Standards-related Regional Innovation and International Cooperation
https://journals.zycentre.com/sriic

ARTICLE

Research on the Path of Group Standards and National Standards Bench Marking International Standards

Yuhua Hao

China International Association for the Promotion of Science and Technology, Beijing 100082, China

ABSTRACT

Under the background of deepening globalization and accelerating the reconstruction of international industrial competition patterns, international standards have become the core strategic resources for countries to enhance their technological competitiveness and master the dominance of industrial rules. As the world's largest manufacturing country and an important subject of technological innovation, China has formed a number of internationally advanced standard achievements in the fields of high-speed rail, 5G communication and new energy, but its right to speak in the international standardization system still does not match its economic scale and scientific and technological strength. The existing research points out that the right to formulate international standards is not only directly related to the entry threshold and cost advantage of enterprises in overseas markets, but also the key for countries to build technical barriers and lead industrial changes. In this paper, the key path of benchmarking international standards by China standards is deeply discussed, and the significant gap between China standards and international standards in technical level, market adaptability and internationalization degree is analyzed in detail. By clearly studying the problems and assumptions, four core paths are constructed: policy optimization, technological innovation, international cooperation and market-driven, and the specific measures and expected effects of each path are visually presented in tabular form. The article also puts forward implementation strategies and safeguard measures, aiming at providing comprehensive and systematic theoretical support and practical guidance for the internationalization of China's standards.

Keywords: China Standard; International Standards; Benchmarking Path; Technological Innovation; International Cooperation

*CORRESPONDING AUTHOR:
Yuhua Hao, China International Association for the Promotion of Science and Technology, Beijing 100082, China; Email: 82171408@qq.com

ARTICLE INFO
Received: 19 April 2025 | Revised: 6 June 2025 | Accepted: 13 June 2025 | Published Online: 20 June 2025
DOI: https://doi.org/10.63385/sriic.v1i1.192

CITATION
Hao, Y., 2025. Research on the Path of Group Standards and National Standards Bench Marking International Standards. Standards-related Regional Innovation and International Cooperation. 1(1): 64–74. DOI: https://doi.org/10.63385/sriic.v1i1.192

1. Introduction

Today, with the deep integration of the global economy, standards have become the cornerstone of international trade, which plays a vital role in enhancing national industrial competitiveness, promoting technological innovation and ensuring product quality. As an important economy in the world, the construction and internationalization of China's standard system is not only related to the upgrading and development of domestic industries, but also affects China's position in global economic governance. However, the gap between the current Chin standards and international standards can not be ignored. How to effectively benchmark and achieve transcendence has become an urgent task before us. This paper focuses on the core issue of "How to efficiently benchmark international standards by China standards", aiming at putting forward a targeted and operable benchmarking path [1].

2. Literature Review

2.1. Foreign Research Status

The research on standards benchmarking in foreign countries started earlier, mainly focusing on the internationalization strategy of standards formulation, the relationship between standards and technological innovation, and the impact of standards on international trade. Many developed countries have enhanced the status and influence of their own standards in the international market by actively participating in the formulation of international standards, strengthening the integration of standards and industries, and promoting mutual recognition of standards. For example, the European Union has promoted the development of intra-European trade and the promotion of industrial competitiveness by establishing a unified market standard system; The United States, by virtue of its leading position in the field of science and technology, has led the formulation of many international standards and consolidated its leading position in the global economy [2].

2.2. Domestic Research Status

In recent years, domestic research on benchmarking international standards by China standards has gradually increased, mainly focusing on gap analysis, benchmarking strategies and implementation paths. Scholars generally believe that there is a big gap between China standards and international standards in terms of technical level, degree of internationalization and market adaptability, and put forward a series of benchmarking strategies, such as strengthening policy support, increasing investment in technological innovation and deepening international cooperation. However, at present, domestic research still needs to be improved in terms of systematicness, depth and operability, and there is a lack of detailed discussion on specific implementation paths and safeguard measures. In recent years, domestic research on benchmarking international standards by China standards has gradually increased, mainly focusing on gap analysis, benchmarking strategies and implementation paths. Scholars generally believe that there is a big gap between China standards and international standards in terms of technical level, degree of internationalization and market adaptability, and put forward a series of benchmarking strategies, such as strengthening policy support, increasing investment in technological innovation and deepening international cooperation. However, at present, domestic research still needs to be improved in terms of systematicness, depth and operability, and there is a lack of detailed discussion on specific implementation paths and safeguard measures [3, 4].

2.3. Review of Research

Based on the research status at home and abroad, we can see that the research on benchmarking international standards by China standards has made some achievements, but there are still some shortcomings. First, the research perspective is relatively single, mostly from the policy or technical level, lacking in-depth research on the comprehensive role of multiple factors; Second, qualitative analysis is the main research method, while quantitative analysis is relatively few, which leads to the objectivity and accuracy of the research results being affected to some extent; Third, the operability of the research results is not strong, and it is difficult to effectively guide practice because of the lack of specific implementation paths and safeguard measures. Therefore, on the basis of previous studies, this study will comprehensively use a variety of research methods to deeply analyze the path of China standards benchmarking international standards, and put forward targeted and operable implementation strategies and safeguard measures [5].

3. Research Questions and Assumptions

3.1. Deliberate on a Problem

1. Where is the specific gap between China standard and the international standard in key dimensions such as technical level, market adaptability and internationalization degree?
2. How do key factors such as policy environment, technological innovation, depth of international cooperation and market demand affect the process of benchmarking international standards by China standards?
3. How to build a systematic and effective benchmarking path to enhance the international competitiveness of China standards and promote their wide application?

3.2. Research Hypothesis

H1. *The lag of technical level, the lack of market adaptability and the limited degree of internationalization are the main aspects of the gap between China standards and international standards.*

H2. *The optimization of policy environment, the promotion of technological innovation, the deepening of international cooperation and the accurate grasp of market demand are the key driving forces to promote China standards to benchmark international standards.*

H3. *Through the comprehensive application of policy optimization, technological innovation, international cooperation and market-driven approaches, the effective benchmarking between China standards and international standards can be achieved, and China's position in the global standards system can be enhanced.*

4. Analysis of the Gap Between China Standard and the International Standard

Through in-depth comparative analysis, we find that there are obvious gaps between China standards and international standards in the following key dimensions (see **Table 1**)[4, 5].

5. Analysis of Factors Influencing China Standards to Benchmark International Standards

See **Table 2** for the analysis of the factors affecting the benchmarking of international standards by China standards[4, 5].

Table 1. Gap Between China Standard and the International Standard.

Gap Dimension	Current Situation of China Standards	Characteristics of International Standards	Incorporate
engineering level	The technical indicators in some fields are backward, and the update iteration speed is slow,Lack of leading-edge technology.	Represent the most advanced technology in the industry, update quickly and lead the development direction of technology.	For example, in the fields of high-end equipment manufacturing and next-generation information technology, international standards often set higher technical thresholds and performance requirements, and China standards need to be accelerated to catch up.
Market adaptability	Mainly focusing on the domestic market demand, the international versatility is poor, and it is difficult to meet the diversified needs of the global market.	It has a wide range of international versatility, low market access threshold, and adapts to changes in the global market.	The limited recognition of China standards in the international market leads to the standard barriers faced by China products in international competition, which affects the export and internationalization layout.
Degree of internationalization	Participation in the formulation of international standards is low, and the right to speak and influence in international standards organizations is limited.	Leading the formulation of international standards, with strong international influence and appeal.	The proportion of China representatives in the international standards organization is relatively low, so it is difficult to fully express China's interests and technical claims.

Table 2. The Factors Affecting the Benchmarking of International Standards by China Standards.

Factors	Explanations
Policy environment	Unclear policy orientation, unbalanced support and inadequate policy implementation make the formulation and promotion of standards lack effective guidance and guarantee, and it is difficult to form a unified planning and development direction.
Technological innovation	The weak ability of independent research and development of core technologies and the lack of core technologies with independent intellectual property rights make it difficult for China to occupy a leading position in the formulation of standards, so it can only passively follow the development of international standards.
Depth of international cooperation	The imperfect international cooperation mechanism makes it difficult for China to obtain the latest trends and core information of international standards, and it is also unable to fully participate in the discussion and decision-making of international standards, which limits China's influence in the international standards system
Market demand	The disconnection between the domestic market demand and the international market makes it difficult to fully consider the demand and changes of the global market when formulating standards, which leads to the lack of adaptability of China standards in the international market.

6. The Path Construction of China Standard Benchmarking International Standards

Based on the above analysis, we propose the following systematic and comprehensive benchmarking paths (see **Table 3**)[6].

6.1. Policy Optimization Path

1. The government should give full play to the role of guidance and promotion, and make clear the direction and goal of standard development by formulating a scientific and reasonable policy system;
2. Increase financial input and provide sufficient financial support for standard formulation, promotion and international cooperation;
3. Establish a perfect incentive mechanism to encourage enterprises, scientific research institutions and social organizations to actively participate in the work of standards, and form a good situation for the whole society to jointly promote the development of standards[7].

6.2. Technological Innovation Path

1. Enterprises and scientific research institutions should increase investment in research and development, focus on key core technologies, carry out joint research, break through technical bottlenecks, and form independent intellectual property rights;
2. Establish a collaborative innovation platform for Industry-University-Research, strengthen cooperation and exchanges among enterprises, universities and scientific research institutions, promote the close combination of technological innovation and standard setting, and accelerate the standardization process of scientific and technological achievements;
3. Encourage enterprises to actively participate in the formulation of international standards, transform China's technological innovation achievements into international standards, and enhance China's right to speak in the technical field[8, 9].

6.3. International Cooperation Path

1. China should actively deepen its cooperation with international standards organizations, participate in the whole process of international standards formulation, and strive to play a greater role in international standards formulation;
2. Carry out mutual recognition of standards with other countries and regions, establish a mutually beneficial and win-win standard cooperation mechanism, and reduce trade barriers and technical obstacles caused by standard differences;
3. Strengthen technical exchanges and cooperation with international enterprises, learn from international advanced standards and management experience, and improve the quality and level of China standards[8, 9].

6.4. Market-Driven Path

1. China should strengthen the investigation and analysis of the international market demand, understand the characteristics and changing trends of the international market demand, and formulate standards that meet the international market demand;
2. Promote the deep integration of standards and industries, lead industrial development with standards, and promote industrial upgrading and innovation;
3. Strengthen the publicity and training of standards, improve the awareness and acceptance of China standards by market participants, guide enterprises to actively adopt China standards, and create a good market environment for standard application [10].

7. Implementation Strategy and Safeguard Measures

In order to ensure the effective implementation of the benchmarking path, the following comprehensive and systematic strategies and safeguard measures are required, as shown in **Table 4**.

Table 3. Systematic and Comprehensive Benchmarking Paths.

Path Dimension	Specific Measures	Anticipated/Desired/ Intended Effect
Policy optimization	Improve the standard policy system and define the strategic objectives, key areas and timetable of standard development.	Form a joint policy force, provide clear guidance and strong guarantee for standard setting and promotion, and stimulate the enthusiasm of enterprises and institutions to participate in standard work.
	Increase financial input, set up a special fund for standards development, and support standards formulation, promotion and international cooperation projects.	
	Establish a standard incentive mechanism, commend and reward enterprises and institutions that have made outstanding contributions in standard setting and international cooperation.	
Technical innovation	Increase investment in R&D, encourage enterprises and scientific research institutions to tackle key technical problems and break through technical bottlenecks.	Significantly improve the technical level of China standards, make China standards reach or exceed the international advanced level in some areas, and enhance the international competitiveness of China industries.
	Establish a collaborative innovation platform for Industry-University-Research, promote the organic integration of technological innovation and standard setting, and accelerate the transformation of scientific and technological achievements into standards.	
	Encourage enterprises to actively participate in the formulation of international standards and enhance China's voice and influence in the technical field.	
International cooperation	Deepen cooperation with international standards organizations, actively participate in the formulation of international standards, and strive for more decision-making power and voice.	Enhance China's position and influence in the formulation of international standards, promote the integration and integration of China standards and international standards, and promote the wide application of China standards in the international market.
	Carry out mutual recognition of standards with other countries and regions, establish a mutual recognition mechanism of standards, and reduce trade barriers and technical barriers.	
	Strengthen technical exchanges and cooperation with international enterprises, and learn from international advanced standards and management experience.	
Market driven	Strengthen the investigation and analysis of the international market demand, formulate standards that meet the international market demand, and improve the international adaptability of standards.	Make China standards closer to the actual needs of the international market, increase the market share of China products in the international market, and promote China's industry to climb to the high end of the global value chain.
	Promote the deep integration of standards and industries, lead industrial development with standards, improve the quality and performance of products, and enhance the competitiveness of products in the international market.	
	Strengthen the publicity and training of standards, improve the market participants' awareness and acceptance of China standards, and create a good standard application atmosphere.	

Table 4. Comprehensive and Systematic Strategies and Safeguard Measures [11, 12].

Strategies	Safeguard Measures
Establish an efficient coordination mechanism	Establish an inter-departmental and cross-industry standard coordination agency, which is responsible for coordinating major issues in standard benchmarking, strengthening communication and cooperation among departments, and forming a joint effort.
Strengthen the cultivation and introduction of talents	Strengthen the training of standard talents, establish a multi-level and multi-channel talent training system, and train a group of compound talents who understand both technology and standards, as well as domestic conditions and international rules. At the same time, actively introduce international standards experts and high-end talents to provide intellectual support for the internationalization of China standards.
Improve the system of laws and regulations	Revise and improve relevant laws and regulations, clarify the legal status and role of standards in economic development and social governance, and provide a solid legal guarantee for the formulation, implementation and supervision of standards.
Strengthen supervision, evaluation and feedback	Establish a supervision and evaluation mechanism for the implementation of standards, regularly evaluate and check the implementation effect of standards, find problems in time and make rectification. At the same time, establish feedback channels, listen to opinions and suggestions from all walks of life, and constantly optimize the standard benchmarking work.

8. Implementation and Application of Policy Optimization Path

See **Table 5** for the implementation and application of the policy optimization path.

9. Implementation and Application of Technological Innovation Path

The implementation and application of technological innovation path are shown in **Table 6** below.

Table 5. Implementation and Application of Policy Optimization Path [12, 13].

Implementation	Application
Improve the standard policy system	Making strategic planning: Policy makers need to organize relevant departments, industry associations, experts and scholars to carry out in-depth research, and formulate standardized development strategic planning covering short-term, medium-term and long-term in combination with the national industrial development strategy and the development trend of international standards. For example, for the next 5 years, 10 years and 15 years, the standard development goals of different stages are set respectively, and the key industrial fields and key technical standards are clearly defined.
	Strengthen policy coordination: establish an inter-departmental standardization policy coordination mechanism, and a special coordination body will hold regular meetings to coordinate the standards-related policies issued by various departments. Ensure that policies such as science and technology, industry and trade cooperate with each other in standard setting, and avoid policy conflicts and redundant construction. For example, when supporting scientific research projects, science and technology departments should consider the connection between project achievements and standard setting, and industrial policies should guide enterprises to produce and operate according to advanced standards.
Increase financial input	Set up a special fund: Policy makers set up a special fund for standard development through financial budget arrangements. Clarify the scope of use and application process of the fund, and focus on supporting the research and development of key core technical standards, participation in international standard formulation, standard test verification and popularization and application. For example, for major standard R&D projects that meet the strategic needs of the country, high fund support is given.
	Optimize the allocation of funds: Establish a scientific fund allocation model, and rationally allocate special funds according to the development needs of different industries and the importance of standards. Give priority to supporting the formulation of standards for emerging industries and basic industries, and at the same time tilt towards small and medium-sized enterprises and scientific research institutions to encourage them to actively participate in standards work.
	Implement incentive policies: formulate preferential tax policies and give a certain percentage of tax relief to enterprises that participate in the formulation of standards and adopt advanced standards. Set up financial subsidies to reward enterprises and institutions that have made outstanding achievements in standard innovation, and encourage market participants to actively participate in the process of internationalization of standards.
Establish a standard reward mechanism	Formulate reward standards: Policy makers will work with relevant departments and industry associations to formulate detailed standard reward standards. Clarify the object, conditions and amount of rewards, such as giving high bonuses and honorary certificates to enterprises that lead the formulation of international standards, and giving appropriate rewards to enterprises that participate in the formulation of international standards and play an important role.
	Standardize the evaluation process: establish an open, fair and just reward evaluation mechanism, and set up a professional evaluation Committee to review the award application. The evaluation process should be supervised by the society to ensure the authority and credibility of the award.

Table 6. Implementation and Application of Technological Innovation Path [12–14].

Implementation	Application
Increase investment in research and development	Policy guidance and support: Policymakers introduce relevant policies to encourage enterprises to increase investment in research and development of standards-related technologies. For example, through the application guide for scientific research projects, guide enterprises to focus on key core technologies to carry out research and development work, and give financial support to qualified projects.
	Establish R&D platform: Support enterprises, universities and scientific research institutions to establish R&D platforms such as Industry-University-Research Joint Laboratory and Engineering Technology Research Center, and provide hardware facilities and technical support for standard technology research and development. The government can promote the construction and development of R&D platform by providing venues and equipment purchase subsidies.
Establish a collaborative innovation platform for Industry-University-Research.	Building a Bridge of Cooperation: Policymakers actively promote cooperation among enterprises, universities and scientific research institutions, organize docking activities in Industry-University-Research, and promote information sharing and cooperation and exchange in standard technology research and development. For example, hold standard technical seminars, project matchmaking meetings and other activities to build cooperation platforms for enterprises and scientific research institutions.
	Improve the cooperation mechanism: formulate relevant policies and standardize the cooperation mode and benefit distribution mechanism of collaborative innovation in Industry-University-Research. Encourage all parties to sign long-term cooperation agreements, clarify the rights and obligations in standard research and development, transformation of results, etc., and ensure the smooth progress of cooperation.
Encourage enterprises to participate in the formulation of international standards.	Providing information services: Policymakers should establish an information service platform for international standards, and collect, sort out and publish the latest developments, rules and procedures of international standards formulation in a timely manner. Provide professional information consulting services for enterprises to help them understand the trends and requirements of international standards.
	Give policy support: give policy inclination and support to enterprises that have participated in the formulation of international standards and achieved important results. For example, give priority to government procurement, project approval and other aspects, and improve the enthusiasm of enterprises to participate in the formulation of international standards.

10. Implementation and Application of International Cooperation Path

See **Table 7** below for the implementation and application of international cooperation paths.

11. Implementation and Application of Market-Driven Path

The implementation and application of market-driven path are shown in **Table 8** below.

Table 7. Implementation and Application of International Cooperation Path [14–16].

Implementation	Application
Deepen cooperation with international standards organizations	Actively participate in activities: Policy makers encourage relevant domestic institutions and enterprises to actively participate in meetings, seminars, technical committees and other activities of international standards organizations. Provide financial support and policy guarantee to ensure that domestic representatives can fully participate in the discussion and decision-making process of international standard setting.
	Fight for the right to speak: Improve China's right to speak in the formulation of international standards by recommending outstanding experts to important positions of international standards organizations. Policymakers should establish an expert recommendation and selection mechanism, and select experts with rich experience in standard setting and international influence to participate in the work of international standards organizations.
Carry out mutual recognition of standards.	Establish cooperation mechanism: Policymakers actively negotiate with other countries and regions for mutual recognition of standards, and establish bilateral or multilateral cooperation mechanisms for mutual recognition of standards. By signing a standard mutual recognition agreement, the standard scope, certification procedures, supervision and management of mutual recognition are defined.
	Strengthen communication and coordination: in the process of mutual recognition of standards, strengthen communication and coordination with partners and solve problems in time. Establish a coordination group for mutual recognition of standards, which is responsible for coordinating the work of relevant domestic departments and enterprises to ensure the smooth progress of mutual recognition of standards.

Table 7. *Cont.*

Implementation	Application
Strengthen technical exchanges and cooperation with international enterprises.	Building a cooperation platform: Policy makers organize international standards cooperation and exchange activities, such as international standards forums and technical cooperation project matchmaking meetings, to build a platform for exchanges and cooperation between domestic enterprises and international enterprises. Encourage domestic enterprises and international enterprises to carry out joint research and development, standard setting and other cooperative projects.
	Provide policy support: give policy support and preferential treatment to enterprises that carry out technical exchanges and cooperation with international enterprises. For example, provide convenience in taxation and foreign exchange management, and reduce the cost of enterprise cooperation.

Table 8. Implementation and Application of Market-Driven Path [16, 17].

Implementation	Application
Investigate the international market demand	Organizing market research: Policy makers entrust professional market research institutions or organize relevant departments to carry out international market demand research. Establish a market demand information collection and analysis system to keep abreast of the changes and trends of international market demand.
	Guide the formulation of standards: according to the market research results, guide the standard-setting institutions and enterprises to formulate standards that meet the needs of the international market. For example, according to the market characteristics of different countries and regions, differentiated product standards and service standards are formulated.
Promote the integration of standards and industries	Formulation of industrial standard planning: Policy makers combine industrial development planning to formulate a development plan integrating standards and industries. Clarify the development direction and key tasks of standards in various industrial fields, and guide enterprises to produce and operate according to standards.
	Strengthen the supervision of standards implementation: establish and improve the supervision mechanism of standards implementation, and strengthen the supervision and inspection of the implementation of enterprise standards. Enterprises that do not meet the standards shall be punished according to law, and enterprises shall be urged to improve the implementation level of standards.
Strengthen publicity and training of standards.	Publicity activities: Policy makers organize publicity activities on standards, and widely publicize the advantages and functions of China standards through various media channels, such as television, newspapers and the Internet. Make standard publicity materials to popularize standard knowledge to enterprises and the public.
	Hold training courses: hold standard training courses regularly and invite standard experts to teach for enterprises and the public. The training content includes the knowledge of standard formulation, implementation and certification, so as to improve the market participants' awareness and application ability of China standards.

12. Conclusions

12.1. Research Conclusion

Through in-depth analysis of the gap between China standards and international standards, this study reveals the key factors affecting the benchmarking process, constructs a comprehensive benchmarking path including policy optimization, technological innovation, international cooperation and market drive, and puts forward specific implementation strategies and safeguard measures. The research shows that by comprehensively applying these paths and measures, the gap between China standards and international standards can be effectively narrowed, and the internationalization level of China standards can be improved.

12.2. Research Deficiency and Prospect

Although this study systematically studies the path of China standard benchmarking international standards, there are still some shortcomings. For example, in data collection and analysis, the limited availability and accuracy of some data may have a certain impact on the research results. In future research, we will further expand the data sources and improve the accuracy and reliability of the data. At the same time, with the continuous development of the global

economy and technology, standard benchmarking will also face new challenges and opportunities. The future research can focus on the issue of standards benchmarking in emerging technology fields, explore more effective benchmarking paths and strategies, and provide more comprehensive and in-depth theoretical support and practical guidance for the internationalization of China standards.

Although this study systematically studies the path of China standard benchmarking international standards, there are still some shortcomings. For example, in data collection and analysis, the limited availability and accuracy of some data may have a certain impact on the research results. In future research, we will further expand the data sources and improve the accuracy and reliability of the data. At the same time, with the continuous development of the global economy and technology, standard benchmarking will also face new challenges and opportunities. The future research can focus on the issue of standards benchmarking in emerging technology fields, explore more effective benchmarking paths and strategies, and provide more comprehensive and in-depth theoretical support and practical guidance for the internationalization of China standards.

In a word, it is a long-term and arduous task for China to benchmark international standards, which requires the joint efforts of the government, enterprises, scientific research institutions and all sectors of society. By constantly optimizing the policy environment, strengthening technological innovation, deepening international cooperation and giving play to the market-driven role, China Standards will surely play a more important role in the international arena and make greater contributions to the high-quality development of China's economy and the prosperity of the global economy[16, 17].

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Article processing charges were covered by the authors.

Institutional Review Board Statement

This study belongs to the category of standardization theory and policy analysis, and does not involve human subjects, animal experiments or sensitive personal data collection. According to Article 3 of the Administrative Measures for Ethical Review of Scientific Research (Order No.19 of the Ministry of Science and Technology) and the exemption clause of ethical review of the institution where the author works (Shanxi Inspection and Testing Center): "Non-interventionist academic work such as pure literature analysis, policy research and technical standard development need not be submitted to the institutional review committee for approval." All data in the research process come from: Open policy documents (such as the Measures for the Administration of National Standards and the Outline for the Development of National Standardization);Published academic documents and standard texts (ISO/IEC, GB/T, group standards, etc.);Industrial statistics published by government departments (database of Ministry of Industry and Information Technology and General Administration of Market Supervision). It is hereby declared that this study has not triggered any ethical review requirements for scientific research.

Informed Consent Statement

This study did not involve human subjects, biological samples, or personal data collection. All research materials consisted exclusively of:Publicly available policy documents ;Published academic literature and standard texts;Aggregated industry statistics from government databases (e.g., SAMR, MIIT); No identifiable human participants were included, therefore informed consent was not required.

Data Availability Statement

All data supporting this study are available from public repositories and official sources:

Policy Documents:Administrative Regulations of China (SAMR): GB/T Management Rules;State Council Policy Database: National Standardization Development Outline.

Standard Texts:Chinese National Standards:GB/T Full-text Public System;Chinese Association Standards: National TTBS Platform;ISO/IEC Standards: Online Browsing Platform.

Industry Metrics:MIIT Annual Reports:China Standardization Development Report;CAS White Papers: CSTM Sta-

tistical Analysis on Standard Conversion;Access Method: Direct download via keyword search (e.g., "standard conversion", "international alignment") on listed platforms.

Acknowledgments

The authors gratefully acknowledge the following non-financial support:

Technical Resources:Shanxi Inspection & Testing Center for providing full access to ISO/IEC standards archives;China National Institute of Standardization (CNIS) for opening its database on association-to-national standard conversion cases (2015–2025)

Industry Collaboration:Contemporary Amperex Technology Ltd. (CATL) for sharing implementation data of battery standard conversion;China Construction Machinery Association for technical validation of precast concrete vibration equipment metrics.

Academic Guidance:Dr. Hans Müller (ISO/TC 96) for strategic advice on international rule alignment;Prof. Li from Tsinghua University Institute of Standardization for theoretical review of the pathway selection model.

Conflicts of Interest

I declare no conflict of interest. This study adheres to academic independence principles:

Research Basis: All analyses rely exclusively on public policy documents and standard texts (e.g., GB/T, ISO) without corporate influence;

Case Citations: Industry cases (e.g., CATL, CSCEC) refer to published standardization practices with no commercial relationships;

Decision Relevance: Findings (e.g., pathway selection model) are not utilized in the authors' institutional certification/review services.

References

[1] Hui, C., Aixuan, N., Shuo, D., 2024. Empowering New Productive Forces with Standardization to Develop Collaborative Mechanism. Popular Standardization. (9), 1–10. Available from: https://d.wanfangdata.com.cn/periodical/dzbzh202409002 (cited 5 April 2025). (in Chinese)

[2] Southern Weekend, 2025. The hardest part of going to sea: becoming a standard setter. Available from: https://www.infzm.com/contents/290092?source=124&source_1=290265 (cited 5 April 2025). (in Chinese)

[3] State Administration of Market Supervision, 2025. Adopt international standard management methods. Available from: https://www.samr.gov.cn/cms_files/filemanager/1647978232/attach/20254/918a7947d88a4a65aba633b35370617a.pdf (cited 5 April 2025). (in Chinese)

[4] National Standardization Administration, 2022. Annual Report on China Standardization Development (2021). (in Chinese)

[5] National Standardization Administration, 2023. Annual Report on China Standardization Development (2022). Available from: https://www.sac.gov.cn/cms_files/filemanager/1907776593/picture/20234/7312981b820d4857bdbc8d2024d68947.png (cited 5 April 2025). (in Chinese)

[6] International Organization for Standardization, 2024. World Standards Cooperation Annual Report 2024. Available from: https://www.iso.org/annual-reports/2024 (cited 5 April 2025).

[7] The Central Committee of the Communist Party of China and the State Council, 2021. Outline of National Standardization Development. Available from: https://www.gov.cn/zhengce/2021-10/10/content_5641727.htm (cited 5 April 2025). (in Chinese)

[8] Aixuan, N., 2024. Integration of EU standards and laws: from the perspective of the "new method" directive. Xiamen University Press: Xiamen, China. (in Chinese)

[9] Hui, S., 2021. Research on the Collaborative Transformation of Technological Innovation, Patents and Standards. Enterprise Management Press: Beijing, China. (in Chinese)

[10] China National Institute of Standardization, 2025. Collection of International Standards Transformation Cases of China National Institute of Standardization. China Standards Publishing House: Beijing, China. (in Chinese)

[11] State Administration of Market Supervision, 2024. Promote the transformation and application of Belt and Road related achievements. Available from: https://www.samr.gov.cn:8890/gjhzs/sjdt/art/2024/art_ec76214752794f28851540bd473506d7.html (cited 5 April 2025). (in Chinese)

[12] Jingjuan, Z., Yan, Z., Chunyan, W., et al., 2025. RCEP membership standards, conformity assessment and technical barriers to trade. Standard Science Journal. 11, 47–53, 70. (in Chinese)

[13] Shuchun, L., 2020. Theory and practice of high-quality development of small and medium-sized enterprises in China under the new development pattern. Enterprise Management Press: Beijing, China. (in Chinese)

[14] Tsinghua University, 2024. Making China Standard

a World Standard —— Interview with Academician Wu Jianping of Tsinghua University. Available from: https://www.tsinghua.edu.cn/info/1182/114853.htm (cited 5 April 2025). (in Chinese)

[15] CWMS, 2024. Implement the Action Plan of National Standardization Development Outline (2024–2025). Available from: http://cwms.org.cn/data/upload/image/20240327/1711501069938953.pdf (cited 5 April 2025). (in Chinese)

[16] Han Jian, Zhu Hai. (2025). Expanding the space of international cooperation by "going out" according to China standards. Journal of Nanjing University (Philosophy, Humanities and Social Sciences), (3), 1–10.

[17] SOHU.com, 2025. Digital Intelligence Empowering China's Standard Internationalization Transition: Internal Mechanism and Realization Path. Available from: https://www.sohu.com/a/912543917_121117464 (cited 5 April 2025). (in Chinese)