THE FUTURE OF TRANSPORTATION UNDER THE NEW NORMAL

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ABSTRACT

Just as the Chinese saying goes, "A gentleman is by birth no different from any other man, it is just that he is good at making use of things." With the rapid popularization of artificial intelligence, 5G, cloud computing and other advanced tools, as well as the requirements of epidemic prevention and control, the transportation industry has gradually realized the necessity of transforming from artificial to intelligent. This paper discusses the current situation, problems and shortcomings of transportation and infrastructure construction after the outbreak of the epidemic, and analyzes the future development trends from the perspectives of passenger transportation, logistics and infrastructure construction. Finally, the application of new technologies, new processes and new materials in transportation and infrastructure construction is analyzed by taking concrete projects in several countries, including China and Thailand, as examples, providing some ideas on how to develop transportation in the future under the new normal of the epidemic.

1.   INTRODUCTION

Under the new normal of COVID-19, the transport industry has not completely stopped operation, but the huge negative impact on the transport industry, infrastructure construction, investment and financing development is obvious and self-evident. Taking the student group as an example, the author, as a college student, found through observation that before the epidemic, the way of out-of-school travel of college students was diversified and mainly by public transportation, among which public transportation accounted for the highest proportion. However, after the outbreak of the epidemic, the travel space of college students is greatly limited, and they are not allowed to go out of school if it is not necessary. They tend to choose walking or private cars when going out of school.

With the advent of the fourth Industrial Revolution, new intelligent technologies (artificial intelligence (AI), information and communication technology (ICT), virtual reality (VR), etc.) aim to be rapidly introduced into the construction and transportation industries; The Chinese government also proposed to "accelerate the commercialization of 5G and strengthen the construction of artificial intelligence, industrial Internet, Internet of Things and other new infrastructure" to cope with the economy impacted by the epidemic (Tian Jietang & Yan Deli).The epidemic has accelerated technological innovation represented by information technology, and meeting in the cloud has become an important mode of cross-regional communication. Combined with the above factors, the in-depth integration of intelligent technology and transportation will be the future of transportation. This paper discusses the current situation, problems and shortcomings of transportation and infrastructure construction after the outbreak of the epidemic, and analyzes the future

development trends from the perspectives of passenger transportation, logistics and infrastructure construction

## 2.	PROBLEM

The epidemic has caused many problems to transportation and infrastructure. Specific performance is in the following several aspects.

### 2.1	Transportation

The impact of COVID-19 on transport is reflected in the following aspects, on the one hand, Industry operations may spread the epidemic: the allocation of medical resources needs the support of the transport industry, even involving international transport. Under such conditions, it is difficult to avoid person-to-person contact, and personnel engaged in transportation work need enter and leave various places frequently, which will increase the probability of epidemic transmission, which has caused great restrictions on the operation of the transportation industry (Ling Yanrong). On the other hand, increasing resource burden of industry operation: cargo transportation is characterized by "reduced total demand, stable rigid demand and sharply increased demand for epidemic prevention materials", which increases resource burden in all aspects, especially human and financial resources (Zhou Jian).

### 2.2	Infrastructure

As a result of COVID-19, the construction industry, have been under severe pressure since early 2020.This effect is seen in the following examples. In China, as noncritical activities and public transit restrictions are suspended through the city and lead to a shortage of supplies needed and experts, several building projects were stopped in Wuhan. In Malaysia, the value of the projects awarded decreased by 42%, from RM94.6 billion from January to October 2020 to RM55.3 billion, according to Building Industry Development Board (CIDB) statistics. In Ethiopia, Jachhoun also predicted that if a pandemic continues for a six-month period, 1.76 million jobs will be lost in its study on the effect of Covid-19 on the construction industry.

## 3.	FUTURE DEVELOPMENTS

### 3.1	Passenger Transportation

In the future development of the passenger transport industry, using big data to analyze the characteristics of transport demand under the impact of the epidemic will become a common analysis method under the new normal of transport. Taking the report of global travel data provider OAG on March 7, 2022 as an example: although the total weekly capacity of global airlines decreased by 23% compared with the same period in 2019, it has gradually recovered. In this environment, it is imperative to implement differentiated epidemic prevention and control policies by studying the characteristics of transport demand.

### 3.2	Logistics Transportation

During the COVID-19 pandemic, poor communication between various links in the logistics chain, manpower shortages and changes in customer behavior are major problems. Due to the fear of the epidemic, many customers bought products through e-commerce

platforms, and the number of orders surged, coupled with the transportation of epidemic prevention materials, which greatly increased the transportation pressure of logistics companies. This requires the logistics system to have high decision-making ability, the Internet of things (IoT) came into being. Compared with the traditional logistics industry, it has many advantages: it combines the real world with the digital world for real-time information exchange; Helps operations improve productivity, reduce time and decisions; Uses technology to replace human beings for social distancing, improves productivity, and autonomous robots can reduce the number of human beings; Big data can improve decision making; The Internet of Things tracks the location of people and objects and measures the operator's heart rate in medical services; Data can be stored and shared with stakeholders at any time and place (Winkelhaus & Grosse).

3.3   Infrastructure Construction

The most prominent impact of the epidemic on the global economy is that the economy is heading for "stagflation". As of April 2020, the unemployment rate in the United States has soared to 14.7%, a post-World War II record. In such a severe global environment, how to attract social investment and stimulate consumption in the infrastructure industry has become a difficult problem for all countries to get out of difficulties in the future.

In the pandemic of COVID-19 most of the construction sites are being halted due to fear about the infection of Coronavirus. The projects are already delayed in relation to completion and handover. The developers are not facing the cost escalation risk only, also afraid of the spreading of COVID-19 in projects. The model of Work Health and Safety (WHS) laws says that it is the duty of the employers to take care of the health and safety of their workers in the workplace. In the building and construction industry where workers work closely together, there is a high risk of exposure to COVID-19 (Majumder & Biswas). And a study showed that construction workers are five times more likely to be hospitalized as a result of COVID-19 than employees in other sectors (Pasco, Fox, Johnston, Pignone & Meyers). In this environment, the automation, modernization and informatization of infrastructure construction process effectively avoid human contact, which will become one of the future trends of transportation under the new normal.

In the use of materials, although the fourth industrial Revolution is gradually introducing new smart technologies into the infrastructure sector, environmental sustainability at the global level has yet to be achieved due to the abuse of energy, excessive consumption of materials and the discharge of harmful pollutants. Therefore, how to replace existing materials with new materials that are safe, durable, green and in line with the concept of sustainable development will become one of the hotspots of future research.

4.   CASE STUDY

4.1   Using Big Data to Analyze Transportation Demand

He Linghui et al. from Tongji University used big data to analyze transportation demand: on the one hand, The spatial-temporal characteristics of inter- city transportation demand is analyzed to understand the overall trend of passenger flow under the influence of the pandemic by using Baidu migration dataset. On the other hand, the singular value decomposition (SVD) algorithm is used to decompose and reduce the dimension of the spatiotemporal OD matrix, and identify passenger flow structure of inter-city transportation. This analysis method can help dynamically understand the type composition and spatial and temporal distribution of intercity transportation demand in different periods, and

provide quantitative decision-making basis for implementing differentiated epidemic prevention and control strategies (He Linghui et al.).

4.2   Industry 4.0 Application of Logistics Systems

Y.butanasing et al. from Thailand presented the overview of Industry 4.0 and logistics system, the evaluation of customer satisfaction in logistics system during COVID-19 situation, and the applications of Industry 4.0 for logistics system in customer satisfaction context during COVID-19 situation. Results indicate that the use of Industry 4.0 technologies and the development of employees' skills are the potential solutions for reducing the effects of COVID-19 in logistics system. IoT, Cloud, and Big Data support all of customer satisfaction factors. It is also found that the use of appropriate Industry 4.0 technologies and the improvement of the logistics system are the critical aspects for enhancing business competitiveness during the COVID-19 pandemic (Buranasing, Jongprasithporn & Yodpijit).

4.3   Automation and Modernization of Bridge Engineering

At present, automatic spray maintenance, automatic tension and intelligent grouting have been realized in the bridge construction process. The automation and modernization of bridge construction can not only meet the requirements of epidemic prevention, but also improve the quality and efficiency of project construction, ensure the economic benefits of bridge engineering, provide safer travel conditions for people after it is put into use, and on this basis ensure the sustainable development of the entire transportation industry (Hong Sen). In bridge monitoring and maintenance, the integration technology of Bridges with advanced information technologies such as Internet of Things, big data and cloud computing has gradually matured, such as the Chinese Qingdao's first "Wise Bridge", it was the important position of the accelerometer installation, displacement sensor, inclinometer, dynamic weighing equipment, timely feedback bridge operation signs. In addition to structure monitoring, it also has the function of vehicle analysis, monitoring heavy vehicles and planning reasonable routes for heavy vehicles. In the process of maintenance, the closed-loop processing process of problem discovery - task acceptance - task distribution - task processing - result feedback - acceptance - case closing and filing is realized (Zeng Zhu).

4.4   Replace the Traditional Petroleum-Based Materials with New Materials

Currently, bio-based materials are attracting the attention of the market (Guo, Li, Li, Xu, Zhang & Chen). According to D. Klemm et al, among the diverse range of bio-based feedstocks, cellulose is the most abundant in nature and is considered to be one of the most suitable candidates for synthesis of green products due to its numerous attractive features including renewability, non-toxicity, biodegradability, colloidal stability and low cost. But current production processes for Nanocellulose requiring strong chemicals and harsh reaction conditions (Klemm, Kramer, Moritz, Lindström, Ankerfors, Gray & Dorris). Future studies are expected to develop facile and single-step extraction processes involving mild reaction conditions (Dhali, Ghasemlou, Daver, Cass & Adhikari).

5.   CONCLUSION

With the continuous development of Internet of Things, 5G, cloud computing and other technologies, the transportation industry and infrastructure construction industry combined with industry 4.0 are also developing. Automation and informatization will be the core of

transportation development in the future under the new normal, which can effectively relieve transportation pressure, improve transportation efficiency and reduce transmission risks in the context of the pandemic. Under the new normal, how to apply advanced technology and materials to practical engineering and solve the shortcomings of infrastructure is the top priority of future research.

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