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Research on Optimization Strategies for United Front Work for Returned Overseas Scholars in Marine-Focused Universities Empowered by Big Data

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Abstract

Returned overseas scholars in marine-focused universities constitute a high-end talent group underpinning marine scientific and technological innovation and serving the strategy of building a powerful maritime nation, and stand as key targets of united front work in universities in the new era. Current united front work targeting returned scholars in marine-focused universities is confronted with practical challenges including vague profiling of talent pools, homogenized ideological guidance, insufficient precision in service guarantee, and weak risk prediction capacity. Conventional manual, static and experience-driven working modes can hardly meet the growth and development needs of high-end marine-related talents. Boasting technical strengths in full-domain integration, intelligent analysis, dynamic early-warning and precise matching, big-data technology offers brand-new empowering pathways for the digitalization and precision transformation of university united front work. Combining the disciplinary characteristics of marine-focused universities and the group features of returned overseas scholars, this paper analyzes the internal logic and practical dilemmas of big-data-empowered united front work. Targeted optimization strategies are proposed from five dimensions: data infrastructure construction, targeted ideological guidance, refined service guarantee, long-term mechanism establishment, and ideological risk prevention and control. It aims to facilitate the transformation of united front work in marine-focused universities from "extensive management" to "smart governance", fully rally high-end returned marine talents to serve high-quality national marine development.

Subject Areas

Oceanology

Keywords

Big Data, Marine-Focused Universities, Returned Overseas Scholars, United Front Work, Precise Governance

1. Introduction

United front work in the new era highlights digital empowerment, targeted policy implementation and regular solidarity. As a major front for united front practice, universities shoulder the vital responsibility of uniting and guiding high-level intellectuals and returned overseas talents. In this paper, "marine-focused universities" refers to higher education institutions whose disciplinary layout is primarily oriented toward marine science, ocean engineering, marine ecology, polar and deep-sea research, and related fields. These include comprehensive marine universities (e.g., Ocean University of China), industry-specific maritime institutions (e.g., Dalian Maritime University, Dalian Ocean University, and the marine-related disciplines of Harbin University of Science and Technology), as well as marine colleges or marine research platforms within comprehensive universities. Institutions without a distinct marine disciplinary cluster are excluded from the scope of this study. "Returned overseas scholars" refers to faculty and researchers who have obtained a degree or completed postdoctoral or visiting research abroad for no less than one year, have returned to work in a marine-focused university, and hold a full-time academic or research position. Short-term exchange visitors and visiting students are not included unless they hold a formal faculty appointment. Centering on national strategic fields such as marine science, ocean engineering, marine ecological governance, polar and deep-sea research, returned overseas scholars from marine-focused universities generally feature broad international vision, cutting-edge research expertise, frequent foreign-related academic exchanges and prominent disciplinary barriers. They represent core human resources for tackling "bottleneck" technologies in marine sectors, advancing marine industrial upgrading, and participating in global ocean governance[1].

2. Practical Dilemmas of United Front Work for Returned Overseas Scholars in Marine-Focused Universities

This paper is a conceptual study. The four dilemmas identified below are synthesized from existing literature on university united front work and from publicly available reports and policy documents concerning marine-focused universities. They are presented as analytical categories rather than as empirically verified findings for all marine-focused universities. Where a specific institution is cited, it serves as an illustrative example rather than as evidence of a sector-wide pattern.

[1]https://www.gov.cn/zhengce/2021-01/05/content_5577289.htm

2.1. Fragmented Data Resources and Inadequate Dynamic Mastery of Talent Information

At present, united-front-related information in marine-focused universities is scattered across multiple departments such as human resources, scientific research, international exchanges and secondary schools. Inconsistent data standards among different systems and prominent information barriers prevent the formation of a unified united-front-oriented data pool. Existing ledgers mostly record static basic information such as educational background, age and overseas institutions, yet lack dynamic core data covering research orientations, project achievements, foreign-related exchanges, ideological trends and development demands. Meanwhile, data updating mainly depends on manual collection, which features severe time-lag and high omission rates. It is difficult to draw an accurate holistic portrait of returned marine talents, resulting in unclear talent profiles and untargeted united front work.

This pattern is reported across multiple universities in the existing literature; however, the degree of data fragmentation varies with each institution's smart-campus infrastructure and administrative structure. The claim here is therefore an analytical generalization rather than a uniform empirical finding.

2.2. Rigid Ideological Guidance Modes and Poor Adaptation to Features of Marine-Related Talents

Returned overseas scholars from marine-focused universities are long engaged in international marine academic exchanges and exposed to diverse overseas ideological trends, hence holding more independent and open value perceptions. Great disparities exist in their cognitive structures and growth backgrounds, so general publicity and education can hardly yield satisfactory outcomes [1]. Nevertheless, current ideological guidance for united front work mostly adopts conventional forms such as unified theoretical lectures and group learning, marked by homogenized content and monotonous formats. Specialized content integrated with the strategy of building a powerful maritime nation, marine disciplinary development and global ocean governance is insufficient. General-purpose publicity and education modes fail to fit the characteristics of high-end research talents who prioritize practice and expertise over formalities, leading to limited appeal and penetration of ideological guidance. For reference, several marine-focused universities have explored specialized paths for ideological guidance. Ocean University of China integrates cultural value orientation with united front work elements. It carries out practices centering on "optimizing cultural supply, constructing cultural pedigree, expanding cultural space and building cultural symbols", produces united-front-themed programs Tongxin Haidayuan, and holds an immersive maritime music Party lecture aboard the research vessel Dongfanghong 3 themed "Spirit of the Red Boat and Blue Dream" [2]. Such practices that combine marine scenarios with ideological guidance provide practical references for "content-scenario matching" under big-data empowerment [3], yet fall short of achiev-

ing in-depth goals of value guidance and ideological cohesion.

The Ocean University of China case illustrates a specialized approach rather than a general solution; its transferability to other marine-focused universities requires further verification.

2.3. Extensive Service Support and Low Matching Degree for Talent Demands

Marine scientific research is characterized by long cycles, high investment, strong practicality and frequent external cooperation. Returned overseas scholars have diversified and individualized demands concerning research resource access, industry-university-research transformation, international academic exchanges, career development and living guarantees. However, existing united-front services in universities are mostly inclusive and unified, lacking hierarchical and categorized targeted service mechanisms. Without data support, universities cannot accurately identify differentiated demands of talents of different age groups, research orientations and development stages. The mismatch between service supply and actual talent demands impedes talent retention and career support [4].

This mismatch is documented in general higher-education literature; marine-specific empirical evidence remains limited, and the Dalian Ocean University case cited in Chapter III represents a localized service innovation rather than a sector-wide model.

2.4. Weak Risk Prevention-and-Control Capacity and Delayed Early Warning for Ideological Risks

Frequent foreign-related research cooperation, international academic seminars and cross-border exchanges in marine sectors grant returned overseas scholars extensive access to overseas information sources, rendering them vulnerable to infiltration by erroneous overseas ideological trends and one-sided public opinions. Traditional risk prevention and control for united front work relies on manual inspection and post-event disposal, lacking regular and intelligent public-opinion monitoring and ideological trend early-warning mechanisms. Potential ideological risks and hidden public-opinion hazards cannot be captured in a timely manner, resulting in insufficient capacity for risk prediction and pre-emptive intervention.

Evidence for delayed risk early-warning is largely derived from general united front work literature; empirical data on marine-specific ideological risks are scarce, and the risk categories discussed here require the legal and procedural safeguards specified in 4.5 [5].

3. Internal Logic and Value Advantages of Big-Data-Empowered United Front Work in Marine-Focused Universities

Existing research proposes that digital-intelligence empowerment operates through

three core mechanisms: data-driven operation, resource integration, and intelligent decision-making, which together transform the cognitive paradigm, organizational form, and decision-making mode of united front work in universities. This chapter adopts these three mechanisms as its analytical framework. Specifically, data-driven operation underpins the integration of full-domain data (3.1); intelligent decision-making underpins portrait analysis and targeted guidance (3.2); and resource integration, combined with data-driven operation, underpins demand prediction and refined service support (3.3). Real-time monitoring for risk prevention (3.4) extends the intelligent decision-making mechanism to the domain of ideological security [6].

3.1. Full-Domain Data Integration for Accurate Profiling of United-Front-Related Talent Pool

Big-data technology can break inter-departmental information barriers and integrate multi-dimensional information including human-resource data, research data, foreign-related exchange data, online behavioral data and demand feedback data. A full-coverage and dynamic database for returned overseas scholars can be constructed to integrate static and dynamic information, addressing the fragmentation, time-lag and one-sidedness of traditional united-front data and laying a data foundation for targeted united front work. This process embodies the core logic of the "data-driven" mechanism: based on collection and integration of full-domain data, united front work shifts from "empirical judgment" to "data-based cognition".The"3 + 2"information collection model practiced by Harbin University of Science and Technology offers operable references for marine-focused universities to build dynamic talent databases.The"3"refers to three categories of core information(basic identity information, dynamic development information and work-process information)for establishing fundamental ledgers; the"2"stands for two basic principles: demand-oriented collection to avoid duplication, and dynamic connection for timely updates [7].

Among the data categories listed above, human-resource and research-output data are generally available in existing university systems; online behavioral data and demand-feedback data, by contrast, require new collection channels and explicit consent procedures, and are therefore treated here as a medium-term rather than immediate capability.

3.2. Intelligent Portrait Analysis for Targeted Ideological Guidance

Based on big-data modeling and tag-based analysis—and drawing on the technical logic of generative AI in united front work—universities can generate indicative assessments of ideological trends, hot topics of concern, learning preferences and cognitive traits of returned overseas scholars, and on this basis produce personalized talent portraits. Relying on portraits, hierarchical and categorized marine-themed ideological guidance content can be customized, replacing the traditional

"flood-irrigation-style" publicity and education with "tailored, precise drip-irrigation" and substantially improving the pertinence and effectiveness of ideological guidance [8]. This path corresponds to the "intelligent decision-making" mechanism: data serves not as an end in itself, but as a means to realize targeted decision-making. Practices including maritime music Party lectures and united-front cultural pedigree construction at Ocean University of China demonstrate that ideological guidance achieves stronger appeal when content is deeply integrated with marine scenarios and disciplinary features. The value of big-data portraits lies in enabling united-front workers to identify which returned talents are suitable for themed research trips on "marine rights and interests" and which for case sharing on "scientific research for national rejuvenation", so as to realize precise matching between content supply and individual demands.

Intelligent portrait analysis is technically feasible where tag-based data exist, but its predictive validity for ideological trends remains untested in the marine-focused university context.

3.3. Dynamic Demand Prediction for Refined Service Support

Big-data technology enables real-time tracking of talents' research progress, career trajectories and changes in demands. Potential development needs can be predicted via data analysis, and marine research projects, experimental platforms, industry-university-research resources and international exchange channels can be proactively matched. United-front services are thus transformed from "passive response" to "proactive empowerment", satisfying specialized development needs of high-end marine talents. Dalian Ocean University co-founded the Dalian Haichuang Concentric Service Center with Dalian Overseas-Returned Scholars Association to "integrate university-local resources and empower marine industrial upgrading" and provide targeted services for returned overseas scholars This practice proves that accurate understanding of talent demands constitutes the premise of service precision, for which big-data technology serves as a technical enabler [9].

Dynamic demand prediction is presented as a design objective rather than a demonstrated capability; its accuracy depends on the completeness and timeliness of demand data.

3.4. Real-Time Dynamic Monitoring for Pre-Emptive Risk Prevention and Control

Big-data-enabled public-opinion monitoring and behavioral early-warning technologies are designed to support all-weather monitoring of legally defined risk categories, including suspected foreign interference, espionage, and the dissemination of illegal content. Where such risks meet reviewable legal criteria, they can be identified at an early stage to enable timely warning and intervention, thereby consolidating the ideological security defense line for united front work in marine-focused universities. It should be emphasized that international academic exchange, scholarly disagreement, and critical professional opinion do not by them-

selves constitute ideological risks and must not be classified as such by the monitoring system.

Meanwhile, risk prevention and control must be compliance-based. China's data governance framework is primarily defined by the Data Security Law of the People's Republic of China (2021), the Personal Information Protection Law of the People's Republic of China (2021), the Cybersecurity Law of the People's Republic of China (2016), and the Cryptography Law of the People's Republic of China (2019), together with the Ministry of Education's Guidelines for Classification and Grading of Educational Data. When constructing intelligent risk-control systems, marine-focused universities shall establish authorization mechanisms for data collection, clearly inform individuals of the purpose, scope and mode of data utilization, and strike a balance between technological empowerment and privacy protection.

Real-time monitoring capability is described at the level of system design; actual deployment requires compliance review and may be limited by legal and ethical constraints discussed in 4.5.

4. Optimization Strategies for Big-Data-Empowered United Front Work for Returned Overseas Scholars in Marine-Focused Universities

4.1. Construct a Unified Data Platform and Build a Dynamic Talent Database

This strategy operationalizes the "data-driven" mechanism outlined in 3.1. Its distinct contribution is a phased feasibility path: Phase 1 connects existing human-resource, research and international-exchange data interfaces to achieve dynamic aggregation of basic and research data; Phase 2 adds ideological-trend and demand-feedback data, subject to the consent and authorization rules specified in 4.5. This sequencing avoids the feasibility risk of large-scale one-off investment.

4.2. Innovate Digital Guidance Carriers and Develop a Marine-Themed Ideological Education System

This strategy operationalizes the "intelligent decision-making" mechanism outlined in 3.2. Its distinct contribution lies in marine-themed content and scenario design: for content, it draws on Ocean University of China's maritime music Party lectures that deliver ideological-political content through marine real-world scenarios; for scenario, it draws on the patriotic education base for non-Party intellectuals aboard the vessel Yukun of Dalian Maritime University, transforming research and training vessels into real-world classrooms for ideological guidance [10].

4.3. Precisely Match Resources and Demands and Build a Refined Service Empowerment System

This strategy operationalizes the "data-driven operation + resource integration"

synergy outlined in 3.3. Its distinct contribution is the closed-loop demand-response platform, which links intelligent collection, precise distribution, time-limited settlement and satisfaction evaluation into a single operational cycle, and connects internal research resources with external industrial transformation channels through algorithm-driven matching.

4.4. Improve Digital United-Front Mechanisms and Establish a Sound Long-Term Operation System

Existing studies propose establishing a sound digital united front work mechanism in universities and incorporating indicators such as information update rate, activity participation rate, and demand settlement rate into the annual assessment of united front work at the school and department levels [11]. Marine-focused universities may add differentiated indicators such as "service efficiency for foreign-related exchanges" and "timeliness of disposal for marine-sector ideological risks" on this basis.

4.5. Build an Intelligent Risk-Control System and Consolidate the Ideological Security Defense Line

Construct a marine-sector-specific intelligent risk-monitoring and early-warning system limited to legally defined risk categories, such as suspected foreign interference, espionage, and the dissemination of illegal content. The system shall apply reviewable legal criteria and human review before any risk is confirmed, and shall not classify international academic exchange, scholarly disagreement, or critical professional opinion as ideological risks. Establish a hierarchical and categorized risk-disposal mechanism that distinguishes timely guidance for confirmed violations, pre-emptive measures for reviewable risks, and rapid response to emergent incidents. Strictly implement united-front data security management systems, standardize procedures for data collection, storage and utilization, safeguard personal privacy of talents under the notice-and-consent rule, and build a safe, controllable, standardized and orderly digital united-front ecosystem [12].

This strategy operationalizes the "real-time dynamic monitoring" logic outlined in 3.4, under the compliance conditions specified there. Its distinct contribution is a marine-sector-specific risk-disposal mechanism: a hierarchical and categorized response that distinguishes timely guidance for confirmed violations, pre-emptive measures for reviewable risks, and rapid response to emergent incidents. All procedures operate within the legal framework set out in 3.4 and abide by the "notice-and-consent" rule.

4.6. Summary of Correspondence between Empowerment Logic and Strategies

As shown in **Table 1**, the optimization strategies empowered by big-data have clear correspondences with empowerment logics and core operating mechanisms. All practical strategies are anchored in relevant empowerment principles and

jointly form a complete logical framework for work optimization.

Table 1. Summary of corresponding relationships.

Empowerment Logic (Chapter III)	Corresponding Strategies (Chapter IV)	Core Mechanism
Full-domain data integration for accurate talent profiling	4.1. Construct a Unified Data Platform	Data-driven operation
Intelligent portrait analysis for targeted ideological guidance	4.2. Innovate Digital Guidance Carriers	Intelligent decision-making
Dynamic demand prediction for refined service support	4.3. Precisely Match Resources and Demands	Data-driven operation + Resource integration
Real-time dynamic monitoring for pre-emptive risk prevention and control	4.5. Build an Intelligent Risk-Control System	Intelligent decision-makin + Risk early-warning
Long-term mechanism guarantee	4.4. Improve Digital United-Front Mechanisms	Institutionalization of the three major mechanisms

5. Conclusions

Returned overseas talents in marine-focused universities constitute precious strategic human resources for implementing the strategy of building a powerful maritime nation, breaking key core marine-technology bottlenecks and developing modern marine industries. They also represent key groups to be united, guided and served by university united-front work. Against the backdrop of advancing Digital China initiative, introducing big-data technology into united front work is far more than simple addition of technical tools; instead, it signifies holistic transformation in work mindsets, governance modes and operation systems.

United front work for returned overseas scholars in marine-focused universities is still constrained by multiple practical obstacles including fragmented and isolated data, disconnection between ideological guidance and industrial features, mismatch between service supply and talent demands, and insufficient pre-emptive early-warning for ideological risks. Conventional static ledger-based and experience-judgment-driven united-front modes can hardly adapt to group characteristics of high-end returned marine talents: high internationalization, strong research practicality, and diverse and open ideological perceptions. Boasting unique strengths in full-domain data aggregation, intelligent portrait assessment, dynamic demand prediction and real-time risk early-warning, big-data technology provides feasible technical approaches to address the above-mentioned practical dilemmas. Theoretically, such empowerment follows the underlying mechanism of "data-driven operation—resource integration—intelligent decision-making". Its essence lies in promoting paradigm transformation of united front work from experience-based governance to smart governance through enhanced data capacity.

Promoting big-data-empowered united front work for returned overseas scholars in marine-focused universities should avoid one-sided pursuit of platform construction and technical over-engineering. It must adhere to the fundamental principle of Party leadership and balance technical efficiency and talent privacy

security. On one hand, consolidate the data foundation for digital united-front work, break inter-departmental data barriers within universities, and establish dynamically-updated digital portrait systems for returned talents. On the other hand, develop hierarchical and categorized ideological-guidance modes based on marine disciplinary features, provide proactive and targeted services covering research development, career growth and daily-life needs. Improve supporting institutional mechanisms, construct an intelligent ideological risk-prevention-and-control system adapted to marine foreign-related scenarios, and strictly abide by legal frameworks including the Data Security Law of the People's Republic of China and the Personal Information Protection Law of the People's Republic of China. Transform united-front work from "extensive management" to "smart governance" and from "passive response" to "proactive solidarity".

It should also be recognized that big-data technology is merely an empowering instrument. The essence of united front work remains people-oriented practice. Digital construction shall avoid formalism that prioritizes technology over humanity and platforms over practical outcomes. On the basis of data analysis, flexible united-front approaches such as offline heart-to-heart talks, academic associations and practical research trips should be coordinated to integrate technological empowerment with emotional cohesion. Only by translating technological advantages into effectiveness of ideological guidance and tangible talent-service outcomes can universities better unite and rally returned overseas scholars in marine-focused universities, guide them to integrate personal research aspirations into national marine-undertaking development, and pool strong talent resources and intellectual strength for marine scientific-technological innovation, high-quality marine-economic development and full implementation of the strategy of building a powerful maritime nation.

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Author Contributions

Hongpeng Zhang: Conceptualization, Supervision, Writing—review and editing; Yongchen Huo: Methodology, Formal analysis, Writing—original draft; Xiaozheng Duan: Data curation, Investigation.

Conflicts of Interest

The authors declare no conflicts of interest.

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