Based on the SWOT-PEST Model, the Practical Approach for the Establishment of a Modern Maritime Academy

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Abstract. This article analyzes the practice of constructing a modern maritime academy at Bohai University based on the SWOT-PEST model and the development of modern industrial colleges. Firstly, it introduces the background and development of industrial colleges. Secondly, based on the SWOT-PEST model, it elaborates on the advantages and disadvantages of applying this model to maritime majors. Using the grey forecasting model, it predicts the enrollment and employment rate of the maritime academy at Bohai University, and demonstrates the feasibility and necessity of implementing an industrial college in the existing technological foundation and environment of the maritime academy. Finally, it discusses the key points and issues in implementing the reform of the maritime academy at Bohai University, and summarizes the experience of constructing an industrial college in maritime industry.

Keywords: Modern Shipping College; SWOT-PEST; Teaching practice

1   Introduction

The term *industrial college* can be traced back to the concept of *polytechnics* in the United Kingdom. The concept of "polytechnics" was first proposed in a report titled "Polytechnics: Creating a National Learning Network" published in 1996 by the independent think tank, the Institute of Public Policy Research[1]. In China, the concept of "industrial college" originated in Zhongshan City, Guangdong Province. Zhongshan City has a characteristic economic development model known as *one town, one product*, where many towns have their own dominant industries[2]. Industrial colleges in China have three characteristics: diversified investment entities, industrial-oriented service targets, and market-oriented operation mechanisms. Although industrial colleges are only secondary institutions, they draw on the essence of corporate governance, implementing a moderate separation and balance of capital ownership, major decision-making power, school management power, and supervision power. This helps to enhance the democratic decision-making, scientific management, and effective supervision in the institutions[3].

As ships and their equipment become increasingly modernized, and the international market for seafarers shifts to the East, it has not only provided opportunities for China's seafarer labor export but also placed higher demands on maritime education and training institutions. To meet the competitive requirements of the international seafarer labor market, it is necessary to

improve the mechanisms for cultivating maritime talents in China based on the requirements of the international shipping market. This includes reforming talent development programs and strategies to enhance the comprehensive quality of Chinese seafarers. The construction and practice of the modern maritime academy at Bohai University breaks away from traditional path dependencies, fully utilizes industrial advantages, and emphasizes the role of enterprises as important educational entities. It deepens the integration of industry and education, promotes universities to explore modern industrial college construction models, strengthens distinctive and advantageous professional programs, and cultivates a large number of high-quality, application-oriented, versatile, innovative maritime talents required by the shipping industry.

2   PEST model analysis of the Modern Maritime College

The PEST model is a strategic analysis method used to enhance the adaptability of an organization to its internal and external environment, facilitating rapid growth. Applying PEST analysis not only allows for an objective evaluation of the external environment in which the modern maritime college operates, but also helps identify areas of improvement and provides theoretical support for optimizing resource allocation [4].

1. Political Environment (P) Analysis: Government policies and regulations have a direct impact on the development of the modern maritime college. Policy adjustments and reforms in the education industry can affect the college's enrollment policies, curriculum offerings, and teaching methods. Therefore, the college needs to closely monitor changes in government policies and regulations and make timely adjustments to its development strategies. For example, in May 2023, the China Maritime Administration issued a notification on optimizing the quality assessment of maritime education and training, emphasizing the enhancement of quality management systems in maritime colleges and the improvement of quality assessment mechanisms for maritime education and training.

2. Economic Environment (E) Analysis: In 2022, the Chinese economy maintained stable growth, with a GDP growth rate of 8.1%. Despite some challenges, indicators such as fixed asset investment, retail sales, and export trade all showed positive growth in the first three quarters. The overall employment situation remained stable, with the government promoting recruitment efforts and higher vocational skill levels. In 2023, as the effects of the pandemic diminish and the Chinese economy regains vitality, the shipping profession is expected to benefit from increased goods trade and rising land-based unemployment[5].

3. Social Environment (S) Analysis: China's aging society and declining labor force pose challenges in terms of employment and international competitiveness. To address these issues, the modern maritime college needs to focus on meeting labor market demands, adjusting educational content, providing practical opportunities and internships, and enhancing students' competitiveness. It should also comply with relevant policies and regulations, and emphasize topics such as environmental protection and social responsibility to cultivate maritime professionals with a sense of sustainable development. Adapting to the changing social environment and providing high-quality education are essential for the college's success[6].

4. Technological Environment (T) Analysis: In the modern maritime college, a focus on information and communication technology, shipping technology, virtual simulation, AI and machine learning, green technology, and technological innovation is crucial. This includes utilizing advanced educational technology, incorporating shipping advancements into the curriculum, maximizing virtual simulation for practical skills, applying AI and machine learning in shipping, cultivating tech-savvy talents, promoting green practices, strengthening technological cooperation, driving innovation, and fostering entrepreneurial spirit through innovative education.

3 SWOT-PEST matrix analysis for the College of Modern Shipping

The SWOT-PEST matrix is a strategic analysis method that combines the political, economic, social, and technological factors from PEST analysis into a unified framework for conducting a systematic SWOT analysis. It helps identify the key factors that influence the development of the College of Modern Shipping and provides strategic decision-making for its growth. The SWOT-PEST matrix analysis for the College of Modern Shipping is shown in Table 1.

Table 1.SWOT-PEST Matrix Analysis of the School of Modern Shipping

Category	Analysis Level	Political Environment(P)	Economic Environment (E)	Social Environment (S)	Technological Environment (T)
Internal Factors	Strengths (S)	The government has introduced relevant policies to strongly support and assist.	The shift to high-quality development has spurred progress in maritime education at shipping schools.	Growing demand for globally-minded and skilled maritime professionals drives the development of maritime education.	Innovative maritime technologies have improved teaching methods and enhanced effectiveness in education.
	Weaknesses (W)	The policies have not been implemented effectively and have not played a significant role yet.	Shipping companies face unstable profitability, with potential losses in ship operations and greater risks in opting out.	Increased demand for maritime personnel may result in a diverse skill set due to a large labor influx.	New technologies raise financial and training costs for maritime schools.
External Factors	Opportunities (O)	Increased demand for maritime personnel may result in a diverse skill set due to a large labor influx.	As the epidemic's impact lessens, domestic economic recovery is gaining momentum.	The global shipping market increasingly seeks skilled Chinese seafarers, known for their excellent reputation.	Advancements in maritime technologies have boosted the demand for maritime education.
	Threats (T)	The establishment of maritime colleges has led to competition among regions.	Intense competition exists between public and private maritime training institutions.	The influx of seafarers from Southeast Asia and underdeveloped regions has impacted seafarers' wages in the international shipping market.	Securing funding for maritime schools' technological development and staff training has become challenging.

4 The practical exploration of Bohai University's School of Modern Shipping

4.1 The current development status of Bohai University's School of Shipping

In 2016, in order to accelerate the cultivation of talents in maritime technology and marine engineering with greater social impact, Bohai University's School of Shipping was approved

by the Ministry of Education and the Ministry of Transport to become a base for undergraduate education in maritime technology. At the same time, the university accelerated the construction of experimental, practical training, and internship bases to provide conditions for vocational education.

The School of Shipping now has ship simulation experiments and practical training equipment worth 35.053 million yuan, remote control equipment from the Maritime Bureau of the Ministry of Transport, and BRM simulation training equipment for ship operation, among others. It has established in-depth cooperation with several directly affiliated enterprises of the Ministry of Transport, providing students with high-quality internship and practical training bases.

In accordance with the regulations on the training of non-navigational engineering graduates as seafarers issued by the Maritime Bureau of the Ministry of Transport (Jiaohai Fa [2006] No. 636) and the Rules for the Examination and Certification of Seafarers in the People's Republic of China (Order No. 15 of the Ministry of Transport in 2022), the School of Shipping at Bohai University has reached preliminary intentions with multiple shipping companies regarding the understanding of maritime majors and graduation internships, as well as the cultivation of order-based classes. In addition to enrolling students majoring in navigation, the school also provides 12 months of full-time seafarer training for non-navigation majors with associate degrees or above, as well as ordinary sailors who meet the requirements of 18 months of duty as a seaman or duty as an engine worker. The training aims to cultivate advanced maritime professionals who meet international conventions, domestic regulations, and enterprise demands[7].

Table 2. Enrollment and Employment Situation of Bohai University in Recent Years

Year	Enrollment number	Graduation number	Employment rate
2016	116		
2017	119		
2018	120		
2019	78		
2020	120	109	98.17%
2021	210	110	96.36%
2022	280	106	99.06%
2023	358	78	99.1%

As shown in Table 2, the enrollment numbers and employment rates of the School of Shipping at Bohai University in recent years are presented. Grey forecasting method is used to predict the enrollment numbers and employment rates for the next two years. The key advantage of grey forecasting is that it does not require a large amount of historical data or strict adherence to a typical distribution. Instead, it applies reasonable technical treatments to the available information, establishes models, and scientifically describes the dynamic process of the system at a higher level. Even with limited and irregularly distributed data, accurate predictions can be made. In this study.

$$\hat{x}^{(1)}(k+1) = [x^{(1)} - \frac{\hat{u}}{\hat{a}}]e^{-\hat{a}k} + \frac{\hat{u}}{\hat{a}}$$

(1)

the GM (1,1) model is used to forecast the enrollment numbers and employment rates at the school, and MATLAB is used for solving. Figure 1 illustrates the overall overview and forecast of the changes in enrollment and employment at the School of Shipping at Bohai University.
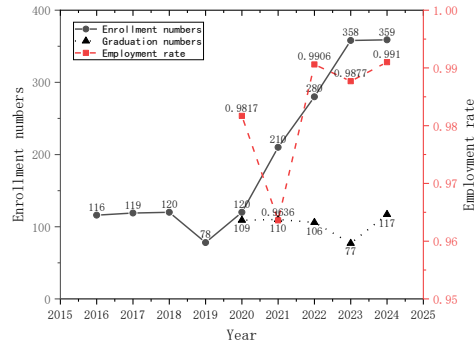

Figure 1. Overview and Forecast of Enrollment and Employment Changes at the School of Shipping, Bohai University

4.2 Key points of the practice mode reform at the School of Shipping, Bohai University's Development Industry College

To address the key issues in the development of the Modern Industry College at our university, the following points are crucial:

1. Reforming the talent cultivation mode: This involves implementing new training models such as "order-based classes" or "sandwich" programs, promoting school-enterprise cooperation, and enhancing the practical application of theoretical knowledge.

2. Enhancing the quality of graduate training and curriculum system: The curriculum should be designed in accordance with industry standards and involve the participation of experts from relevant enterprises. This ensures that graduates have comprehensive skills and the ability to continue learning in their careers[8].

3. Establishing an effective quality assurance system: Adequate classroom and laboratory equipment should be provided, with regular updates and maintenance to facilitate practical education, Collaborative teaching and joint training[9].

4. Continuous improvement of mechanisms: Monitoring mechanisms should be established to evaluate the teaching process, curriculum quality, and the achievement of training objectives. Feedback from graduates and external stakeholders should be incorporated for analysis and improvement.

5. Promoting school-enterprise cooperation: The university and industry partners should collaborate in developing teaching staff, resources, and practical training facilities to align talent cultivation with industry needs. [10].

5   Conclusions

Bohai University's School of Shipping has developed the Industry College with the following practical experience:

The college's success can be attributed to its strong industry-university cooperation, market-oriented curriculum, and unique college model. By collaborating with shipping companies, the college provides relevant education. Its curriculum focuses on practical skills and meets industry demands. The School of Shipping offers comprehensive industry knowledge and practical experience. These factors contribute to the college's achievements in industry partnerships, market-driven education, and its distinctive approach to maritime training.Overall, these experiences have established a strong foundation for industry-university cooperation, market-driven courses, and a unique college model.

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