CULTIVATING HIGH-QUALITY TALENT IS THE ANSWER TO FACING THE FUTURE CHALLENGES OF THE TRANSPORTATION INDUSTRY

Q NIE

School of Highway, Chang'an University, P O Box 710064, Xi'an, China;
Tel: (+86) 15007529148; Email: 2022121054@chd.edu.cn

ABSTRACT

This article, set against the backdrop of Chinese bridge construction, explores how education and training of high-quality talent can enhance the transportation industry's ability to confront future challenges. Firstly, it analyses the challenges faced by Chinese bridges, including the scarcity of high-quality talent, the integration of computer technology with bridge construction, and intelligent construction and smart detection. Secondly, in light of the current highly integrated landscape of artificial intelligence and bridge construction, three strategies for cultivating high-quality talent and methods for social education and popularization are proposed. Finally, through successful case studies, the importance of talent development and education is demonstrated, along with suggestions for collectively addressing future challenges in the transportation industry.

1. INTRODUCTION

Bridges are the most crucial infrastructure in transportation, and in recent years, the demand for bridge construction in China has been continuously growing. Taking China's construction of sea-crossing bridges as an example, China has completed landmark bridges such as the world's longest Hong Kong-Zhuhai-Macao Bridge and the largest-scale Zhoushan Islands Link Project (Liu, 2023). However, the construction environment for sea-crossing bridges is harsh, requiring higher technical standards for design, construction, monitoring, and maintenance. Faced with these challenges, only high-quality and high-level talents can better address the current and future difficulties.

2. CHALLENGES AND APPROACHES FACING THE TRANSPORTATION INDUSTRY IN CHINA

2.1 Scarcity of High-Quality Talent

The bridge construction industry has long faced a talent shortage, particularly lacking high-level, skilled engineers. The traditional education system focuses heavily on theoretical knowledge, neglecting practical skills training, leading to graduates being ill-equipped for actual projects. In an environment where computer science intersects with bridge engineering, educational systems lag behind industry developments, failing to update teaching content and training methods promptly. As a result, graduates lack practical and innovative abilities, requiring prolonged training to adapt to work.

2.2 Integration of Computer Technology With the Bridge Industry

Utilizing computer technology to enhance the design and construction efficiency of transportation infrastructure presents a significant challenge today. To address this issue, Chinese engineers have proposed three approaches: the application of Building Information Modeling (BIM) technology, AI-assisted design, and big data-supported decision-making (Yuan, 2023).

2.3 Intelligent Construction and Smart Inspection

Traditional bridge construction faces issues such as long construction periods, prompting Chinese engineers to propose three methods to address them: employing engineering robots for automated bridge construction, utilizing 3D printing technology for customized bridge component fabrication, and prefabricated component assembly to achieve factory production and on-site assembly, thereby shortening construction periods (Liu, 2024).

In terms of inspection, traditional manual inspection is inefficient and narrow in coverage. To tackle this, engineers have proposed methods such as unmanned aerial vehicle inspections, sensor monitoring, and establishing health monitoring systems. High-definition imaging for damage identification, bridge inspection vehicles, underwater inspection robots, among others, are also the latest technologies applied in intelligent inspection (Editorial Department of China Journal of Highway and Transport, 2021).

3. THE ROLE OF EDUCATION AND TRAINING IN ENHANCING THE LEVEL OF BRIDGE CONSTRUCTION.

High-quality talent includes the cultivation of practical, composite, and innovative skills.

3.1 Practical Talent Cultivation

Traditional education focuses solely on theoretical knowledge, lacking practical teaching experiences. To address this issue, we can establish practical teaching bases through collaboration between schools and enterprises, providing students with internship opportunities to accumulate experience in actual engineering projects. Additionally, setting up engineering practical training courses helps cultivate students' practical operational abilities.

3.2 Composite Talent Cultivation

In an environment where transportation infrastructure construction is closely integrated with artificial intelligence, we should cultivate interdisciplinary talents with both computer knowledge and high-level skills. Firstly, it's necessary to integrate engineering technology and artificial intelligence by offering interdisciplinary courses to enhance students' cross-disciplinary abilities. Simultaneously, actively engaging in international exchanges and cooperation promotes the improvement of domestic talent cultivation standards and enhances internationalization levels.

3.3 Innovative Talent Cultivation

The bridge industry is experiencing rapid technological advancements and intense market competition. We need to cultivate innovative talents. Firstly, by offering innovation education courses to foster students' innovative awareness. Secondly, the government

should establish mechanisms for the transformation of scientific research achievements, incentivizing researchers to convert their findings into practical productivity, thereby promoting the application and dissemination of industry technologies. Lastly, establishing integrated innovation platforms that bridge academia, industry, and research promotes the integration of research achievements with actual engineering projects.

3.4 Social Education Promotion

In addition to educating and training professionals, we should also focus on social education. By disseminating knowledge about the transportation industry through popular science formats, we can enhance public interest in the transportation sector and attract more talent to join the industry.

4. CASE STUDY ANALYSIS

4.1 Intelligent Operation and Maintenance of the Hong Kong-Zhuhai-Macao Bridge

During the maintenance of the Hong Kong-Zhuhai-Macao Bridge, intelligent detection and maintenance technologies such as sea-crossing bridge and tunnel close-range monitoring based on inspection robots were employed (Jing, 2023). These technologies stem from highly qualified individuals with computer knowledge and extensive bridge experience. Cultivating high-quality talents can effectively enhance overall competence, better preparing us to face future challenges.

Moreover, the construction of the Hong Kong-Zhuhai-Macao Bridge involved close collaboration with various research institutions and universities in China, leading to the proposal of numerous innovative methods and the utilization of advanced intelligent construction and transportation equipment. These endeavors directly showcase the transformation of research achievements into practical applications.

4.2 Bridge Projects in Cooperation Between China and South Africa

The Msikaba River Bridge in South Africa is a landmark project constructed by China, featuring a main span of 580 meters with a single-span full-ground anchored cable-stayed bridge (Fan, 2020). The construction methods employed for the bridge, such as the bracket cast-in-situ construction for concrete rib plates and the cantilever assembly method for composite beams, were based on the structural characteristics. Such designs rely on the cultivation of practical and innovative talents, as only individuals with sufficient professional knowledge and skilled abilities can propose such rational methods.

The Maputo Katembe Bridge in South Africa is a single-span steel box girder cable-stayed bridge constructed by China (Yuan, 2023). This bridge not only facilitates transportation but also stimulates local employment. Various job types in bridge construction, including repair workers, electricians, rebar workers, welders, painters, etc., have employed local Mozambican workers. During the construction period, over 200 Chinese engineers led local workers, providing hands-on technical guidance and mentoring over 5000 management talents and skilled workers locally (Sun, 2023). These practical and innovative talents have made significant contributions to the transportation development and construction in South Africa, enabling them to effectively confront future challenges.

5. CONCLUSION

To address future challenges, we need to formulate and implement long-term plans for education and training to cultivate high-quality talents adaptable to future development needs, leading technological innovation in the transportation industry. Drawing inspiration from talent development methods employed in the Maputo Bridge project, we should nurture practical talents with engineering experience. Lastly, emulating the collaboration model between China and South Africa, establishing cross-border cooperation platforms will enhance exchanges and collaboration among governments, enterprises, and academic institutions worldwide. Together, we can tackle global challenges faced by the industry, achieving sustainable development and shared prosperity in the transportation sector.

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