Case Study: Analysis of Tencent's "CIM+" Smart Transportation Construction Advantage

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Abstract: In the current era of digitization, networking, and intelligence, realizing the importance of transportation infrastructure alongside internet connectivity and urban development is crucial. This article focuses on Tencent's efforts in smart transportation construction, aiming to understand its unique advantages in traffic service development compared to other companies. Additionally, the study explores the practical application of CIM technology in Tencent's transportation domain, facilitating the intelligent evolution of the transportation sector. By examining Tencent's strategies, technical capabilities, and comprehensive planning, we can gain a better understanding of their competitive edge in the field of traffic service development. Overall, this research aims to comprehensively understand Tencent's smart transportation initiatives, highlighting their advantages in traffic service development, and showcasing the transformative power of CIM technology in driving intelligent transportation solutions.

Keywords: CIM, BIM, We transport, Cloud computing, Tencent.

1. Introduction

In the context of digital twinning city construction, continuous national promotion of digital economic growth, and the gradual pursuit of digitization, informatization, and AI in cities, urban transportation planning faces multiple challenges, including rapid alignment with urban positioning, acceleration of all-factor mobility in industries, difficulties in stakeholder collaboration, and long decision-making cycles. With the increasing number of vehicles and drivers, major cities across the country are burdened with modern urban ailments to varying degrees, and traffic congestion to some extent hinders socioeconomic development. At the same time, the governance demands for urban transportation systems have shifted from single-dimensional evaluation to multidimensional assessment, necessitating technologies such as CIM and digital twinning to achieve diversified, lightweight, economical, and appropriate integration perception. This calls for the creation of a convenient, standardized, procedural, and tool-driven intelligent platform that provides decision-makers with more professional, accurate, and user-centric digital planning services. Tencent, as one of China's leading Internet industry enterprises, adheres to a people-centered service philosophy and leverages its own digital technology capabilities to make smart transportation construction more perceptive, interactive, and supported by a powerful foundation behind Tencent.

2. Methodology

Smart transportation is a service system based on modern electronic information technology for transportation. This article will elucidate how Tencent utilizes CIM to further develop and promote smart transportation based on its existing resources. By observing and comparing Tencent with other companies, analyzing relevant literature and conducting comprehensive investigations and analyses of individual cases, as well as engaging in speculative imagination, we can determine its advantages and development trends in the field of smart transportation. This article focuses on how Tencent utilizes CIM as a driving force for better construction and development of smart transportation. By combining Tencent's strong technological capabilities, efficient management systems, user engagement on social platforms, and the foundation of user resources brought by Tencent Maps and WeChat Pay, it finds new breakthroughs on the Internet to facilitate the improved development of smart transportation.

3. Case study

3.1. Introduction to Tencent Smart Transportation

Tencent Smart Transportation is an intelligent transportation brand under Tencent, which leverages big data ecology to provide comprehensive solutions in the areas of transportation construction, management, operation, and services. Its goal is to create a smooth, safe, and green urban transportation ecosystem. Addressing the core pain points of high costs in smart highway construction and maintenance, low perception coverage, extensive control methods, and weak service reach, Tencent has developed the "We transport" solution for smart highways. This solution achieves cost-effective perception coverage across the entire highway network, establishes a unified big data foundation for the highway industry, and offers products such as intelligent monitoring, emergency command and dispatch, traffic control, and situational awareness. Tencent aims to extensively serve and enhance the operational level and user experience of highways.

In the transportation sector, there has always been an imbalance between supply and demand. Tencent's objective is to build a human-centric transportation ecosystem that integrates cloud brain and digital infrastructure, seamlessly combining vehicles, roads, cloud, and networks. This initiative supports scientific planning and governance of smart cities and provides a more comfortable travel experience for the public [1]. Leveraging its digital technology capabilities, Tencent enables transportation infrastructure to have perception capabilities, implement intelligent decision-making, improve operational efficiency, enhance service experiences, and accelerate traditional transportation models towards data-driven and technology-based smart transportation.

3.2. Tencent's Advantages

Considering the overall environment in China, the penetration rate of smart transportation is relatively low, with many pain points. Accelerating the development of the smart transportation industry through digital means has become the ultimate challenge for numerous digital transportation vendors. Tencent fully utilizes its own strengths to assist in constructing and shaping smart transportation.

3.2.1. Tencent's Game Development Technology

Tencent's strong control in game development technology highlights its exceptional fusion and modeling capabilities. In the industry, Tencent typically produces top-tier products, surpassing other companies in terms of following up on high-quality product models and ensuring production processes. It also outperforms competitors in homogeneous competition characterized by similar

approaches and models. Additionally, Tencent excels at acquiring products with super pivot value, dominating other companies.

Game engines serve as the culmination of game technology, and Tencent Games has made significant breakthroughs in digital twinning modeling and rendering technology, as well as cloud rendering technology, leveraging its CROS self-developed engine. These technological advancements enable game engines to be applied across different industries, effectively promoting the development of authentic interconnectivity. Apart from game engines, other game technologies have also deeply integrated with production and daily life. PCG technology and differentiable rendering technology, already widely and standardized in the gaming industry, are also applied to digital projects in the fields of digital culture and industry.

It is evident that Tencent's game technology provides great assistance to the construction of smart transportation. Firstly, its rapid modeling capabilities, including visual modeling and dynamic modeling, allow for the refinement and rendering of the created models. Based on reuse and further development, Tencent has built a real-time twinning platform. Through highly accurate 3D reconstruction, this platform creates a three-dimensional space for real-time monitoring, device automation, and system interaction, forming a closed-loop service. By better supporting Tencent Smart Transportation construction and leveraging its own advantages, Tencent unleashes even greater vitality [2].

3.2.2. Tencent Map Research

Tencent has conducted research on its self-developed Tencent Map, which facilitates seamless data interaction within vehicle systems. Tencent WeMap stands out for its efficiency, lightweight design, and open nature, providing enterprise customers with convenient access to various types of data. Furthermore, it offers robust map management capabilities, allowing developers to create maps, overlay different data layers, and effectively configure and manage diverse datasets.

In order to enhance scenario-based applications, WeMap Online provides a range of powerful spatial analysis computing capabilities. These include buffer analysis, in-layer statistics, single-layer statistics, clipping analysis, spatial relationship determination, and point clustering computation. The continuous development and improvement of Tencent Map have also strengthened its integration with third-party platforms in the smart transportation domain. With top-notch qualifications for its map services, it supports various high-precision positioning technologies like BeiDou, enabling the acquisition of transportation industry data for the advancement of smart transportation infrastructure. This integration facilitates the fusion of BIM models and the transition from two-dimensional to two-three-dimensional unity, establishing significant industry-leading advantages for Tencent Smart Transportation in terms of data accuracy and model integrity [3].

3.2.3. Tencent's Vast User Resources

Tencent possesses extensive user resources and strong user stickiness, which reflects its robust audience support. In the Chinese internet industry, there are many companies spanning multiple business lines, but none can lead across multiple business lines simultaneously like Tencent can. Tencent has a first-mover advantage and broad scope due to its wide range of users. Customers are already familiar with using QQ, which makes it challenging for them to abandon it unless a fundamentally different product emerges. With the introduction of WeChat later on, the audience base for apps like WeChat and QQ expanded, and Tencent capitalized on this advantage for further development [4].

For example, the introduction of the "ride code" relies on WeChat Mini Programs, integrating mobile payment with public transportation. This brings a convenient mobile payment experience for

users' commuting, solving issues such as carrying change and card top-ups, and improving travel efficiency for citizens. Through the "one code for all" concept, Tencent achieves seamless integration of scenarios, providing users with more efficient, convenient, and enjoyable travel experiences. According to reports, Tencent's exploration in the field of smart connected vehicles and travel services has established a consistent service experience for users across various terminals, such as mobile phones and in-car systems, using a single ID. Tencent's travel service Mini Program has already integrated with over 300 ecological service partners, serving a cumulative user base of 270 million. Tencent's ride codes have been implemented in over 180 cities nationwide.

3.3. Tencent's CIM Technology Advantages

CIM refers to the integrated use of electronic data processing in all departments related to production within an enterprise. The application of informatization and datafication in the smart transportation industry is an inevitable result of technological progress and societal development, leading to extensive research and development in various fields. For instance, Alibaba Cloud, Qianfang Technology, and A map jointly released the "Qianfang Alibaba Cloud City Brain· Transportation Management Joint Solution," effectively leveraging Qianfang Technology's vast traffic data. Huawei focuses on "new transportation infrastructure," aiming to achieve intelligent transportation by enhancing the intelligence level of infrastructure. However, when it comes to internet capital investment, few companies have shown significant focus on transportation, except for Tencent. Tencent has long utilized its advantages to connect consumer internet and industrial internet, seeking value points within [5].

In the current context, with the accelerated development of new infrastructure at the national level, CIM technology will undoubtedly encounter a significant development opportunity period. At the Tencent Digital Ecosystem Summit, Zhong Xiangping, President of Tencent Smart Transportation and Travel, mentioned that the rapid development of China's smart automobile industry is accompanied by the formation of a matching infrastructure system for coordinated development between vehicles, roads, and cities. CIM technology serves as the underlying support platform based on industry development and the company's own planning. Smart transportation, as a concrete manifestation of smart cities in the transportation sector, is also an important indicator for measuring the digitalization and informatization level of cities.

Tencent leverages the CIM platform to create three-dimensional models of various urban spatial elements and uses digital twinning technology to analyze the data. This allows for better connectivity between people, vehicles, roads, and the cloud, while ensuring seamless integration between road systems, in-vehicle systems, and data interaction systems. It brings together companies across the upstream and downstream of the industry chain, such as highway companies, wireless network equipment providers, data center equipment suppliers, operators, and content providers, seamlessly integrating mobile internet services into the entire smart transportation scene. Tencent's digital advantages in smart transportation promote the integration and application of big transportation data in industry development. By constructing a digital twinning platform driven by data, it enhances detailed traffic monitoring, proactive traffic prediction, and supports efficient traffic dispatching [6].

3.4. Advanced Technologies within CIM

CIM incorporates Building Information Modeling (BIM) technology, which is a digital representation of the physical and functional characteristics of a building. Leveraging Tencent's strong modeling capabilities from its gaming expertise, BIM helps designers and construction personnel better design transportation models and three-dimensional spaces, establishing a digital twin asset repository for urban transportation infrastructure for precise management. For example, in Huizhou, Guangdong,

Tencent has built a city-level holographic network and integrated perception data into the digital twinning platform, achieving dynamic visualization through excellent modeling technology.

Within CIM, Geographic Information System (GIS) provides integrated two-dimensional and three-dimensional base maps and unified capabilities for coordinate systems, combining building information with geographic information for better building management. Tencent's development of Tencent Map has played a significant role in this aspect, providing Tencent Smart Transportation with strong technological capital. The synergy between GIS and BIM can extend its applications from the construction field to the precise domain of bridges, upgrading the transportation industry. Through cloud-based data acquisition and comprehensive monitoring of engineering information and construction conditions, large amounts of information can be collected and analyzed in real time to identify quality issues during construction, thereby improving work efficiency. It also enables macro and micro-level unity, providing managers with clear data analysis and construction references for more intuitive decision-making, promoting the development of smart transportation.

CIM also includes Internet of Things (IoT) technology, which connects various devices. For example, sensors and lighting systems enhance building security. The collaboration between IoT communication platforms and technology platforms has created an integrated cloud-core solution. Leveraging Tencent's Mini Program ecosystem, it provides features like WeChat scan, one-click device pairing, and Bluetooth device connection within the WeChat system. With Tencent's strong user engagement, Tencent Smart Transportation reaches a wider audience, bringing convenience to more people [7].

3.5. Summary

Tencent's "We Transport" is an all-encompassing solution that represents Tencent's gradual expansion into the smart transportation sector in the context of new infrastructure. It combines their technical capabilities, planning, and vision into a comprehensive plan, serving as a medium to long-term strategy. Its purpose is to address the current environment of digital upgrades in transportation and fulfill the need for a role that can act as a seamless connector without intruding. The three main dimensions of urban planning, ecological collaboration, and user services have been identified to support future urban transportation development. CIM technology has also been applied in various aspects in conjunction with We Transport. For example, Tencent's strategic cooperation with the China Highway Society promotes the digitization transformation of the transportation industry. Tencent and Shudao Group launched the "Weekly Vehicle Warning Expressway Edition" mini-program, providing real-time twin-lane navigation functionality through the Tencent Map app, which is currently being used on the western section of Chengdu's Second Ring Expressway and Chengdu-Yibin Expressway. Tencent won a bid worth 25.11 million RMB from Guangzhou Housing and Urban-Rural Development Bureau using the CIM management platform, leveraging Guangzhou's position as a CIM pilot city to acquire relevant three-dimensional urban spaces, strengthen smart transportation construction, and improve urban management. These examples demonstrate the practicality of Tencent's CIM technology and the significant advantages it brings to the development of smart transportation.

4. Discussion and Conclusion

In our analysis of future urban transportation and layout considerations, it becomes evident that Tencent is effectively leveraging its tremendous potential in the era of intelligent transportation, positioning itself as the central nervous system for urban operations. Our research underscores Tencent's significant advantage in this development pathway. By harnessing CIM technology, Tencent achieves enhanced coordination between vehicles and roads, enables the construction of

three-dimensional city models, and provides integrated data management and services for both vehicles and the cloud. This approach accelerates the development and iteration of related functionalities while also offering valuable insights for Tencent's future directions, thereby facilitating industry-wide advancements.

Tencent's exploration and practical efforts in smart transportation construction far outpace those of other entities, demonstrating their superiority in terms of intelligent connectivity and smart city perspectives. Tencent has successfully established a comprehensive range of hardware and digital infrastructure, amassing extensive data resources and technological capabilities across various domains. The utilization of CIM, BIM, digital twinning, and other technologies has made significant contributions to supporting end-to-end digital operations and enabling service intelligence. These invaluable digital assets form the bedrock for Tencent's smart city construction, providing them with a formidable advantage for future development endeavors.

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