Studies in Social Science Research
ISSN 2690-0793 (Print) ISSN 2690-0785 (Online)
Vol. 6, No. 2, 2025
www.scholink.org/ojs/index.php/sssr

Original Paper

Research on the Internationalization Strategy of the Remote Sensing Satellite Industry: A Multi-Dimensional Perspective Based on Human Resources, Finance, and Foreign Affairs

Bo Peng

China Siwei Surveying and Mapping Technology Co., Ltd. Beijing 100089, China

Abstract

Against the backdrop of a reshaped global geopolitical landscape and the deep integration of commercial space activities, remote sensing satellite enterprises are entering a critical period of strategic transformation. Based on the author's years of practical experience in the international operations of remote sensing companies, this paper focuses on three key management dimensions: human resources organization, financial operations, and foreign affairs channels. It identifies core challenges in the current international market and explores responsive mechanisms. The paper proposes a "Technology–Market–Politics" collaborative framework, emphasizing the importance of cross-departmental coordination in enhancing global resilience. Particularly in remote sensing cooperation along the Belt and Road countries, a single technical capability is insufficient to support complex projects. Instead, a stable international cooperation system must be built upon multidisciplinary talent, dynamic financial mechanisms, and diversified diplomatic strategies. This study aims to provide practice-based strategic insights for Chinese commercial space enterprises going global, while also offering empirical support and real-world interpretation for the management theory of remote sensing space activities.

Keywords

Remote Sensing Satellite, Internationalization Strategy, Cross-border Management, Geopolitics, Commercial Space Industry

1. Background and Overview of the Current Situation

In recent years, the global commercial space industry has entered a phase of rapid development, with space-based information services—represented by remote sensing satellites—transitioning from military dominance to civilian applications and evolving from single-source data provision to multi-scenario integration. As remote sensing imagery finds extensive applications in agricultural monitoring, urban planning, disaster early warning, and energy resource exploration, an increasing number of countries now regard remote sensing capabilities as a critical component of national digital sovereignty and

security. Against this backdrop, Chinese remote sensing enterprises have established a foundation for "going global" in terms of technological iteration, cost control, and engineering capabilities, actively seeking to participate in the global market through satellite exports, data services, or joint launches.

However, amid dramatic shifts in the global geopolitical landscape, Chinese remote sensing companies face multiple challenges in their international expansion. On one hand, the Western-dominated remote sensing industry has erected implicit barriers for Chinese enterprises in technology, standards, and market access—particularly in high-end markets such as North America and Europe, where political risks and sensitive data regulations are significantly heightened. On the other hand, while emerging markets in the Middle East, Africa, and South Asia exhibit strong demand, these regions often grapple with policy instability, insufficient payment capacity, and weak local operational capabilities, leading to high uncertainty in remote sensing collaborations. Additionally, challenges such as cross-cultural personnel management, financial coordination complexities, and high diplomatic engagement costs have become critical bottlenecks hindering the execution of remote sensing enterprises' internationalization strategies. Therefore, there is an urgent need to explore a systematic transnational management approach from a practical perspective to enhance corporate resilience and strategic adaptability in an increasingly complex global environment.

2. Global Remote Sensing Market Landscape and Geopolitical Dynamics

2.1 Structure and Evolution of the Global Remote Sensing Market: High-Resolution Imaging, Big Data Processing, and AI-Driven Extraction Trends

With ongoing advancements in remote sensing technologies, the global market is transitioning from providing single-source imagery to offering integrated solutions combining “data + intelligent services.” High-resolution remote sensing satellites are becoming a focal point in national strategies, with spatial resolution increasing from the meter level to sub-50 cm, and even reaching the 30 cm level or higher. These advances greatly enhance Earth observation capabilities and expand application scenarios.

This evolution meets the needs of military reconnaissance, urban governance, and agricultural monitoring, while also opening up broader avenues for commercial remote sensing. At the same time, the integration of big data and AI technologies within the remote sensing field is accelerating. The ability to rapidly acquire, process, and automatically interpret massive remote sensing datasets—often via cloud platforms—has become a key competitive advantage. Traditional manual interpretation is increasingly being replaced by AI-driven models.

Applications such as disaster response, target recognition, and change detection are significantly enhanced by machine learning and deep learning algorithms, boosting both the efficiency and responsiveness of remote sensing services. Leading enterprises and research institutions are shifting from “selling data” to “selling results” or even “selling decisions,” by developing industry-specific algorithm libraries and customizable service modules.

In this context, future market entry barriers will not only involve satellite manufacturing and launch capabilities but will increasingly revolve around data ecosystem development, algorithmic superiority, and systems integration capabilities. For Chinese remote sensing enterprises to establish a strong foothold in international markets, they must accelerate their strategic shift "from hardware to software"—enhancing not only resolution and revisit rates but also expanding downstream operations within the value chain, including algorithm modeling for specific scenarios, localized data processing, and the development of robust cloud service platforms.

2.2 Comparative Analysis of Major Remote Sensing Powers: Maxar, Airbus, and Opportunities for Chinese Enterprises

In the current global remote sensing market, North American and European enterprises maintain dominance in both technology and market presence. Maxar Technologies and Airbus Defence and Space represent two typical models of remote sensing commercialization in the U.S. and Europe, respectively. Maxar, with its WorldView and GeoEye series of high-resolution satellites, has established a remote sensing data supply system centered on U.S. national security. Its core competitive edge lies in its deep integration with the U.S. government, particularly intelligence agencies such as the National Geospatial-Intelligence Agency (NGA), which ensures stable, long-term procurement contracts. This structure supports sustainable cash flow, constant upgrades, and the elevation of its remote sensing data to a quasi-public good on a global scale. Maxar also supplies imagery services to civilian platforms such as Google Earth and Esri, achieving a dual-driving force of commercial and strategic growth.

In contrast, Airbus emphasizes system diversification and a government-led procurement model. Its Pleiades and SPOT series cover medium- to high-resolution data demands, serving multiple European governments and international organizations. Airbus's remote sensing business is deeply embedded in livelihood-focused areas such as agriculture, maritime affairs, urban planning, and environmental monitoring, reflecting a strong "non-military" orientation.

Although Chinese enterprises have narrowed the gap with Western competitors in hardware manufacturing and satellite constellation deployment—and may even hold cost and launch advantages—they still lag significantly in areas such as global service networks, engagement with high-end clients, image interpretation systems, and international discourse power.

A promising entry point lies in deepening penetration into "Global South" markets. Through the Belt and Road Initiative, development of foundational remote sensing capacity in developing countries, and government-to-government (G2G) cooperation, Chinese enterprises can exchange market access for strategic space. This could be further supported by cultivating local talent, deploying regional data centers, and exporting algorithm platforms to build system integration and service capabilities, thus increasing brand stickiness in emerging markets.

2.3 Geopolitical Constraints and the Restructuring of Space Resources and Remote Sensing Applications

In an era of intensifying global strategic competition, remote sensing satellites have become key instruments of national security and data sovereignty. They are now focal points in geopolitical

contention. The U.S. and EU have implemented strict export controls through frameworks like the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR), placing restrictions on key components, image processing software, and encrypted communication devices within remote sensing satellites. These regulations serve as a de facto "invisible ceiling" for Chinese enterprises.

Even with full in-house manufacturing capabilities, Chinese firms must still grapple with external restrictions in areas like camera chips, attitude control devices, and encryption modules. Additionally, remote sensing data itself is increasingly being designated as a “strategic national resource.” Many countries now require that foreign-acquired data be processed locally or prohibit cross-border data transfers altogether. These sovereign mandates have transformed remote sensing from a purely commercial activity into one that must be closely aligned with foreign policy and national security agendas.

As a result, the logic underpinning remote sensing application development is undergoing a fundamental shift—from a globalized supply chain model toward a regionally self-sufficient and domestically embedded one. Sovereign control and local deployment are becoming essential.

In this context, international cooperation is trending toward bilateral or mini-multilateral arrangements. Chinese remote sensing enterprises must closely coordinate with overseas embassies and foreign affairs departments, proactively identify political sensitivity points, and establish cross-departmental response mechanisms. Moreover, flexible yet secure policy frameworks must be developed for data transmission, ground station construction, and ownership of image interpretation rights. Only by ensuring political and institutional security can remote sensing companies operate sustainably and form durable international partnerships in geopolitically sensitive areas.

3. “Three-Axis Integration” Management Practice: Personnel, Finance, and Foreign Affairs Mechanisms in International Operations

In the process of Chinese remote sensing enterprises “going global,” traditional linear business expansion strategies are no longer sufficient to cope with today’s highly complex and dynamically evolving international market. To establish a stable presence in overseas environments marked by intricate political, economic, and cultural factors, companies must build an integrated management mechanism based on the three axes of **personnel, finance, and foreign affairs**. This mechanism should enable cross-departmental coordination, intercultural communication, and cross-institutional adaptability.

3.1 Personnel Axis: International Talent Organization and Localized Collaboration

Human resources management plays a crucial role in the internationalization of Chinese remote sensing enterprises—not only influencing the efficiency of technical deployment but also directly determining organizational resilience and market adaptability. In emerging markets such as the Middle East and Africa, complex cultural backgrounds and organizational systems present the primary "soft barriers"

Chinese enterprises face. Thus, a shift from "technology-driven dispatch" to "localized collaboration and integration" has become a strategic necessity.

(1) Cross-Cultural Management Challenges in the Middle East and Africa

The Middle East and Africa represent strategic frontiers for the overseas deployment of remote sensing enterprises, with demands mainly concentrated in resource exploration, agricultural monitoring, urban planning, and emergency disaster response. However, both regions differ significantly from China in terms of religious beliefs, language structures, labor systems, and cultural perceptions.

For instance, in the Middle East, Islamic practices significantly influence daily management routines: working hours are shortened during Ramadan, Friday is the official day of rest, and workplaces often implement gender segregation. These factors require Chinese enterprises to adapt their existing work systems. Moreover, the prominent language barrier—Arabic being the dominant means of communication while most Chinese technicians rely on English—necessitates that dispatched staff possess strong language adaptability.

In Africa, multilingual environments (e.g., English, French, Portuguese) further complicate communication, and in some countries, limited educational infrastructure results in a shortage of local talent with remote sensing expertise. This often leads to an organizational imbalance characterized by "technical dependence on Chinese staff, managerial reliance on Chinese systems, and cultural isolation from Chinese teams," which hampers project localization and long-term stability.

To address this, companies should prioritize candidates with cross-cultural adaptability, foreign language proficiency, and crisis management skills when selecting expatriate staff. Contracts should include clear terms for overseas allowances, rotation cycles, and safety guarantees to enhance personnel stability and sense of security. Additionally, enterprises should establish local technical training programs, joint laboratories, or talent incubation hubs to gradually shift from "employing locals" to "depending on locals," thereby reducing long-term dependence on Chinese expatriates.

(2) Collaboration Mechanisms Between Local Employees and Chinese Expatriates

Facilitating effective collaboration between Chinese personnel and local employees is central to upgrading HR strategies. First, enterprises should adopt a **hybrid organizational structure**. While Chinese technical experts hold key positions in core technologies and decision-making, operational roles such as field execution, support services, and administration should be opened to local employees. This "Chinese leadership + local execution" model, supported by delegated authority and clear role definitions, enhances collaborative efficiency.

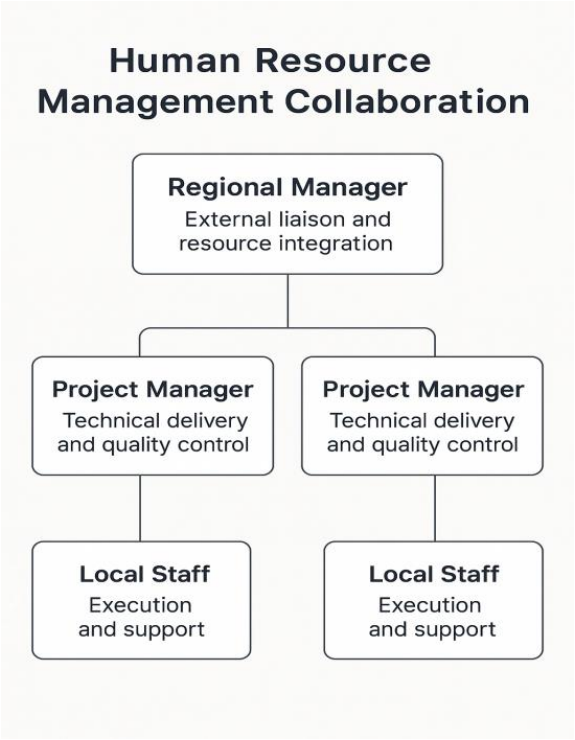
Second, building a **bilingual work system** is essential for organizational integration. All company regulations, operation manuals, and project updates should be made available in English or local languages to ensure information transparency and employee inclusion.

To bridge cultural gaps between superiors and subordinates, companies should also implement periodic **cultural integration workshops**, language exchange programs, or "local culture nights" to strengthen team cohesion.

For medium- to long-term organizational development, a **dual-track management model**—featuring both a regional manager and a project manager—is recommended. The **regional manager** focuses on resource integration, foreign affairs communication, and risk mitigation, acting as the primary interface with the external environment. The **project manager**, on the other hand, is responsible for implementation, technical delivery, and quality control, driving internal project execution. This clear division of labor ensures both technical reliability and adaptability to local environments.

(3) Illustrative Organizational Structure

To better illustrate the personnel coordination mechanism described above, this paper proposes the following three-tier organizational model:



3.2 Financial Axis: Multi-Currency Settlement, Cost Control, and Risk Hedging

(1) Capital Cycle Management in Foreign Aid Projects in South Asia and Africa

Remote sensing satellite services in South Asia and Africa are often dominated by intergovernmental agreements, foreign aid projects, or concessional loan models. These projects typically have long durations, slow payment recovery, and complex foreign exchange issues, posing significant challenges to enterprise fund management and financial stability.

Taking China's remote sensing cooperation with Pakistan and Ethiopia as examples, a common approach is the "build first, operate later" bundled contract. This involves large upfront investment and extended operational periods, often accompanied by responsibilities such as technology transfer, personnel training, and platform maintenance. As a result, enterprises must bear continuous costs for several years without quick cash flow recovery.

To address these challenges, enterprises should establish dedicated financial pools tailored to project characteristics and collaborate with policy financial institutions such as the China Development Bank and the Export-Import Bank of China to design phased fund disbursement mechanisms. Additionally, exploring contract models based on "segmented delivery + milestone payment" can ensure payments upon completion of key tasks, thereby reducing overall cash flow risk.

For African countries with low credit ratings and strict foreign exchange controls, enterprises can also adopt a "RMB settlement + local escrow" model—establishing RMB accounts in local banks or using trade settlement methods to offset part of the costs—to increase fund flexibility and usability.

(2) Cross-Border Tax Compliance and Exchange Rate Risk Management

In global expansion, remote sensing enterprises inevitably face differences in international tax regimes. Policies on value-added tax (VAT), corporate income tax, and withholding tax vary across countries, and even small oversights can lead to compliance blind spots or overlapping tax burdens. Therefore, enterprises need to proactively develop a "tax risk map" and include "tax bearing clauses" in contracts to transfer or adjust uncontrollable tax liabilities.

Regarding exchange rate risk, faced with volatile local currencies in the Middle East and Africa, enterprises can utilize forward foreign exchange contracts, currency hedging mechanisms, and multi-currency pricing strategies. For example, in dealings with the UAE, a "USD quotation with RMB settlement" mechanism can be adopted. In highly volatile markets such as Sudan, contracts can include clauses that lock prices in RMB while allowing local currency adjustments within a specified exchange rate range.

For large-scale projects, partnering with insurance providers to secure combined coverage for "political risk + exchange rate fluctuations" can further enhance financial security and contract enforceability.

3.3 Foreign Affairs Axis: Government Relations Building and Multilateral Communication Mechanisms

(1) Diplomacy-Driven Remote Sensing Cooperation Model — The China-Pakistan Case

As a strategic technology, international cooperation in remote sensing heavily relies on political support and diplomatic channels at the government level. Among China's various cases of "going global" in remote sensing, the China-Pakistan collaboration stands out as a benchmark.

China, through the China-Pakistan Economic Corridor (CPEC) platform, partnered with the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO) to jointly develop and launch two remote sensing satellites, PRSS-1 and PakTES-1A. This cooperation achieved deep integration from technology transfer, full satellite delivery to subsequent ground station operation and local data interpretation.

This "government-to-government (G2G) + enterprise implementation" cooperation model greatly enhances political controllability and circumvents security control mechanisms imposed by Western remote sensing powers on technology exports.

Under this model, enterprises must maintain close coordination not only with domestic supervisory bodies such as the China National Space Administration (CNSA), the Foreign Affairs Office, and the

Ministry of Commerce but also actively engage in policy research and foreign affairs liaison with target countries. The dispatched offices should explicitly designate a **"Foreign Liaison Officer"** responsible for coordinating daily communications with embassies, international organizations, and government departments in the target country, thereby strengthening informal communication channels and building trust.

(2) International Exhibitions and Multilateral Communication Mechanisms — The ASEAN Space Cooperation Example

Beyond bilateral government cooperation, multilateral platforms and international exhibitions serve as important venues for remote sensing enterprises to expand diplomatic resources and secure potential partnerships.

For example, Chinese remote sensing enterprises participate in events such as the Singapore Airshow, Abu Dhabi Unmanned Systems Exhibition, Brazil Space Technology Conference, and the ASEAN Space Development Forum. Through technology demonstrations, keynote speeches, roundtable discussions, and memorandum of understanding (MoU) signings at these events, companies enhance their influence and credibility in regional markets.

In such activities, foreign affairs strategies should be closely integrated with brand building and technology dissemination. Organizing events like **"National Theme Days," "Regional Remote Sensing Service Salons,"** and **"Closed-Door Meetings between Chinese and Foreign Remote Sensing Enterprises"** can maximize engagement efficiency through a comprehensive "technology + foreign affairs + media" approach.

Specifically, under the ASEAN framework, China can leverage pilot space cooperation projects with Laos, Cambodia, and Thailand to promote the establishment of a **Southeast Asian Regional Remote Sensing Service Platform**, creating a new data service model of **"regional sharing + local distribution."** This lays the policy and diplomatic groundwork for Chinese remote sensing enterprises to expand their regional business presence.

4. In-Depth Analysis of Regional Markets: Strategy Formulation and Implementation Pathways

Table 1. Key Characteristics, Challenges, Strategic Priorities, and Response Measures in Five Major Regions — Middle East, Africa, South Asia, South America, North America & Europe

Region	Main Needs	Major Challenges	Strategic Focus	Typical Cases
Middle East	High security requirements, data integration	Cultural differences, policy sensitivity	Multi-source data integration, local partnerships	UAE drone project
Africa	Low technology level, insufficient funding	Payment difficulties, weak technical capacity	Aid projects, local talent training	Sudan aid model

South Asia	Technology export, political trust	Financial pressure, cultural adaptation	Government concessional loans, China-Pakistan cooperation	PRSS-1 satellite project
South America	Mineral and agricultural remote sensing	Political instability, language barriers	International cooperation, talent cultivation	Brazil resource monitoring
North America & Europe	High regulation, high barriers	ITAR restrictions, market monopoly	Academic cooperation, entry via low-resolution data	Maxar, Airbus

4.1 Middle East Market: Strategic Client Binding and Security-Sensitive Demand

The Middle East, as a global hub for space investment, exhibits a remote sensing market characterized by high security orientation and multi-source data integration. The United Arab Emirates (UAE) has been actively advancing a "multi-source remote sensing + UAV collaboration" model, establishing an autonomous imaging acquisition system centered on satellites while incorporating drones and ground stations. Its National Space Strategy (2019-2030) prioritizes enhancing Earth observation capabilities and data security, setting stringent cooperation requirements particularly regarding image resolution, data encryption, and access control. Since 2023, Chinese enterprises have successfully implemented UAV remote sensing pilot projects to achieve data fusion applications, breaking through traditional technical barriers and gradually establishing trust mechanisms.

Saudi Arabia has deeply integrated remote sensing into its Vision 2030 strategy, with focused applications in resource governance, urban expansion, and environmental monitoring. Remote sensing imagery has become indispensable for metropolitan planning in cities like Riyadh and desertification surveillance. Chinese companies should concentrate on developing integrated "remote sensing + urban governance" and "remote sensing + resource exploration" solutions, while promoting the establishment of joint data centers and talent development programs with local universities and planning departments to ensure project implementation and sustained cooperation.

Egypt primarily requires medium-to-low resolution remote sensing data, emphasizing cost-effectiveness and update frequency. Due to limitations in local technical capabilities, Egypt mainly relies on external data to support agriculture, water resources, and urban infrastructure management. On December 6, 2023, Zhang Kejian, Administrator of the China National Space Administration (CNSA), and Sherif Sedky, CEO of the Egyptian Space Agency (EgSA), signed two significant agreements in Beijing: the Memorandum of Understanding on Space Cooperation and Peaceful Uses of Outer Space between the Chinese and Egyptian governments, and the Cooperation Agreement on the International Lunar Research Station between CNSA and EgSA. China-Egypt space cooperation has yielded fruitful results, including the completion and acceptance of the Egyptian Satellite Assembly, Integration, and Testing Center aided

by China in June 2023, and the successful launch of the EgyptSat-2 satellite assembled and tested at the center on December 4, 2023. These agreements chart the course for future China-Egypt space cooperation, which holds great significance for advancing space technology development and enhancing the comprehensive strategic partnership between the two countries. Chinese enterprises can focus on providing basic data services and localized training, complemented by ground station upgrades and entry-level terminal equipment, to rapidly improve market recognition. As a strategic hub bridging Africa and the Arab world, Egypt remains open to Chinese companies and possesses considerable potential for regional influence.

4.2 African Market: Aid-Driven Projects and Localization Capacity Building

Africa's remote sensing needs are broad, covering agriculture, disaster early warning, forest monitoring, and mineral exploration, yet the market faces a "high demand, low payment, low technology" triple challenge.

Taking Sudan and Nigeria as examples, many remote sensing projects rely on international aid from organizations like FAO and UNDP, with fragile funding chains and long execution cycles. Chinese enterprises should adopt low-cost data packages, platform-based delivery, and offline model technologies to solve the "affordability and usability" dilemma. Leveraging local embassies and aid platforms, the "donated equipment + local service" model can alleviate funding and technology bottlenecks.

Payment constraints, difficulty in data localization, and talent shortages are common pain points in Africa. Chinese companies need to proactively promote local training and capacity building, cooperating with "remote sensing + agricultural universities" to establish laboratories and technical support platforms, providing simplified software and automated tools to enhance data analysis capabilities. Through "turnkey projects + capability hosting + phased withdrawal" strategies, a sustainable remote sensing application ecosystem can be created, enhancing brand influence and project longevity.

Capitalizing on China's advantages in non-governmental intergovernmental cooperation, priority should be given to remote sensing cooperation projects under G2G agreements to achieve integrated services across multiple countries. Establishing local bilingual operation teams and partnering with universities and government agencies for technical support and business operation can ensure project stability and prevent trust breaks due to staff turnover, forming a personnel management loop of "posting + incubation."

4.3 South Asia Market: Technology Export and Political Trust Model

Pakistan, as a key "Belt and Road" partner, centers its remote sensing cooperation on jointly developing the PRSS-1 and PakTES-1A satellites, blending technological strength and political trust.

On the personnel front, Chinese technical teams are stationed long-term, responsible for satellite maintenance and data services while conducting local technical training to ensure language and cultural adaptation, promoting bilateral collaboration. Financially, projects are mainly supported by concessional loans and aid funds from the Chinese government, easing the Pakistani side's burden and ensuring stable funding, with contract execution emphasizing phased outcomes.

In terms of foreign affairs, frequent high-level strategic dialogues provide political assurance, with Chinese diplomatic and commerce departments coordinating enterprise foreign affairs to mitigate policy risks. Both sides have signed high-standard data security and confidentiality agreements to ensure the safe transmission and application of remote sensing data. This model offers valuable experience for Chinese companies' internationalization, demonstrating successful integration of technology, funding, and politics.

4.4 South America Market: A Blue Ocean Balancing Commercial and Resource Remote Sensing

South America, rich in mineral resources and vast agricultural and forestry lands, primarily demands remote sensing for mineral monitoring and agricultural management. Countries like Chile, Brazil, and Argentina have strong needs for medium- and high-resolution imagery, particularly focusing on resource spatial changes and sustainable utilization.

This market is complex, with political volatility, language barriers, and complicated government procurement processes leading to long project cycles. Chinese companies generally lack local networks and need to leverage multilateral cooperation with European remote sensing firms and Chinese embassies in South America. Through international environmental protection and sustainable agriculture projects, technology and service joint outputs can reduce market risks and enhance credibility.

To meet South American clients' needs, companies should offer full-chain customized solutions covering data acquisition, analysis, and application. Joint efforts with local universities and research institutes to promote talent development are vital to localizing remote sensing technology and deepening the market. Despite challenges, South America remains a key region for Chinese remote sensing enterprises due to resource advantages and growth potential.

4.5 North America and Europe Markets: Cooperation Opportunities and Competitive Challenges under Strong Regulation

The North American remote sensing market is monopolized by companies like Maxar, whose products have strong military attributes and are subject to strict regulations, particularly US ITAR rules that restrict Chinese companies from entering the high-end remote sensing and data service markets. Chinese enterprises find it difficult to enter the high-resolution remote sensing segment in North America via traditional commercial channels.

The response strategy is to leverage third-party academic and scientific cooperation, utilizing platforms of research institutions and universities on both sides to engage in remote sensing data analysis and applications in non-sensitive fields, gradually building technical credibility and cooperation foundations. Low-resolution data and derivative services serve as entry points to seek niche markets or vertical application scenarios.

The European market, represented by Airbus, depends on intergovernmental procurement and research projects, emphasizing data accuracy and compliance. The EU's Copernicus program offers platforms for scientific research and application cooperation. Chinese companies can participate in international

scientific projects in fields like environmental monitoring and climate assessment to achieve a "low-profile embedded" presence, promoting market-oriented technical services.

Overall, facing high barriers and intense competition in the US and Europe, Chinese companies should adopt an "indirect entry + cooperative innovation" approach, focusing on application services and academic collaboration, avoiding direct competition, and forming long-term cooperation paths that comply with local regulations and market demands.

5. Construction of the "Technology–Market–Politics" Three-Dimensional Collaborative Management Framework

5.1 Proposal and Connotation Analysis of the Three-Dimensional Framework Model

(1) Technology Adaptation

The core competitiveness of remote sensing satellite enterprises lies in their advanced technological capabilities, covering multiple stages such as image acquisition, data processing, and intelligent interpretation. Facing diverse demands from different countries and regions, companies must implement precise technology adaptation strategies. Specifically, they should first establish a multi-level remote sensing capability layout, designing product lines that cover multiple grades from medium-low resolution to high resolution, flexibly responding to varied application scenarios such as agricultural monitoring, resource exploration, and security surveillance.

Secondly, by integrating artificial intelligence and big data technologies, companies can enhance automated image interpretation and change detection through deep learning algorithms. This not only reduces labor costs but also improves the timeliness and accuracy of data processing, transforming remote sensing products from simple imagery outputs into application services that support scientific decision-making.

Additionally, given the sensitivity of the international political environment, strengthening data security is crucial. Enterprises must strictly adopt security technologies such as data encryption and access control to ensure customer information security and comply with the laws and regulations of multiple countries.

Finally, technology localization and service innovation are equally important. Companies need to focus on ground station construction and optimization of data transmission links, and develop localized software systems tailored to local needs, achieving a closed loop of technical services that significantly enhances customer experience and project sustainability.

(2) Market Strategy

The core of market strategy is to accurately respond to diverse customer needs while building sustainable service capabilities. Firstly, a tiered pricing strategy forms the foundation for expanding international markets. Prices should be differentiated based on customer scale, payment capacity, and complexity of needs, balancing personalized customization for high-end clients and cost-effectiveness for the mass market, thereby improving overall market coverage.

Secondly, building a localized service system is critical. Enterprises need to establish service centers or develop partner networks in key regions to provide professional technical support, training, and after-sales service, enhancing customer loyalty and shaping a strong reputation.

Dynamic adjustment capability is key to coping with the complex and changing international environment. Through market monitoring and customer feedback, enterprises can timely optimize sales strategies and service offerings to handle uncertainties caused by geopolitical fluctuations and economic changes.

At the same time, actively promoting upstream and downstream cooperation in the industrial chain and cross-industry collaboration helps build an open and shared ecosystem, facilitating the deep integration of remote sensing technology and applications and creating a multi-win sustainable development situation.

(3) Political Channel

Political factors play a decisive role in the success of cross-border remote sensing business, especially in countries and regions with strict security and policy controls. Companies must proactively build solid government relationship networks, including with government agencies, regulatory departments, the military, and industry authorities in partner countries, to facilitate policy understanding and support and create a favorable environment for smooth project advancement.

Secondly, signing government-to-government (G2G) cooperation agreements ensures legal compliance and stable funding sources for projects, significantly reducing commercial operational risks.

Meanwhile, establishing a specialized foreign affairs team with multilingual capabilities, familiar with local political culture and legal systems, improves cross-cultural communication efficiency and policy negotiation skills, which is key to ensuring smooth cooperation.

Furthermore, in response to increasingly complex international situations, enterprises should develop comprehensive risk control systems covering technology export restrictions, data security regulations, and international sanctions, ensuring compliant management throughout the business process and dynamic risk warning, effectively preventing potential risks and protecting the legal rights of both the company and its clients.

5.2 Case Applications

The China-Pakistan remote sensing satellite cooperation project exemplifies the “Technology–Market–Politics” three-dimensional collaborative management framework.

At the technology level, the project utilizes medium-resolution remote sensing satellites tailored to Pakistan’s actual needs and integrates China’s independently developed AI intelligent interpretation system, enabling key applications like agricultural monitoring and disaster assessment. The technology adaptation is precise and the system performance stable.

At the market level, project financing combines Chinese government concessional loans with aid funds, significantly easing Pakistan’s financial pressure, ensuring stable capital flow and continuous project advancement, reflecting a flexible and diversified market financing strategy.

At the political level, high-level visits and strategic dialogues between China and Pakistan provide political guarantees. The Chinese Foreign Ministry and Ministry of Commerce closely coordinate foreign affairs work to facilitate smooth diplomacy, greatly reducing policy barriers and uncertainties. During project implementation, both parties strictly implement data security and technical confidentiality agreements to ensure the secure transmission and application of satellite data.

This cooperation case fully demonstrates the successful practice of integrating technological innovation, market financing, and political assurance, effectively promoting the internationalization and localization of Chinese remote sensing technology.

The UAE multi-source fusion project reflects the application effectiveness of the three-dimensional framework in a highly security-sensitive market.

Technologically, the project integrates satellite imagery, UAV remote sensing, and ground station multi-source data, supporting comprehensive applications in energy supervision and border security. It also imposes strict requirements on data encryption and access control to meet very high security standards.

Market strategies focus on localized technical support and training, combining customized solutions with stringent client qualification reviews, successfully building a stable trust system.

Foreign affairs work closely with the UAE's state-owned aerospace institutions to establish strong cooperative relationships, ensuring the project's lawful and compliant progress.

This project not only breaks through traditional aerospace enterprises' barriers to entering highly security-sensitive markets but also demonstrates the strong adaptability and operational efficiency of the three-dimensional collaborative framework in complex environments.

5.3 Management Logic of Organizational Resilience and Dynamic Capability

The international remote sensing satellite market is deeply affected by global geopolitical fluctuations, rapid technological iterations, and volatile market demands. Enterprises must possess high organizational resilience and dynamic capabilities in this environment.

Firstly, cross-functional collaboration is a core management logic. Technology, market, and foreign affairs departments must work closely, establishing efficient information sharing and rapid response mechanisms. The technology team should keenly track industry frontier trends, the market team monitor client demand changes closely, and the foreign affairs team proactively manage policy risks. Interaction among the three greatly enhances the company's overall adaptability.

Secondly, dynamic strategic adjustment capability is vital. Enterprises should establish comprehensive monitoring and early warning systems to track international situations, regulatory changes, and customer feedback in real time, enabling swift adjustments in product strategy, market layout, and cooperation models, thus avoiding rigid or single-mode operations.

Thirdly, talent development and knowledge management are indispensable. Companies need to strengthen cross-cultural management and multilingual talent cultivation to ensure international team stability and professionalism, and build systematic knowledge management platforms to accumulate project experience and risk lessons, forming a virtuous cycle of continuous improvement.

Fourthly, risk control and compliance management systems must comprehensively cover technology export restrictions, financial risks, political interference, and data security, ensuring the stable operation of the business chain.

Finally, innovation-driven development ensures sustained competitiveness. Promoting technological innovation and upgrading service models, deepening the application of AI, big data, cloud computing, and other emerging technologies help companies maintain a leading position.

By strengthening these management logics, enterprises can enhance their survivability and competitiveness in a complex and volatile international environment, steadily advancing strategic objectives.

6. Strategic Recommendations and Outlook

6.1 Recommendations for Remote Sensing Enterprises "Going Global"

In the context of increasingly fierce and complex competition in the global commercial aerospace and remote sensing markets, remote sensing enterprises must build composite management teams that integrate talents from technology R&D, marketing, international law, and foreign affairs coordination, forming interdisciplinary, multilingual, and cross-cultural collaborative capabilities.

Companies should establish detailed regional strategic maps that combine country-specific political risk assessments with market potential analyses, dynamically adjusting overseas layouts to achieve an optimal balance between risk and return.

Building diversified foreign affairs networks is equally crucial. Enterprises need to leverage diplomatic channels, industry associations, overseas partners, and expatriate institutions to create stable yet flexible cooperation platforms, enhancing cultural adaptability and reducing communication barriers and potential friction.

Additionally, promoting localized operations through cultivating and recruiting local talent helps achieve both technological and managerial localization, thereby improving project sustainability and competitiveness.

Overall, precise positioning, risk pre-control, and cultural integration are the three key factors for the international success of Chinese remote sensing enterprises.

6.2 Calls for China's Remote Sensing Aerospace Strategy

As a national strategic resource, the international expansion of remote sensing technology is not only an enterprise-level task but also requires national strategic guidance.

First, there should be strengthened coordination and synergy of national-level policies, particularly in foreign aid, technology export regulation, and diplomatic support, forming a unified and efficient policy system to provide solid guarantees for enterprises going global.

Second, promoting the internationalization of industry standards is essential to improve the global recognition of Chinese remote sensing technologies and services, enhance China's voice in international standard setting, and facilitate technology export and industry chain integration.

Moreover, active participation in international cooperation mechanisms and multilateral organizations is needed to gain leadership in global remote sensing governance, data sharing, and security management, thereby enhancing national soft power and technological influence.

It is a call for government, enterprises, and research institutions to form a joint force to build an internationally competitive remote sensing aerospace industrial ecosystem, supporting China's transformation from a technology follower to an innovation leader.

6.3 Research Limitations and Future Directions

This study, based on recent practical experience and publicly available data, focuses on strategic layouts and management mechanisms of the international remote sensing satellite market. However, due to limitations in data timeliness and openness, it lacks long-term continuous quantitative data support, preventing a comprehensive capture of deeper market evolutions and the dynamic impacts of policy changes.

Future research should focus on building more systematic data tracking systems, combining the effectiveness of remote sensing data applications with dynamic analyses of economic and political variables to enhance the scientific rigor and predictive accuracy of strategic studies.

Furthermore, as remote sensing technology's role in international politics becomes increasingly prominent, subsequent studies could delve into the discourse competition of remote sensing data in international disputes, geopolitical games, and information warfare, investigating how remote sensing data emerges as a strategic resource in new international relations, enriching the theoretical connotation and practical guidance value of the "technology–market–politics" three-dimensional framework.

References

Chen Fangmiao, Jiao Hong Zhi, & Huang Huiping. (2023). Analysis of foreign satellite remote sensing resource management policies and models. *World Science and Technology Research and Development*, *45*(3), 398-406. http://doi.org/10.16507/J.ISSN.1006-6055.2022.20021010106

Dong Lu, & Wu Chunhua. (2014). Looking at the international development of China's remote sensing satellite industry from the perspective of international satellite operators. *Proceedings of the third annual academic conference on high-resolution Earth observation*, *2014*, 1-10.

Gao Jun. (2016). Exploration on some issues of internationalization service of commercial remote sensing satellites. *Proceedings of 2016 Aerospace Internationalization Development Forum*, *2016*, 48-63.

Guo Renzhong, Hu Fen, & Tang Xinming. (2018). Research on internationalization development of high-resolution satellite remote sensing industry. *China Soft Science*, *2018*(11), 1-9. http://doi.org/10.3969/j.ISSN.1002-9753.2018.11.001

Guo Xiarui. (2019). International Market Analysis of Commercial High-resolution Remote Sensing Satellites and Data. *Proceedings of the 6th Annual Conference on High-resolution Earth Observation*, *2019*, 1-7.

Hu Ruzhong, Li Zhizhong, & Ge Bangjun. (2003). Progress of China's satellite remote sensing industrialization. *2003 Remote Sensing Science and Technology Forum and Proceedings of the 2003 Annual Meeting of China Remote Sensing Application Association*, *2003*, 10-18.

Le Fengmin, Liu Furong, Guo Fengfeng, et al. (2025). The annual contribution of satellite remote sensing and application industry in China reached 245 billion yuan. *Satellite application*, *2025*(1), 29-30. http://doi.org/10.3969/j.ISSN.1674-9030.2025.00020020025

Shangguan Boyi, He Ying, Tian Luyun, et al. (2025). Overview of the development of large-scale space remote sensing model and prospect of industrial application. *Shanghai Aerospace* (in Chinese and English), *42*(2), 9-18. http://doi.org/10.19328/J.CNKI.2096-8655.2006

Wang Jinlong. (2018). *Study on legal protection mode of satellite remote sensing data*. Hubei: Huazhong University of Science and Technology. http://doi.org/10.7666/d.d01543131

Yu Qingchuan. (2018). Development status and trend of foreign remote sensing satellite application industry. *Dual-use technology and products*, *2018*(20), 16. http://doi.org/10.3969/j.ISSN.1009-8119.2018.20.016

Zeng Lan. (2003). Discussion on the Industrialization of Satellite Remote Sensing Information in China. *Proceedings of the 6th Cross-Strait Symposium on Space Information and Disaster Prevention in 2003*, *2003*, 1-5.

Zhao Xiaojin. (2015). Research and analysis on accelerating the development of China's commercial remote sensing satellite industry and ways of thinking. *China Aerospace*, *2015*(12), 3-7.