffic safety and ease traffic congestion, will greatly improve the road traffic safety and efficiency of the organization.

Smart Green Vehicles will Become Mainstream

Firstly, the road will be generally green, intelligent vehicles. With the continuous innovation of science and technology and the strong support of national policies, the transportation industry will develop the Internet of vehicles and improve the efficiency of vehicle operation. Attach importance to the development of intelligent vehicles, improve the intelligent level of vehicles, and strengthen the intelligent management of vehicles; Active use of energy efficient and environment-friendly operating vehicles such as hybrid cars and alternative materials; Build a green "slow traffic" system to enhance the attraction of public transport and non-motorized travel; We will build a green transportation technology system, promote the electronic and networked transportation efficiency, reduce energy consumption, and achieve technical energy saving and emission reduction.

Secondly, self-driving cars will realize industrialization and democratization. With the further development of the intelligent technology, automatic driving and get faster development of rail transit system, vehicle-mounted perception, automatic car driving, networking, Internet of things technology integration and form a complete set, developed traffic intelligent perception system, form our country independent of the automatic driving system and product assembly platform technology ability, explore the self-driving car sharing mode. Driverless cars will gradually realize the industrialization, MinYongHua, become a new tool of urban transportation, passenger and cargo, the development of consumer and commercial class uavs, unmanned ship, establish test evaluation, testing, such as the specialized service system, will become the main work.

Transportation will Provide a More Personalized, Safe and High-quality Service

The first is the development of personalized and customized services. Service is the essential attribute of transportation. With the wide application of mobile Internet and intelligent mobile terminal, information service is developing towards personalization and customization. Information
service system and the information of the traffic elements interact more frequently, the system of the user's needs more timely and accurate tracking and recognition, to provide users with the whole process of transportation or goods transport planning, real-time navigation and ticketing services, location-based information services, and actively push the service level to improve greatly.

Secondly, road transport will be in a more secure operation state. Compared with the traditional management means, the use of the Internet technology, by strengthening the vehicle's dynamic monitoring, implements dynamic monitoring for drivers and vehicles, is beneficial to prevent and reduce accidents, improve the monitor ability of security. At the same time, the popularization of new technologies such as the application of vehicle-road coordination system, intelligent automobile and unmanned driving will effectively reduce the perceived operation error and increase driving safety, which is conducive to the smooth road.

Conclusion

With the global information condition that makes all the industries have the revelatory changes, road transportation also has much closer connection with disruptive technology. As the based and foundation industry to a country, the efficiency improvement not only bring the changes on people lives and travel methods, but also the huge promotion to the country’s economy development. Meanwhile, the cooperative and combine with the disruptive technology also needs to consider the protection for the lives and property as well as environment. This ask the help for the monitor organization or government to issue the policy and regulations for this new area. The direction for the further research is discussion the specific changes of after road transportation combined with disruptive technology and the effective on people and countries.

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Reference


