Original Research Article

Leveraging Large-Scale AI Models for Transforming China's Marine Industry: A TOE Framework Analysis[1]

ABSTRACT:

As an important driving force leading a new round of scientific and technological revolution and industrial change, artificial intelligence is becoming a hot spot. Promoting the deep integration of "artificial intelligence + ocean" will help build a world-class Marine artificial intelligence industry cluster with global competitiveness.How to effectively apply artificial intelligence to the Marine industry to solve the problems of resource redundancy and information island caused by industrial agglomeration is urgent for innovation and breakthrough. In this paper, TOE and modified T-TOE framework are used to analyze the above problems, and the following conclusions are drawn: 1) From the perspective of technical factors, intelligent information technology plays an important role in promoting the construction of large-scale models at the level of hardware and software; From the perspective of organizational factors, enterprise digital transformation and open sharing platform play an important role in supporting organization construction. From the perspective of environmental factors, policy support and market orientation play an important role in encouraging the construction of large models. 2) From the perspective of T-T, the breakthrough and application of technology need to balance the contradiction between development and conflict; From the perspective of T-O, intelligent supply-demand matching and transition resistance have both positive and negative effects; From the perspective of T-E, there is a problem of actively promoting multidimensional interactive innovation and achieving a balance. Relevant studies provide new ideas for the comprehensive development scenario of Marine industry and inject new impetus into the development of Marine industry.

Key words: Marine industry; industry big model; T-TOE model

1. INTRODUCTION

As a strategic part of high-quality of China's economic development, the importance of blue ocean is self-evident. Xi general secretary in the party's 20 report stressed that "the

development of Marine economy, protect the Marine ecological environment, speed up the construction of Marine power", the Marine power construction as the organic composition of promoting Chinese modernization and important task, this is comrade xi as the core of the CPC Central Committee of Marine power construction strategic deployment, clearly put forward to speed up the construction of a world-class Marine port, improve the modern Marine industry system, green sustainable Marine ecological environment, contribute to the construction of Marine power.

In today's industry wave of digital transformation, for the blue ocean scientific and technological innovation in improving, a batch of key core technology breakthrough, such as "offshore wind +" integration development, ocean forecast chip "mazu waves" widely used and port "5G + Internet" one-stop service wisdom management platform, etc., reveals the Marine industry to the digital, intelligent, cluster development. Some scholars have pointed out that the collaborative innovation of Marine high-tech industries has a spatial spillover effect (Liu Tao et al., 2021)[1], Help to attract digital talents to exchange knowledge, and then improve the production efficiency of the upstream and downstream of the industrial chain (Minamata, 2022)[2]. However, with the deepening of industrial agglomeration, the dependence on resources and the effect of factor crowding are also gradually increasing (Ji Yujun et al., 2023)[3]To build a high-quality Marine industry development system requires not only the concentration of various industries in space, but also the play to the degree of professional segmentation in different fields and the synergistic effect of value creation and spatial interaction (Hesley, Strange, 2014)[4]How to carry out efficient resource segmentation and data interconnection and sharing has become an urgent problem to be solved in the academia and industry.

With the rise of GPT language model, many large models with industry influence have emerged in China. According to the research Report on AI Model Map of China, compiled by the Research Center of the Ministry of Science and Technology, as of May 2023, China has 79 large models with a scale of more than 1 billion parameters, and AI is entering a critical stage of large-scale implementation. The industrial model with the characteristics of modal diversification, resource interconnection and industrial enabling can generate various application scenarios and solutions with massive data as the base of the model (Zhao Chaoyang et al., 2023)[5]For example, the power industry equipment transportation and inspection model jointly built by Baidu and State Grid, the multi-mode industry model in the construction field jointly built by the Institute of Automation of Chinese Academy of Sciences and China Railway Construction Group, which enables thousands of industries with various modes and thousands of modes. The application of digital intelligence technology can enable the Marine industry to innovate the emerging business model of Marine economy with the platform as the carrier, and avoid the limitation of time and space, and thus reduce costs and increase efficiency (Fu Kaibao et al., 2022)[6]. Unfortunately, there are few industry models for the Marine industry. How to explore this blue ocean market and make the industry model empower the Marine industry is worth in-depth study.

To chart strong diversification path is drawn, in the face of reality urgent and theoretical gap, this paper by building the improved TOE framework, through the analysis of Marine industry model, establish T-TOE analysis model, aims to clear big model of subversive update of the traditional Marine industry technology, organization and environment, and how to rely on

UNDER PEER REVIEW

industry big model to Marine industry financing development of the corresponding policy Suggestions are put forward. This study provides new insights on the influence mechanism of the large model empowerment of Marine industry, and also provides practical inspiration for the structural upgrading of Marine industry driven by technology.

2. THE CONCEPT AND DEVELOPMENT STATUS OF THE BIG MODEL OF THE MARINE INDUSTRY

2.1 Concept of large model of Marine industry

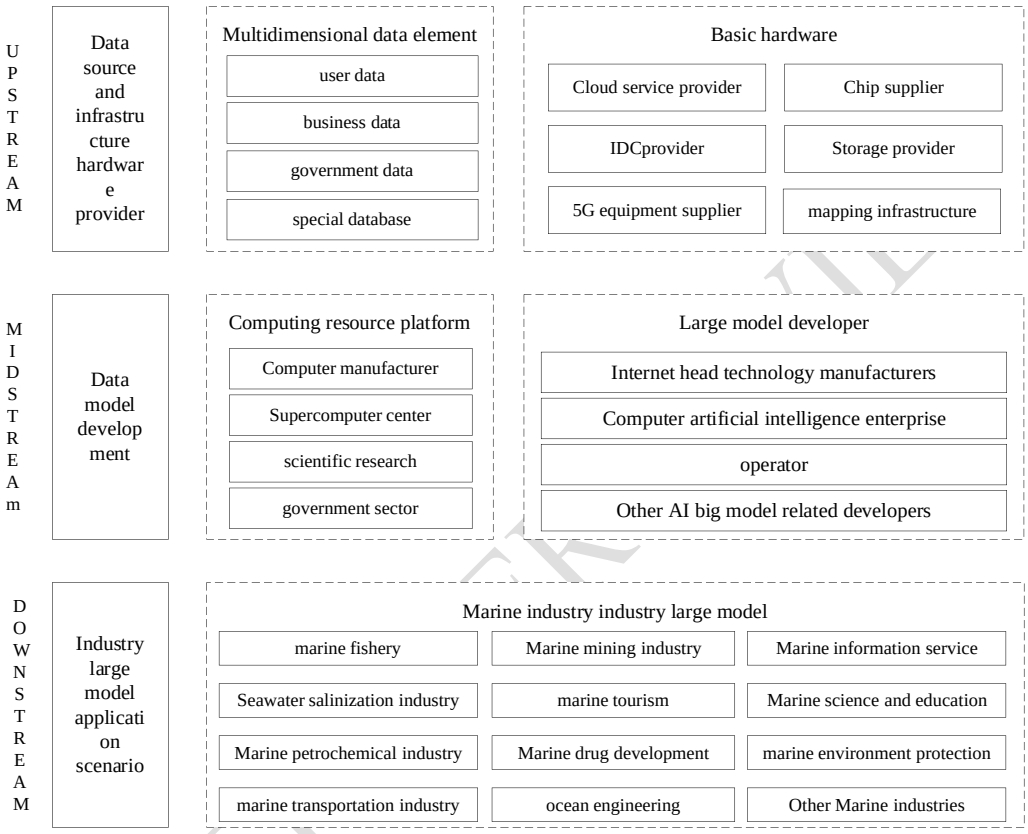

Figure 1. Overall view of the large model of the Marine industry

Big industry model is a large-scale language model that deeply integrates industry data, knowledge and expert experience, and improves its matching degree with industry applications. In Marine industry, based on huge amounts of data training industry model can more accurate to complex Marine data analysis and prediction, thus provide support for decision-making and reform of related industries, for the enterprise using more efficient means in project execution, promote organization work, create open ecological environment conducive to Marine industry innovation (Liu Cong, etc., 2023)[7]。

2.2 Development status of the large model of the Marine industry

China has made great progress in the development of Marine economy. The total Marine economy exceeded 9 trillion yuan for the first time, contributing 8.0% to the national economic growth and accounting for 15.0% of the GDP of coastal areas. In recent years, the digital and intelligent network of the Marine industry is being continuously deployed. Ecological environment in 2020 issued by the "difference" Marine ecological environment quality detection network layout scheme, based on 1359 monitoring sites framework, the formation of

Marine environmental quality monitoring, Marine ecological monitoring, Marine monitoring 15 monitoring system, form of Marine ecological environment monitoring network, by building a sensor network, using intelligent computing, big data analysis, conduct comprehensive Marine resources management, multi-dimensional research and other multi-level intelligent application. In 2022, the Ministry of Ecology and Environment and six other six ministries and commissions jointly issued the 14th Five-Year Plan for Marine Ecological Environment Protection, stressing the need to give full play to the monitoring capabilities of satellites and drones, and focus on improving the efficiency and coverage of Marine ecological surveys. At the same time, we will combine remote sensing, fixed-point continuous monitoring, video surveillance and other scientific and technological means, and use "Internet +", big data, cloud computing, intelligent and other scientific and technological means to build a smart and sustainable Marine economic development ecosystem. Including specific cases, such as Fuzhou, Fuzhou big data center, communication center, China mobile Fujian Fuzhou branch, Fuzhou in 2023 "5G + digital ocean" strategic cooperation agreement, and with sharp jie network, fortune in Fujian province, fortis technology 18 digital enterprises signed to build sea 5G ecological alliance, intelligent Marine industry cluster effect has gradually emerged, gradually become the leading our country Marine economy development of high quality momentum.

According to the China institute of science and technology information released the China big model of artificial intelligence map research report, according to China's big model technology route in parallel breakthrough, as of May 2023, China has released 79 level 1 billion parameters above scale model, especially in natural language understanding, machine vision, multimodal, etc, but in the Marine industry related field of big model. In October 2023, CNCC2023 " AI + Ocean: When will the ocean model come, organized by the Artificial Intelligence Oceanography Committee of the Oceanographic Society of China?"Technology BBS for model construction, technical requirements and ground application of three aspects are discussed and summarized, BBS points out that Marine data present 4V5H characteristics (multi-source, multi-disciplinary intersection, multimodal, more aging and strong time and space, high coupling, high variation, multi-level and high regularity), can combine supercalculate platform for Marine big data training and analysis, general Marine data as the base, establish the adaptation model of each professional industry, there is a huge development space and research prospects, the field of the ocean development and exploration has profound significance.

UNDER PEER REVIEW

3. RESEARCH METHODS

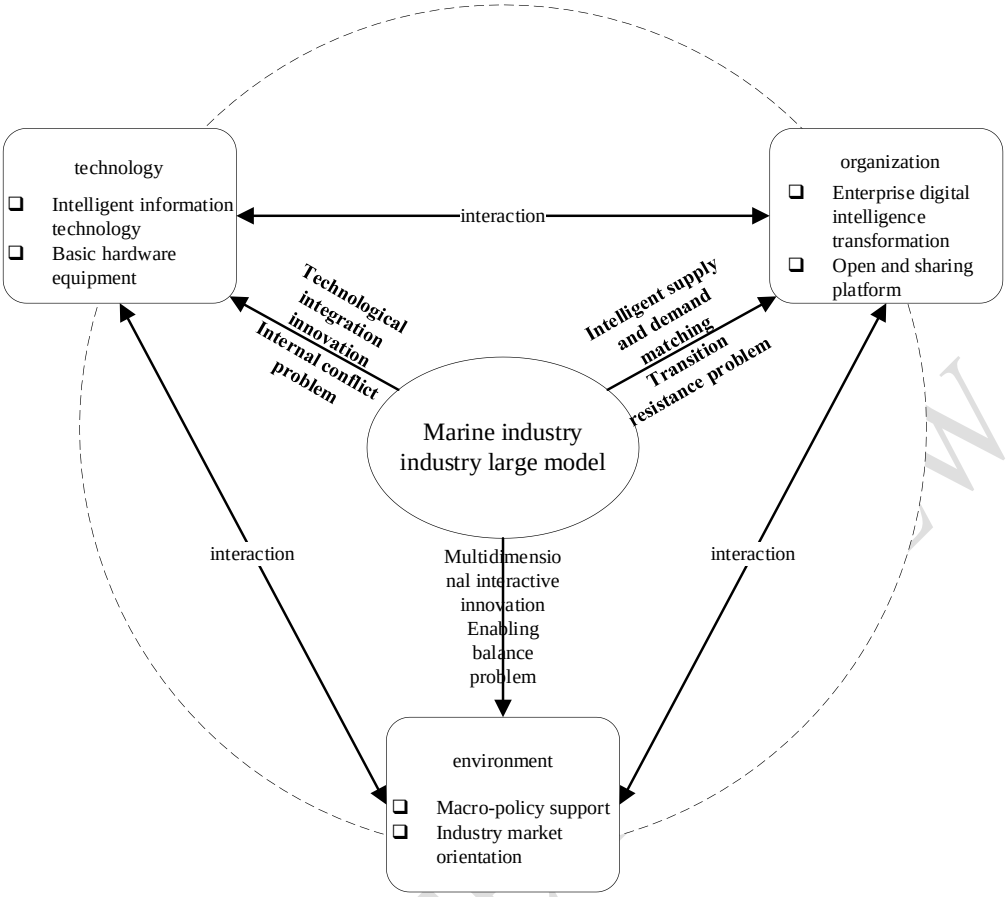

Figure 2. T-TOE analysis framework

The TOE framework is a comprehensive analysis framework based on the background of technology application, which was first proposed by Tornatzky and Fleisher in the Process of Technology Innovation (Utterback, 1971)[8]This theory emphasizes the promotion of technological innovation, the management change of the organization and the external support of the environment, and is widely quoted in the research field of information technology innovation, which is highly consistent with the problems explored in this paper. Secondly, because the theoretical framework is highly general, in the process of investigation and analysis of specific problems, it is necessary to subdivide and extend the framework according to the problems explored. Therefore, this paper uses the TOE framework to analyze the influencing factors of the large model of the Marine industry from three aspects: technology (Technology), organization (Organization) and environment (Environment), and puts forward the T-TOE model focusing on the technical implementation analysis of the large model of the Marine industry (Chen Sheng, et al., 2023)[9], To provide a new perspective for clarifying the technological innovation, changes and risks brought by the "double-edged sword" of the industrial big model technology in the Marine industry.

4. ANALYSIS OF THE INFLUENCING FACTORS OF THE LARGE MODEL OF MARINE INDUSTRY BASED ON TOE MODEL

4.1 Technology: Intelligent information technology and basic hardware equipment

The technical factors of the construction of the large model of the Marine industry mainly

UNDER PEER REVIEW

include intelligent information technology and basic hardware equipment, which are the main driving force to promote the Marine industry to digital intelligence, industrial cluster and resource connectivity. From the aspect of intelligent information technology, 5G technology with large coverage, large capacity and low latency is obviously an important part of it. It can effectively reduce the data island in the Marine industry, solve the complex information integration problem, and enable the ecological transformation of the Marine industry (Gou Lufeng, Wang Ning, 2023)[10], Thus combined with basic hardware facilities, realize the Marine surveying and mapping satellite, the ground of base station, Marine sensor network of air sea integration of full space monitoring data system, for Marine fisheries, Marine petrochemical industry, Marine transportation industry Marine industry through data channels, formed through the basis of massive data training learning model, according to the differentiation scene in the field of industry demand, further segmentation generate specialized industry big model depth can assign.

4.2 Organization: Enterprise digital intelligence transformation and open sharing platform

Organization mainly includes enterprise digital transformation and open sharing platform two parts, in terms of enterprise digital transformation, due to the Marine industry has strong heterogeneity, in the past, the industry between connectivity exist the inherent barriers, with the continuous development of enterprises, digital transformation makes the connection between enterprises and enterprises increasingly closely, thus drives the financing between the industry. At the same time, the innovative ideas generated by the internal organizational reform of enterprises can also break the inefficient cooperation under the old system. The management talents with digital ideas play a great role in promoting the efficient operation of enterprises, and play a huge endogenous role in the access and popularization of the big model of the Marine industry. However, only rely on the development of a single unicorn enterprise is not enough to drive the industry big model, the sophisticated model still need support from all walks of life, as a result, some forward-looking enterprises to establish open sharing platform, promote the depth of the innovation chain and industry chain fusion, technological innovation to support industry development, with key technology breakthrough leading industry transformation and upgrading.

4.3 Environment: macro-policy support and industry market orientation

In recent years, the National Development and Reform Commission, department of natural resources, the State Oceanic Administration and other ministries issued documents, aims to build wisdom, promote the digital transformation of Marine industry, including fiscal, tax, subsidies, policy support, such as Marine resources development technology innovation center in Lianyungang city, for industry innovation technology development, achievements, industry incubation services, promote the core competitiveness of the overall Marine industry in our country. According to the China artificial intelligence model map research report, the analysis results of China is currently in 14 provinces and cities regions have a large model research and development, Guangdong, Zhejiang, Shanghai and other places of the largest number of models, at the same time the four place is nearly three years the largest number of artificial intelligence server procurement region, show very obvious strong correlation, for large model development application provides important support. At the same time, local governments are also providing public intelligent computing power methods, providing more

UNDER PEER REVIEW

computing power support for the research and development of large models.

5.TECHNICAL IMPACT ANALYSIS OF THE LARGE MODEL OF MARINE INDUSTRY BASED ON T-TOE MODEL

In Marine industry model TOE framework analysis, we noticed that as technology as the main driving factor of the construction of the industry model to itself to its established conditions of iterative update cycle effect, makes the Marine industry model technology elements in the process of building in the innovation chain cycle. However, technology, as a double-edged sword, provides convenience and promotes industrial transformation. Therefore, based on the T-TOE analysis model, this study explores the impact and impact of the industry model on technology, organization and environment, and provides more comprehensive suggestions for the establishment of the industry model of the Marine industry.

5.1 T-T perspective: technology integration innovation and internal conflict

The establishment of industry foundation model can narrow the professional gap between various industries and create the technical knowledge gap, make industry integration more convenient through large-scale data training, and provide decision optimization with the paradigm revolution of production tools brought about by code generation and optimization (Zhang Hui et al., 2023)[11]. At the same time, due to the interaction of technology triggering cross-industry cross-innovation, the Marine industry segment field based on the industry big model can improve the personalized customization ability (Wang Xiaojun, 2022)[12]For example, the cross innovation of Marine energy and information technology, the application of information technology in the development of Marine energy, the use of big data analysis and intelligent control technology to optimize the operation efficiency of Marine energy equipment, improve the efficiency of energy utilization; the cross innovation of Marine tourism and virtual reality technology, the use of virtual reality technology to provide immersive experience for Marine tourism, through virtual reality glasses to allow tourists to experience the beauty of the underwater world at home.

However, the innovation of technology is often accompanied by a series of problems, including cross-domain coordination conflicts and patent problems, and the ownership of the results after heterogeneous resource integration innovation. Although artificial intelligence can provide decision support for managers, create industry application scenarios, and provide solutions, is there over-reliance and lack of innovation. In the process of massive data collection, where is data collection? How to ensure that privacy is not compromised? These practical problems have gradually become the endogenous risks of the industry big model, which need to be paid enough attention to.

5.2 T-O perspective: intelligent supply and demand matching and resistance to transformation

The emergence of large industry models can have a subversive effect on the operation mechanism of the Marine industry. On the one hand, the combination of large industry models and intelligent manufacturing can transform the production structure of the Marine industry from the past to the cloud multi-thread structure, reduce the production operation costs and improve the production efficiency; on the other hand, the Marine industry models can attract the related industry units to promote the formation of cross-border alliance and open platform, achieve the supply and demand matching of the overall intelligent docking, and release the productivity of the industry.

UNDER PEER REVIEW

However, the process of establishing a large model of the Marine industry will bring great challenges to the transformation resistance of the organizational structure and the cost of the transformation needs. Since the construction of the industry large model needs to fit the use scenarios of the specific industry, the adaptation of hardware and engineering issues such as technical standards and industrial equipment sensors need to consider the transformation cost affordability of the organization. In addition, whether the construction industry model will aggravate the digital divide among various sectors of the Marine industry is also a questionable question.

5.3 T-E perspective: multi-dimensional interactive innovation and enabling balance problem

The establishment of a large model of the Marine industry based on artificial intelligence can trigger human-computer interaction innovation and have a multi-dimensional impact on the overall social environment (Le Chengyi, Liu Yan, 2023)[13]For example, strong data analysis ability, rapid learning and training ability, and diversified module adaptation ability can connect various technical standards and form a unified docking window, which not only enables and upgrades various departments of the Marine industry, but also plays an important role in promoting digital city, intelligent public governance and other aspects. At the same time, an industry-university-research cooperation innovation network with technology as the link, enterprise linkage as the core and the university-enterprise research cooperation mode as the focus, so as to strengthen the positive driving effect of network scale effect on innovation performance (Guo Jianke et al., 2023)[14]。

However, with the continuous development of the industry model, will the ability to collect information and the construction intensity of the computing power base cause the information cocoon effect, thus forming the monopoly situation of the strong and the strong? At present, the big model of Marine industry is in the exploratory stage, the development degree of different countries and regions is not consistent, and the technical standard system established is different, so it is inevitable to have problems such as enabling barriers. The government and the industry should make reasonable planning and governance of the above problems to avoid the practical problems of interest imbalance.

6. CONCLUSION

Based on the TOE framework, this paper analyzes the influencing factors of the large model of the Marine industry, and found that from the perspective of technical factors, intelligent information technology plays the important role in promoting the construction of the large model with software and hardware level; from the perspective of organizational factors, the enterprise digital transformation and open sharing platform play an important role in supporting the construction of the organization; from the perspective of environmental factors, policy support and market orientation play an important role in encouraging the construction of the large model.

Moreover, on the basis of the establishment of the Marine industry model, this study puts forward a more comprehensive and in-depth technical impact and existing problems of the Marine industry model from the three dimensions of technology, organization and environment based on the research conclusions. The study found that from the perspective of positive promotion and internal conflict of T-T; from the perspective of T-O, there are positive and negative effect of intelligent supply and demand matching and transformation resistance; from

UNDER PEER REVIEW

the perspective of T-E; there are problems of positive promotion and enabling balance of multi-dimensional interactive innovation, which provide more comprehensive positive feedback factors for the construction of large model of Marine industry.

7. STRATEGY RECOMMENDATIONS

7.1 Strengthen the top-level design of collaborative development of large model of Marine industry

The construction of an intelligent Marine industry model is inseparable from the top-level planning guidance, To adhere to the 14th Five-Year Plan for Marine Economic Development, Give full play to the important guiding role of the national and local governments in building a modern Marine industrial system, With building a maritime power and developing a maritime economy as the core goal, To foster emerging technologies in the Marine industry, To promote the construction of the standard model of Marine industry, We will strengthen planning guidance and coordinated industrial development, To promote the Marine industry model of market-oriented policy support, Help the digital transformation of traditional Marine industries, Combing the strategic view of the development of the large model, Build an innovative Marine industry ecological base, We will explore new models for the development of the Marine industry.

7.2 Accelerate the integration of innovation in science and technology in the Marine field

At present, the technological innovation in the field of Marine has become the key competition areas, on the one hand, we must speed up the key core technology breakthrough, technical support the Marine industry innovation change, aimed at high-end frontier breakthrough technology blockade, improve production technology conversion, structures for Marine industry infrastructure network, build by 5G communication technology, cloud technology of base, for the Marine industry model provide data source and force, with massive data resources to strengthen the model learning training depth, to provide comprehensive solutions (Wang Zhuohao, etc., 2023)[15]; On the other hand, we should promote the deep integration of innovation chain and industrial chain, improve the circular iteration mechanism of innovation elements in the whole industrial chain, trigger cross-field innovation by arrangement and patchwork of technical resources, improve the customized service ability of Marine industry model, and drive the development of Marine industry to high-end, clustering and digital intelligence. Taking the Marine industry of Lianyungang as an example, Lianyungang will play its advantages in Marine fishery, transportation, coastal tourism and other industries. Select the leading or key enterprises in the industry to carry out the pilot demonstration work, and the government functional departments will regularly hold digital transformation promotion meetings, select demonstration enterprises and demonstration projects, and focus on building benchmark enterprises in the digital transformation of the city's Marine industry. We will build characteristic software industrial parks around national high-tech zones, constantly improve our software innovation capabilities, strengthen breakthroughs in artificial intelligence, big data, cloud services and other technological fields, cultivate a number of listed enterprises and local "little giant" enterprises, and encourage and guide them to continue to penetrate into the Marine industry.

7.3 Strengthen the agglomeration effect of the digital composite Marine industrial system

UNDER PEER REVIEW

China's Marine digital talents are faced with the relative saturation of traditional Marine industry talents, and the shortage of emerging Marine industry talents and compound talents. Compound Marine talents should not only have Marine professional discipline accomplishment, but also have the knowledge of industry and economy. However, the ability and quality of the existing Marine talents cannot meet the relevant job requirements, which hinders the development of various Marine undertakings to a large extent. Need to strengthen the construction of Marine research platform, aiming at Marine science and technology frontier, the introduction of the world's leading Marine research strength, promote innovative research institutions in coastal base, play a Marine research center coordination function, condensed key universities and research institutions of Marine science and technology resources, promote the combination, provide human resources for Marine development. With Marine equipment, deep-sea development, Marine Internet of things industry as the key point, targeted to introduce related talents and high-tech industries, recruiting and training a group of young engineers and technical workers, build the international first-class talent team and high-end industrial park, promote Marine science and technology innovation level, improve the level of Marine comprehensive management (Tan Yusong, etc., 2023)[16]。

7.4 Establish and improve the large model guarantee mechanism of Marine industry

It is necessary to establish a balanced multi-dimensional target system between the government and Marine industry to ensure the balanced development of AI governance in value, order, innovation and technology, invest in digital infrastructure, provide low-cost Internet access services, improve social security system, strengthen education and vocational supervision, ensure no discriminatory results in data processing process; improve the identification and positioning of technical risks, and conduct in-depth analysis of AI through interdisciplinary research to provide strong support for the development of more comprehensive governance strategies. Corresponding technical standards and specifications shall be formulated in terms of data security, privacy protection, algorithm transparency and interpretability, and the needs and interests of all stakeholders shall be fully considered (Rong Zhi, Ren Chenyu, 2023)[17]. Establish an effective and fair liability compensation mechanism to ensure that the affected parties receive timely relief and compensation. Adjust the standards and specifications timely to adapt to the changing technological environment.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

REFERENCE

[1] Liu Tao, Wu Fan, Gao Qiang, etc. Efficiency measurement and spatial optimization of collaborative innovation in Marine high-tech industry [J]. Statistics and Decision-making, 2021,37 (06): 109-112.

UNDER PEER REVIEW

[2] Minamata fly. Analysis of the influence of industrial agglomeration on the efficiency of Marine industry [J]. Economic and Management Review, 2022,38 (02): 147-158.

[3] Ji Yujun, Feng Fan, Feng Kuo. The factor crowding effect of Marine manufacturing industry agglomeration [J]. Resource Science, 2023,45 (04): 786-799.

[4] Hesley R W,Strange W C.Coagglomeration,clusters ,and the scale and composition of cities[J].Journal of Political Economy,2014,122(5):1064-1093.

[5] Zhao Chaoyang, Zhu Guibo, Wang Jinqiao. ChatGPT Enlightenment brought to the language large model and the new development ideas of the multimodal large model [J]. Data Analysis and Knowledge Discovery, 2023,7 (03): 26-35.

[6] Fu Kaibao, Ding Zhengrate, Guo Yuhua. Digital economy, industrial upgrading and high-quality development of Marine economy [J]. Price Theory and Practice, 2022 (05): 78-81 + 205.

[7] Liu Cong, Li Xin, Yin Bing, etc. Status, practice and thinking of large model technology and industrial —— [J]. Artificial Intelligence, 2023 (04): 32-42.

[8] Utterback J M.The process of technological innovation within the firm[J].A cademy of management Journal,1971,14(1)75-88.

[9] Chen Sheng, Liu Zijun, Zhang Nan. The influence of generative AI in the digital age and governance policy orientation in the digital age [J / OL]. Scientific research: 1-21 [2023-11-05].

[10] Gou Lufeng, Wang Ning. The influence of digital technology on the ecol ogy of Marine industry —— Take Qingdao city as an example [J]. Marin e Development and Management, 2023,40 (09): 110-116.

[11] Zhang Hui, Liu Peng, Jiang Jun, etc. ChatGPT: From technological innov ation to paradigm revolution [J / OL]. Scientific research: 1-15 [2023-11-0 5].

[12] Xiao-jun wang. Discussion on the technology innovation effect of digitaliz ation on the service of embedded circulation [J]. Business Economics Rese arch, 2022 (18): 178-180.

UNDER PEER REVIEW

[13] Le Chengyi, Liu Yan. The impact of digital business environment on the digital transformation of enterprises from the perspective of enabling power [J / OL]. Journal of Chongqing University of Technology (Social Science s): 1-14 [2023-11-11].

[14] Guo Jianke, Tian Dongcui, Hu Kai. Evolution of industry-university-research cooperation innovation network and innovation performance in China's Marine industry [J]. Tropical Geography, 2023,43 (09): 1712-1725.

[15] Wang Zhuohao, Zeng Wen, Li Fang, etc. Thoughts on the construction of industrial data resources under the new situation [J / OL]. Information Theory and practice: 1-7 [2023-11-11].

[16] Tan Yusong, Ren Baoping, Shibo. Research on the effect of artificial intelligence on industrial co-agglomeration [J]. Economist, 2023 (06): 66-77.

[17] Rong Zhi, Ren Chenyu. AI's social security risks and their governance path [J / OL]. Journal of Guangzhou University (Social Science Edition): 1-12 [2023-11-11].

[18] Rong Ke, Kang Zhengyao, Luo Yining. Large Model Empowering All Walks of Life:Ecological Business Models [J]. China Social Science Review, 2023, (04): 38-46 + 156.

[19] Liu He, Ren Yili, Li Xin, et al. Research status and prospect of application model of artificial intelligence in oil and gas industry [J]. Petroleum exploration and development, 2024,51 (04): 910-923.

[20] Zhang Tao, Chen Zhibin.The Path Exploration of Blue Economy to Realize Green Development——Configuration Analysis Based On TOE Framework [J]. Journal of Guizhou University of Finance and Economics, 2024, (04): 90-98.

[21] Lin Yan, Mian Junmin. The Driving Force and Realization Path of Digital Transformation in Manufacturing Enterprises:a Case Study Based on TOE Framework [J]. Journal of Management, 2023,36 (05): 96-113.

[22] Liu Peide, You Xinli. Research on Selection of the Offshore Platform Based on Entropy Weight and Extended ELECTRE Method [J]. Economic and

UNDER PEER REVIEW

Management Review, 2017,33 (03): 53-59.

[23] Wang Chunjuan, Wang Qi, Liu Dahai, et al. Co-integration Analysis on China Marine Science and Technology Innovation,Transformation and Upgrading of Marine Industrial Structure and Marine Economic Development Based on ARDL Model [J]. Science and Technology Management Research, 2021,41 (24): 136-142.

[24] Bi Chongren, Zhao Yun, Ji Xiaonan. Research on the Effectiveness of Marine Industry Policy Based on GRA-DID Method [J]. Scientific Decision making, 2019, (05): 79-94.

[25] Lv Jianhua, Luo Ying. Research on innovation of Marine Environment Management System in China [J]. Environmental protection, 2017,45 (21): 32-37.

UNDER PEER REVIEW