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Exploration of the Excellent Talents Training of Maritime Management Technology in the Background of Maritime Power

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Abstract: Building a maritime power is a major national strategy in the new era of China. The fields of maritime transportation, ocean governance, maritime security, and port shipping have raised higher, more specialized, and more refined requirements for high-quality technical and skilled talents. As one of the core disciplines serving the maritime power strategy, Maritime Management Technology undertakes the important mission of cultivating interdisciplinary technical and skilled talents with modern maritime governance capabilities, shipping management competencies, maritime emergency response skills, and international perspectives. Currently, China's Maritime Management Technology programs still face critical issues such as a significant disconnection from dynamic industry demands, insufficient innovation capabilities, and low internationalization levels in fundamental areas including talent cultivation objectives, curriculum systems, practical teaching, faculty teams, and industry-education integration. Based on the strategic requirements of maritime power development, this paper comprehensively analyzes emerging trends in the global maritime industry and the new characteristics of contemporary talent demands. To address these pressing challenges, it constructs an excellence-oriented talent cultivation model for Maritime Management Technology from six fundamental aspects: precise training positioning, optimized curriculum systems, advanced practical platforms, highly qualified faculty teams, deep industry-education integration, and comprehensive evaluation mechanisms. Ultimately, this comprehensive framework provides robust theoretical references and actionable practical pathways for the high-quality development and sustainable advancement of maritime-related programs at both vocational and higher vocational undergraduate educational levels.

Keywords: maritime power; maritime management; talent cultivation; vocational education; industry integration

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1. Introduction

Building a maritime power represents a critical strategic objective in the pursuit of the great rejuvenation of the Chinese nation [1]. With the rapid progression of the "Belt and Road" Maritime Silk Road initiative, the marine economy is undergoing a transformative phase characterized by high-quality development. This includes advancements in smart ports, green shipping, and intelligent ships, which collectively signify a shift toward more sustainable and technologically advanced practices. China's shipping industry, maritime management, port operations, ship management, and maritime emergency rescue systems are evolving to align with global trends, emphasizing intelligence, environmental sustainability, international collaboration, and adherence to legal frameworks [2, 3]. The maritime management technology program plays a pivotal role in this transformation by directly addressing the needs of core sectors such as maritime management, shipping services, port operations, ship safety, and maritime traffic management. This program serves as a vital talent pipeline, ensuring the

availability of skilled professionals to support the implementation of the maritime power strategy and to meet the demands of a rapidly changing global maritime landscape.

In the context of the swift evolution of vocational undergraduate education, the cultivation of highly skilled maritime professionals has emerged as a pressing priority. These professionals must possess not only strong political awareness and technical expertise but also exceptional practical skills and a global outlook to effectively navigate the complexities of the modern maritime industry. The traditional educational model, which has historically prioritized theoretical knowledge over practical application, is increasingly inadequate in addressing the demands of contemporary maritime governance systems and operational capabilities. This gap underscores the necessity of rethinking and innovating educational approaches to better align with industry needs. By integrating practical training with theoretical instruction, educational institutions can produce graduates who are well-equipped to handle the challenges posed by technological advancements, environmental considerations, and international regulatory frameworks [2, 4]. Exploring new methodologies for talent cultivation within the maritime management technology field is therefore of significant theoretical and practical importance. Such efforts not only contribute to the broader national strategy of building a maritime power but also ensure that the workforce is prepared to support sustainable and intelligent development in the maritime sector.

2. New Characteristics of Maritime Industry Development and Talent Demand under the Strategy of Building a Strong Maritime Nation

2.1. New Trends in the Maritime Industry Development

Smart maritime governance is advancing rapidly, characterized by the integration of cutting-edge technologies such as electronic patrols, intelligent traffic management systems, drone-based inspections, big data-driven supervision, blockchain-enabled bills of lading, and the deployment of smart ships. These innovations are propelling the maritime industry toward a digital, networked, and intelligent transformation, enhancing operational efficiency and regulatory oversight. Concurrently, green shipping has emerged as a critical focus area, driven by the imperative to reduce environmental impact [4, 5]. This includes the adoption of low-carbon vessels, utilization of shore power, implementation of energy-saving measures, emission reduction strategies, advanced ship exhaust treatment technologies, and comprehensive carbon footprint management practices. These developments have significantly increased the demand for professionals skilled in green shipping technologies and sustainable management practices. Furthermore, maritime governance is increasingly aligning with international standards, necessitating expertise in global maritime conventions, safety regulations, port state control, crew management, and maritime search and rescue operations. Professionals in this domain must possess a deep understanding of international rules and exhibit strong cross-cultural communication skills to navigate the complexities of global maritime operations effectively. Additionally, the industry is placing greater emphasis on maritime safety and emergency response capabilities, particularly in addressing challenges posed by extreme weather conditions, maritime accidents, ship pollution incidents, and security threats. This shift underscores the need for highly specialized, adaptable, and operationally ready emergency management professionals who can respond swiftly and effectively to diverse scenarios. These evolving trends highlight the dynamic nature of the maritime industry and the growing importance of cultivating a workforce equipped with advanced technical knowledge, environmental awareness, and international expertise to meet the demands of a rapidly changing global landscape.

2.2. New Characteristics of Maritime Excellence Talent Demand

Maritime professionals today are expected to embody a strong sense of political awareness and responsibility, ensuring adherence to principles that safeguard national security, maritime rights, and public safety. They must exhibit a profound understanding

of legal frameworks and uphold the highest standards of professional ethics. Their expertise is built on a solid foundation of specialized knowledge and advanced technical skills, enabling them to excel in critical areas such as shipping operations, port management, vessel safety, and traffic control. These individuals are adept at leveraging modern maritime technologies and equipment to enhance operational efficiency and safety [6, 7]. Furthermore, they are distinguished by their ability to address complex, real-world challenges through a combination of practical problem-solving and innovative thinking. This includes proficiency in emergency response, coordinated command, and comprehensive risk assessment strategies. In addition to their technical and operational capabilities, these professionals are characterized by their global outlook and adaptability, which are essential in the dynamic maritime industry. They possess a thorough understanding of international maritime conventions and demonstrate strong English language skills, enabling effective communication and collaboration on a global scale. Their commitment to lifelong learning and career adaptability ensures they remain at the forefront of industry advancements, making them invaluable assets in addressing the evolving demands of the maritime sector.

3. Main Problems in the Current Training of Maritime Management Technical Talents

The objectives for cultivating maritime management technical talents lack sufficient precision, as some educational institutions continue to prioritize traditional shipping management while failing to address emerging areas such as smart maritime affairs, green shipping, marine governance, and emergency response [8]. This approach does not align with the evolving standards required for producing exceptional professionals in the field. Furthermore, the curriculum system has not kept pace with industry advancements, exhibiting slow updates and inadequate coverage of critical topics like smart maritime affairs, big data supervision, green shipping practices, and international maritime regulations. The curriculum remains heavily focused on theoretical courses, with practical courses underdeveloped and lacking coherence between subjects. This weak integration undermines the systematic development of students' skills and knowledge, leaving them ill-prepared for the complexities of modern maritime management.

A significant gap persists between the practical teaching conditions provided by institutions and the actual requirements of maritime management roles. On-campus training environments rely heavily on simulations, which fail to replicate authentic scenarios such as ship operations, port management, traffic control centers, and emergency command systems. This limitation restricts students' ability to gain hands-on experience in real-world settings. Additionally, off-campus internship bases often lack stability and fail to provide students with opportunities for deep engagement in core business operations. The development of dual-qualified faculty remains insufficient, with many instructors lacking direct experience in frontline maritime operations and practical expertise in areas such as smart equipment usage, international conventions, and emergency response protocols. Moreover, industry mentors are not adequately integrated into the teaching process, further limiting the practical exposure and professional guidance available to students.

The integration of industry and education, along with collaboration between schools and enterprises, remains superficial and underdeveloped. Most partnerships are limited to symbolic activities such as nameplate displays, guest lectures, and short-term internships, which fail to foster meaningful collaboration. There is a notable absence of deeper integration efforts, including joint program development, co-designing curricula, co-creating textbooks, co-training faculty, and establishing shared training bases. The evaluation system employed by institutions remains overly traditional, relying predominantly on exam scores while neglecting essential competencies such as professional ethics, practical skills, innovation capabilities, emergency response proficiency, and teamwork [2, 9]. This outdated approach does not effectively support the identification and cultivation of outstanding talents, thereby hindering the development of professionals equipped to meet the demands of the modern maritime industry.

4. Construction of the Excellent Talents Training System of Maritime Management Technology in the Background of Maritime Power

This paper develops a comprehensive "six-in-one" system for cultivating exceptional talents in maritime management technology. The system is strategically designed to ensure a holistic approach to education and training. It begins with precise positioning to establish clear objectives and directions for talent development. At its core lies a robust curriculum system, meticulously structured to provide theoretical and practical knowledge essential for maritime management. This is further reinforced by a well-equipped practice platform, which offers students hands-on experience and real-world applications of their learning [10, 11]. The teaching staff plays a pivotal role as the cornerstone of this system, with their expertise and dedication ensuring high-quality instruction and mentorship. The integration of industry and education serves as a dynamic pathway, fostering collaboration between academic institutions and maritime enterprises to align training with industry needs. Finally, a multi-faceted evaluation mechanism guarantees continuous improvement and ensures that the training outcomes meet the highest standards of excellence.

4.1. Clarifying the Positioning of Excellence in Talent Cultivation

Guided by the strategic vision of advancing maritime capabilities and grounded in the enhancement of maritime administration and shipping services, the objective is to nurture a new generation of maritime technical professionals. These individuals will embody a harmonious integration of moral integrity and technical expertise, ensuring a balance between theoretical knowledge and practical application. They will be equipped with specialized skills in areas such as maritime supervision, shipping management, port operations, vessel safety, and emergency response. Furthermore, these professionals will be prepared to meet the evolving demands of smart maritime systems, green shipping initiatives, and the global shipping industry. Their training will emphasize the development of vocational bachelor's-level technical competencies, fostering an innovative mindset and the capacity for continuous growth. By aligning their expertise with the latest advancements in technology and sustainable practices, these talents will play a pivotal role in shaping the future of maritime operations, ensuring efficiency, safety, and environmental responsibility in an increasingly interconnected and technologically advanced global maritime landscape.

4.2. Reconstructing the "Job-Course-Competition-Certification Integration" Curriculum System

Strengthening core foundational courses is essential to cultivating a robust maritime education system. Key subjects such as maritime regulations, ship and crew management, maritime traffic engineering, port administration, shipping operations, maritime geography, and maritime English form the backbone of this curriculum. To meet the demands of modern maritime industries, it is crucial to introduce advanced specialized modules. These include smart maritime systems, which focus on the integration of artificial intelligence and automation in maritime operations, and big data in maritime supervision, which emphasizes the use of data analytics to enhance safety and efficiency. Other critical areas include green shipping, which addresses sustainable practices to reduce environmental impact, ship pollution prevention, maritime emergency command, international maritime conventions, and intelligent vessel fundamentals. By promoting the integration of job roles, curriculum content, competitive activities, and certification processes, the curriculum aligns closely with real-world tasks in maritime law enforcement, shipping operations, and port scheduling, ensuring that students are well-prepared for practical challenges in their careers.

Integrating maritime vocational skills competitions, emergency drills, and other practical programs into the curriculum is vital for aligning educational outcomes with professional certification standards. These activities are designed to complement "1+X" certificates, which include qualifications such as seafarer certificates, safety management

certificates, and logistics management certificates [12, 13]. This approach ensures that students not only gain theoretical knowledge but also develop hands-on expertise that meets industry requirements. Additionally, the curriculum emphasizes the importance of general education and literacy courses to foster well-rounded professionals. Topics such as national security, maritime rights and interests, legal education, and professional ethics are critical for instilling a sense of responsibility and adherence to regulations. Emergency rescue training and psychological adjustment modules prepare students to handle high-pressure situations effectively, while teamwork exercises enhance their ability to collaborate in diverse and dynamic environments. By integrating these elements, the curriculum aims to produce competent, ethical, and adaptable maritime professionals capable of addressing the multifaceted challenges of the industry.

4.3. Building a "Virtual-Physical Integration, Practical" Teaching Platform

On-campus, we have established advanced training facilities that include a maritime traffic simulation center, a port simulation sandbox, a ship simulation cockpit, an emergency command training room, and a smart maritime big data platform. These facilities are designed to provide students with hands-on experience and practical skills in maritime operations. Off-campus, we have cultivated extensive partnerships with organizations such as the Maritime Safety Administration, port groups, shipping companies, pilotage stations, and maritime search and rescue centers. These collaborations enable the creation of internship and employment bases that offer diverse opportunities, including on-the-job internships, capstone internships, and tailored training programs. To ensure students are well-prepared for real-world challenges, regular drills are conducted, encompassing maritime search and rescue exercises, ship pollution emergency response scenarios, port emergency incident management, and simulated command of vessel traffic organization. These activities are meticulously designed to simulate real-life situations, allowing participants to develop critical problem-solving skills and operational expertise. By integrating virtual and physical platforms, the program aims to bridge theoretical knowledge with practical application, fostering a comprehensive learning environment that equips students with the competencies required to excel in the maritime industry.

4.4. Building a Teaching Team with a "Combination of Full-time and Part-time Staff and Dual-qualified Teachers"

To strengthen the practical capabilities of full-time faculty members, arrangements will be made for them to engage in rotational assignments at maritime authorities, ports, and shipping enterprises. These assignments will allow educators to participate in real-world projects, gain hands-on experience, and acquire industry-recognized certifications that enhance their professional qualifications. Additionally, experienced professionals from the maritime sector, such as law enforcement officers, captains, port dispatch directors, and emergency management specialists, will be invited to serve as adjunct instructors. Their involvement will enrich practical courses and case-based teaching by integrating industry insights and expertise into the curriculum. Furthermore, a collaborative research and teaching community will be established to focus on key areas such as smart maritime governance, innovative talent development models, and curriculum reform strategies. This initiative aims to foster academic excellence by leveraging research-driven improvements in teaching methodologies and program design. By combining the strengths of full-time educators and part-time industry experts, the teaching team will be better equipped to address the evolving demands of maritime education and ensure students are prepared for the complexities of the field. This approach underscores the importance of bridging academic knowledge with practical application to cultivate highly skilled professionals [14].

4.5. Deepening the Integration of Industry and Education and Collaborative Talent Cultivation Mechanism

Schools and enterprises collaborate closely to design and implement comprehensive talent cultivation programs. Industry professionals are actively involved in every stage of the process, including defining training objectives, designing curricula, planning practical activities, and establishing evaluation standards. This partnership ensures that educational content is directly aligned with industry needs. Collaborative efforts extend to the co-authoring of textbooks and the joint delivery of courses, which include modular materials, project-based learning resources, and case studies that reflect real-world workflows and challenges. By adopting innovative approaches such as order-based classes and modern apprenticeship systems, these programs facilitate seamless transitions from education to employment. Students are recruited as employees from the outset, gaining practical experience within enterprises during their studies and transitioning smoothly into full-time roles upon graduation. This approach significantly enhances the relevance of their training to actual job requirements, thereby improving employment outcomes. Furthermore, these collaborations extend beyond traditional education to include technical services and social training initiatives. Programs such as maritime business training, emergency response drills, and safety protocols are offered to strengthen the professional and social service capabilities of both students and industry professionals. This integrated approach not only addresses the immediate needs of the labor market but also contributes to the broader development of a skilled and adaptable workforce [11, 15].

4.6. Establishing a Multi-dimensional Talent Development Evaluation System

The evaluation system is designed to integrate both formative and summative assessments, ensuring a balanced and comprehensive approach to talent development. It places significant emphasis on various aspects of student performance, including classroom engagement, practical training sessions, successful project completions, and outcomes from academic or professional competitions. This multi-faceted evaluation framework aims to provide a holistic assessment of an individual's knowledge base, technical skills, and professional competencies [7]. Key areas of focus include specialized expertise, practical problem-solving abilities, emergency response preparedness, innovative and critical thinking, adherence to professional ethics, effective teamwork, and proficiency in English communication. To enhance the objectivity and credibility of the evaluation process, the system incorporates feedback and assessments from multiple stakeholders, including educational institutions, corporate mentors, and industry representatives. This collaborative approach ensures that evaluations are not only comprehensive but also aligned with real-world industry standards. Additionally, internship performance reviews and industry-specific skill assessments are integrated to provide a more accurate reflection of a candidate's readiness for professional challenges.

5. Implementation Guarantee of Excellent Talents Training in Maritime Management Technology Specialty

Organizational support plays a crucial role in ensuring the success of talent cultivation in maritime management technology. A Professional Development Committee, comprising university leaders, maritime authorities, and industry experts, is essential for coordinating and advancing reforms in this field. This committee serves as a bridge between academia and industry, ensuring that the curriculum and training programs align with the evolving demands of the maritime sector. Institutional support is equally important, as it involves the establishment and enhancement of systems that promote industry-education integration, school-enterprise collaboration, and practical teaching methodologies. Faculty training programs must be prioritized to ensure educators are equipped with the latest knowledge and skills. Additionally, robust student management systems are necessary to provide a structured and supportive environment for learners, fostering their academic and professional growth. These measures collectively create a

strong foundation for cultivating outstanding talents in maritime management technology.

Financial support is a fundamental pillar in the implementation of reforms aimed at developing exceptional talents in the maritime sector. Increased investment is required to establish and upgrade practical training bases, ensuring students have access to state-of-the-art equipment and facilities. Faculty training programs must also receive adequate funding to enhance the teaching capabilities of educators, enabling them to deliver high-quality education. Strengthening school-enterprise collaboration is another critical area that demands financial backing, as it facilitates real-world learning experiences and bridges the gap between theoretical knowledge and practical application [7]. Furthermore, the development of specialized textbooks tailored to the needs of the maritime industry is essential for providing students with relevant and up-to-date learning resources. Cultural support is equally vital, as fostering an environment that emphasizes marine culture, shipping culture, safety culture, and legal culture helps instill a strong sense of mission and professional identity in students. By nurturing these values, students are better prepared to contribute to the advancement of the maritime industry and uphold the principles of safety, sustainability, and legal compliance in their future careers.

6. Conclusion and Outlook

The comprehensive implementation of the maritime power strategy has created substantial opportunities for the advancement of maritime management technology while simultaneously raising the bar for the quality of talent cultivation in this field. To effectively prepare maritime professionals who can meet the evolving demands of the modern era, it is imperative to adhere to core educational principles. These include aligning education with industry needs, tailoring training to specific job roles, emphasizing hands-on practical experience, fostering the development of critical competencies, and striving for excellence in all aspects of professional preparation. Such an approach ensures that the educational framework remains relevant and responsive to the dynamic requirements of the maritime sector.

By clearly defining precise training objectives, overhauling and optimizing the curriculum structure, and placing a stronger emphasis on practical, experiential learning, the maritime management technology discipline can address pressing challenges such as the misalignment between educational outcomes and industry expectations, insufficient practical skill development, and a lack of innovative capabilities. Building a highly skilled and dual-qualified faculty team is essential to achieving these goals, as is fostering deeper integration between industry and education to ensure that students are exposed to real-world challenges and solutions. Additionally, refining evaluation mechanisms to better assess and enhance student performance will contribute to a more robust talent pipeline. These measures collectively aim to elevate the overall quality of talent cultivation, ensuring a steady supply of highly skilled professionals who can contribute to the advancement of the shipping industry, the modernization of maritime governance, and the broader goals of maritime development.

Looking ahead, the rapid evolution of technologies such as smart ships, unmanned vessels, digital maritime systems, and green low-carbon shipping will significantly influence the competencies required of maritime professionals. Future talent development initiatives must prioritize the cultivation of digital literacy, expertise in sustainable technologies, proficiency in international maritime governance, and robust emergency response capabilities. To remain competitive and relevant, the maritime management technology program must continuously adapt its training models to reflect these industry transformations. By doing so, it can ensure the delivery of high-quality professional development that not only meets current demands but also anticipates future challenges. This proactive approach will enable the program to play a pivotal role in supporting the strategic objectives of maritime development, fostering innovation, and contributing to the sustainable growth of the global maritime sector.

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