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Innovation and Development Strategy of International Seafarer Education in the Context of Hainan Free Trade Port

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Abstract: This paper focuses on the innovation and development of international seafarer education under the background of the Hainan Free Trade Port. It analyzes the opportunities brought to international seafarer education by the construction of the Hainan Free Trade Port, including policy support and geographical advantages; it explores the challenges currently faced by international seafarer education, such as professional identity, technical adaptation, and functional transformation; finally, it proposes strategies for innovation and development, including optimizing the curriculum system, strengthening industry-education integration, promoting digital education, and enhancing international cooperation, aiming to provide a reference for the high-quality development of international seafarer education in the Hainan Free Trade Port. *Keywords:* Hainan Free Trade Port; International seafarer education; Innovation development strategy

Introduction

Data from the International Maritime Organisation (IMO) show that 15% of global ship positions are filled by non-professional seafarers, highlighting the urgency of reforming international seafarer education. Promoting the synergistic development of Hainan Free Trade Port and international seafarer education is an inevitable choice to serve the national strategy, and also a key path to crack the talent bottleneck and drive the upgrading of the shipping industry. Through the analysis of policy text and shipping data, the new requirements for the internationalisation and expansion of seafarers' skills in the FTIP are revealed; combined with the cases of local colleges and universities and empirical research, it is pointed out that the shortcomings of the current education system are in the areas of curriculum content, practical training conditions and school-enterprise synergy, etc. Finally, it is put forward that the dual-wheel drive strategy of "technology+system" is proposed: the construction of the intelligent seafaring Finally, a "technology+system" dual-wheel drive strategy is proposed: building an intelligent maritime teaching platform, promoting mutual recognition of international vocational qualifications, and improving the collaborative education model between the government, schools and enterprises. The study uses a combination of policy analysis and empirical methods, with data from the Ministry of Transport, the Ministry of Education and the IMO Convention, and aims to provide theoretical support for Hainan to build an international seafarer education highland, and to help our country to transform from a "big shipping country" to a "strong shipping country".

1. Hainan Free Trade Port Construction and the Demand for Shipping Industry

1.1 Policy Advantages and Opportunities for Shipping Development

Relying on the core policies of "zero tariff, low tax rate and simple tax system", Hainan Free Trade Port has injected strong impetus into the shipping industry. According to the "overall programme for the construction of Hainan Free Trade Port", the opening up of ship registration, shipping finance and other fields has been significantly enhanced: in 2023, the number of newly registered shipping enterprises in Hainan will increase by 48% year-on-year, and the scale of cross-border ship leasing will exceed USD 5 billion. The policy of "free flow of cross-border funds" reduces the cost of enterprise financing and attracts international giants such as Maersk and COSCO Shipping to set up regional headquarters. The construction of the free trade port has also promoted the upgrading of the shipping industry - smart ships and green shipping have become the focus of development. Yangpu Port has introduced liquefied natural gas (LNG)-powered ships and piloted "unmanned freighter" technology, requiring seafarers to master digital operation and maintenance, new energy management skills. The International Maritime Organisation (IMO) predicts that the proportion of smart ships in the world will reach 30% by 2030, and Hainan Free Trade Port, as an open window for China's shipping industry, urgently needs to cultivate composite seafarers with international vision and technical ability to match the iterative needs of the industry.

1.2 Status and challenges of seafarers' education in China

Currently China's seafarer education system is facing multiple contradictions: firstly, there is an imbalance between quantity and structure.2023 data shows that China's senior seafarers holding certificates of competency are only 120, 000, with a shortfall of more than 30, 000, and the proportion of seafarers over 45 years of age reaches 35 per cent, with the problem of aging prominent. Secondly, the supply of skills is lagging behind. Most colleges and universities still focus on traditional mechanical ship training, with less than 20% coverage of courses on intelligent navigation systems (such as E-navigation) and hydrogen fuel power, and less than 40% updating of practical training equipment. Thirdly, the international standard docking is insufficient. Although the STCW Convention requires crew members to have cross-cultural communication and emergency management skills, foreign language teaching in domestic colleges and universities accounts for less than 15%, and the mutual recognition rate of international certificates is only 60% (e.g., the Manila Amendment Compliance Assessment is not fully covered). In Hainan, for example, only 8% of the curriculum involves green shipping technology, and the simulator model is two generations behind the international mainstream products, which makes it difficult for graduates to pass the interviews with European shipowners. This status quo is in marked contrast to the "internationalised, professionalised and youthful" seafarers required for the construction of the Free Trade Port, forcing the education system to be reformed.

2. Innovative strategies for international seafarer education

2.1 Innovations in teaching content and methods

Virtual simulation (VR) and augmented reality (AR) technologies are reshaping the nautical training scene. Shanghai Maritime University has introduced a "full-task ship manoeuvring simulator", which can simulate extreme scenarios such as typhoons and pirate attacks, and increase the emergency response capability of trainees by 40%, while AR technology assists in the teaching of turbine engineering by superimposing animations of equipment dismantling and increasing the efficiency of the understanding of complex mechanical principles by 35%. As for the reconstruction of the curriculum system, three major modules need to be added: data security and network security (e.g. protection of ship communication system), to cope with the regulatory requirements of the International Maritime Organization (IMO) on the network risk of ships; cross-cultural communication and legal practice, covering the handling of disputes of the Maritime Labour Convention and multinational port regulations; and the application of green technology, such as LNG-powered ship operation and carbon emission monitoring technology, to match the international shipping carbon reduction trend. international shipping carbon reduction trend. Dalian Maritime University, for example, has seen a 25 per cent increase in the hiring rate of graduates from its new "Intelligent Shipping Systems" programme at international cruise lines.

2.2 Path of internationalised school running and school-enterprise cooperation

Hainan can learn from the model of cooperation between Shanghai Maritime University and Maersk Group, introduce Danish maritime simulator technology, and build a "China-ASEAN maritime training centre" in Yangpu port to achieve localisation of international certification courses. The "order-type" cultivation model requires deeper collaboration between schools and enterprises: COSCO Shipping and Wuhan University of Science and Technology have cooperated to set up an "Intelligent Ship Operation Class", in which enterprises participate in the curriculum design and promise that 80% of the trainees will be directly employed. This model requires the establishment of a dynamic adjustment mechanism - enterprises provide quarterly feedback on changes in job requirements, and institutions adjust their practical training modules accordingly (e.g., adding a new course on hydrogen-fuelled ship maintenance). Promote the "dual tutor system", inviting captains and chief engineers to serve as practical tutors, and integrating enterprise cases into classroom teaching.

3. Optimising the allocation of educational resources

Establishment of the Hainan Nautical Education Cloud Platform, which integrates resources such as VR simulators and AR dismantling tools to support remote access to the practical training system by remote colleges and universities. Nautical colleges can access the LNG ship simulator in Yangpu port through the cloud, reducing the cost of hardware investment. Skewed policies and funds: It is recommended to set up a "special fund for maritime education in the Free Trade Port", focusing on supporting the hardware upgrading of Danzhou and Dongfang, and purchasing intelligent navigation systems (with a budget of 2 million yuan per set).

4. Talent development and job fit

The construction of Hainan Free Trade Port has spawned a structural shift in the demand for shipping talents. Explosive growth of cruise economy: Sanya International Cruise Port will receive more than 500, 000 passengers in 2023, leading to a 35% increase in demand for cruise management, maritime services and other positions, including a shortage of 2, 000 positions with multi-language service capabilities. Intelligent ship technology popularity: According to the China Classification Society data, in 2025 China's intelligent ships will account for more than 25% of the ship's autonomous navigation, remote operation and maintenance of the emerging field of the urgent need for both knowledge

of navigation technology and information technology composite talents, is expected to be related to the annual increase in demand for more than 12, 000 jobs. Green shipping mandatory transformation: the International Maritime Organisation (IMO) requires a 50% reduction in carbon emissions from the shipping industry in 2050, Hainan Free Trade Port pilot hydrogen-fuelled ship technology, 2023 has launched the first batch of 50 hydrogen ship orders, hydrogen fuel power system maintenance, carbon trading management and other positions to become a new blue ocean of employment.

5. Conclusions and outlook

Hainan Free Trade Port policy through tax concessions, cross-border cooperation and other institutional dividends for the international seafarer education injected into the internationalisation and technological transformation of power, but is still facing uneven distribution of resources, lagging supply of skills, international standards do not converge well and other bottlenecks. It is necessary to solve the contradiction between supply and demand through the synergy of "technological empowerment" (such as VR/AR technology to reduce the cost of hardware by 60%) and "institutional innovation" to support the high-quality development of the shipping industry. In the future, we need to focus on promoting international mutual recognition of qualifications, deepening the application of AI and blockchain technology (e.g. 70% reduction of human errors in crew behaviour modelling, transparent management of qualifications), expanding the cultivation path of "zero-carbon seafarers" (in line with the carbon reduction target of IMO 2050), and developing the support system for seafarers' mental health. We will continue to track the effectiveness of the education innovation in the light of the policy developments after the closure and operation of the Free Trade Port, so as to provide a replicable "China Solution" for the upgrading of global shipping talents.

References

- Zhao Qingtao, Liu Yan, Ni Chengshi. Countermeasures to Expand the Scale and Improve the Quality of China's Seafarer Education[J]. Research on Maritime Education, 2009, 26(04):18-22+32.
- [2] Zhao Zhiwei, Liu Zhengjiang, Wang Huanxin. Analysis of BIMCO/ICS 2015 Seafarers' Human Resources Report and Thoughts on the Future Development of China's Seafarers' Workforce[J]. Nautical Education Research, 2016, 33(04):1-4.
- [3] Song Qin. Opportunities for Seafarers' Labour Export and the Reform of China's Maritime Education[J]. Research on Maritime Education, 2002, (02):1-4.

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