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The Centennial Internationalization Process of Engineering Education at Tsinghua University: Transplantation, Transformation, and Development

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ABSTRACT

The century-long evolution of engineering education at Tsinghua University reflects the typical path of China's higher engineering education transitioning from a latecomer, externally influenced modernization to independent innovation. Its internationalization process has experienced several stages: the early transplantation of the American model, a period of comprehensive shift to the Soviet model during departmental adjustments, accelerated alignment with international standards following the Reform and Opening-up, and deep participation in global engineering education in the new era. The fundamental driving force behind the internationalization of Tsinghua University's engineering education has always originated from the intrinsic needs of national rejuvenation and modernization, with the evolution path exhibiting a spiral development logic from "learning from others" to "independent construction" and then to "development and innovation".

Keywords: Tsinghua University, engineering education, internationalization process, development and innovation

INTRODUCTION

Engineering education is a key support for national industrialization and modernization. As an important institution of engineering education in China, Tsinghua University's century-long development carries the historical memory of China from a backward agricultural country to an industrial power, and from a major educational country to a powerful educational nation. In this process, internationalization has always been one of the deep driving forces behind the reform and development of Tsinghua University's engineering education. The so-called internationalization of engineering education means that engineering education aligns with international standards in various aspects, and gradually forms a dynamic process with its own characteristics and global influence through international cooperation and joint construction (Chen, 2004; Wang et al., 2021). For a late-developing, externally influenced modernization country like China, foreign influence is a core variable in understanding the construction and development of its engineering education system (Liu, 2011). Tsinghua University's engineering education originated in the historical context of learning from the West, continuously transforming and growing amid the dual interplay of domestic development missions and international political patterns, gradually achieving a shift from deep dependence to independent innovation, profoundly

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reshaping its core position in the global knowledge flow pattern.

The main body of this paper is organized according to the historical periodization of the internationalization of engineering education at Tsinghua University. It first examines the transplantation of the American educational model and attempts at localization between 1911 and 1949, as well as their significance for laying the foundation of engineering education at Tsinghua. It then analyzes the reorientation and reconstruction constituted by the introduction of the Soviet model and the exploration of autonomous education between 1949 and 1978. Subsequently, it discusses the process by which Tsinghua accelerated its alignment with international norms and expanded its internationalized integration against the backdrop of reform and opening-up between 1978 and 2011. It further examines the orientation toward autonomy and innovation manifested in the implementation of global strategies and deep participation in internationalization from 2012 to 2026. Finally, in the concluding remarks, it distills and explicates the underlying logic of Tsinghua's century-long internationalization.

RESEARCH METHODOLOGY

This study adopts a qualitative historical case study approach, taking the internationalization practices of engineering education at Tsinghua University as the analysis object. Based on various historical materials such as archives, newspapers, and publicly published academic works, it systematically reviews the historical development of the university's engineering education internationalization. On this basis, it further examines, in distinct phases, the institution's internationalization strategies, key implementation measures, and institutional outcomes, while exploring the transferable value of these experiences for contemporary engineering education reform.

The adoption of a qualitative historical case study design is warranted on three grounds. First, the case is selected not for its statistical representativeness but for its analytical leverage: over a relatively long historical span, the internationalization of engineering education at Tsinghua University condenses successive shifts across models of internationalization in latecomer universities, and thus offers considerable heuristic value. Second, the four-phase periodization is analytically rather than merely chronologically derived. It is organized around shifts in the dominant institutional logic, corresponding respectively to the transplantation of the American model, the introduction of the Soviet model, international alignment after reform and opening-up, and autonomous participation under a global strategy; each phase comprises a discernible configuration of internationalization strategies, organizational arrangements, and knowledge-flow patterns. Third, the tension between model transplantation and localization, and the balance between external institutional reference and internal autonomy, constitute general problems recognizable in comparable settings. The case thereby provides an exemplary site in which these mechanisms can be traced over an extended period, underpinning the transferability of the analysis.

EVOLUTION

Transplantation and Foundation: The American Model and Localization Attempts (1911–1949)

Since the mid-19th century, with the eastward spread of Western learning and the rise of domestic military and civilian industries, modern engineering education in China emerged (Shi, 2004). Tsinghua was founded at a time when the Chinese nation faced internal turmoil and external threats, and its engineering education from the beginning carried distinct international characteristics. In 1908, the U.S. government announced that part of the excess Boxer Indemnity would be returned to China for the purpose of promoting education. In 1909, the Qing government established the Bureau of Educational Mission to the United States with an affiliated preparatory school, and selected students to study in the United States, which spurred a large-scale wave of studying in the United States in the modern history of China (Li & Liu, 2000) and initiated the cultivation of Tsinghua engineering talents. In order to cultivate practical talents and promote social and economic development, the Qing government stipulated that 80% of students should specialize in practical subjects such as agriculture, engineering, commerce, and mining, and 20% should study law, politics, etc. Until the end of the Preparatory School in 1929, Tsing Hua trained and sent 1,280 students to study in the United States, of whom 404 were studying engineering, accounting for the highest proportion (Tsinghua University History Research Office, 1991). These international students entered the Massachusetts Institute of Technology (MIT), the University of Michigan, Columbia University, Harvard University and other institutions to study, actively absorbing advanced Western scientific and cultural knowledge. After returning to China, they mostly devoted themselves to education, industry, science and technology and other fields, which profoundly influenced the development trend of modern China.

In 1911, with the approval of the Qing government, the School changed its name to Tsinghua Xuetang, and in 1912 it was renamed Tsinghua Xuexiao. In the early days of Tsinghua Xuetang and Tsinghua Xuexiao, the school

adopted the methods from American middle and high schools to set up middle school and high school (each lasting four years). In engineering, courses such as manual work and applied drawing were offered to provide students with a preliminary foundation in industrial technology for studying in the United States. In 1926, to meet the urgent demand for engineering and technical talents in social and economic development, Tsinghua School established the Department of Engineering, with three divisions: civil, mechanical, and electrical engineering. Early students sent to the United States to study returned to teach at Tsinghua and became the core faculty of the Department of Engineering, introducing the American model to Tsinghua and making beneficial explorations for the development of engineering education. For example, at that time, the five professors in the Department of Engineering had studied at institutions such as MIT, the University of Southern California, Harvard University. Their academic backgrounds and teaching philosophies directly determined the deep transplant of the American model in Tsinghua's engineering education during this period, with the MIT model having the most profound influence (Liu, 2011).

Since the late 1920s, the National Government vigorously promoted the educational policy of "advocating practical sciences and restricting literature and law" to meet the needs of the country's economic, political, and national defense development. In response to these requirements, National Tsinghua University established the College of Engineering in 1932, with departments of Civil Engineering, Mechanical Engineering, and Electrical Engineering. The university actively recruited scholars returned from overseas studies as well as experienced domestic experts to teach. "As for professors, they had all studied abroad for many years and had expertise and insights in European and American engineering knowledge" (Gu, 1936). Among the 26 professors before 1937, 14 were graduates of MIT, with others having studied at Cornell University, Yale University, the University of Michigan, Purdue University, and other institutions, providing direct conditions for introducing the American higher education model, especially that of MIT, into Tsinghua (Liu, 2011). Whether in the philosophy of emphasizing general education or in the selection of teaching materials, the university took American universities as its model (Liu, 2011). At the same time, some teachers actively attempted to localize engineering education by compiling Chinese textbooks, standardizing engineering terminology, and other measures, gradually reversing the excessive reliance of modern Chinese higher engineering education on Western materials and terms (Shi, 2004), and promoting an initial combination of "transplantation and learning" and "local adaptation".

At the level of international academic exchange, the School of Engineering actively invited internationally renowned scholars such as Frank Wattendorf and Norbert Wiener to teach at Tsinghua University long-term or to conduct collaborative research, promoting the deep integration of Tsinghua's engineering education with the international academic forefront. Among them, Wattendorf taught aerodynamics experiment courses at Tsinghua, actively advocated changing students' tendency to focus more on theory than experiments, and was responsible for the overall planning of the 15-foot wind tunnel in Nanchang (Editorial Committee of "A History of Aerodynamics Development in China", 1987). Wiener, during his one year teaching at Tsinghua, played an important role in promoting talent training and scientific research in the Departments of Mathematics and Electrical Engineering (Wang & Liu, 2013). At the same time, Tsinghua's excellent research environment also greatly advanced Wiener's own academic development. In his memoirs, he wrote fondly: "If I were to determine a specific turning point in my career, that is, from being a just-trained craftsman in science to, to some extent, an independent master in this field, I should choose 1935, the year I spent in China, as this turning point" (Wiener, 1956/1987). Such deep academic exchanges fully demonstrate that "Tsinghua University's academic level has rapidly improved and gradually been recognized by the international academic community. Scientific research is no longer just about learning from and introducing Western knowledge, but collaborating and communicating with top international scholars and participating in the torrent of international academic innovation" (Jin, 2024). To further improve faculty quality and academic level, National Tsinghua University also established a leave system, encouraging professors to go abroad for advanced study and investigation, and to promptly absorb international advanced teaching and scientific research experience. After 1933, National Tsinghua University began nationwide recruitment for government-sponsored students to study in the United States, and by 1936, a total of 92 students were admitted, of whom about 30 studied engineering-related majors, continuing to cultivate internationalized talent for China's engineering field (Tsinghua University Archives, 1933–1936). At the same time, Tsinghua University and the German Far East Association jointly established the Sino-German student exchange program. In the field of engineering, Germany sent 2 engineers to Tsinghua for exchange in 1935, and in 1936, Tsinghua sent one student each in civil engineering and aeronautical engineering to Germany (Li et al., 2011). In addition, to promote educational, scientific, technological, and cultural exchanges between China and Poland, in 1935, Tsinghua University sent one civil engineering student to study in Poland (Jin, 2023), expanding the cooperative dimension of internationalization in engineering education.

After the full outbreak of the Anti-Japanese War in 1937, to resist Japanese aggression and continue educational activities, National Tsinghua University relocated successively to Changsha in Hunan and Kunming in Yunnan, and, together with National Peking University and the private Nankai University, successively formed the Temporary Changsha University and National Southwest Associated University, persisting in running the school under extremely difficult conditions. The School of Engineering at the Southwest Associated University had departments such as Civil Engineering, Electrical Engineering, Mechanical Engineering, Chemical Engineering, and Aeronautical Engineering, as well as a Telecommunications Specialization. Affected by the wartime situation, international exchanges in Tsinghua's engineering education were severely impacted during this period, with most teachers only able to conduct academic leave within the country, and only a few allowed to go abroad for advanced studies or research. During the Anti-Japanese War, Tsinghua selected two classes of 39 government-funded students to study in the United States, including 20 students in engineering disciplines (Tsinghua University History Research Office, 1994a); at the same time, scholarships for self-funded students studying in the United States were established, supporting four engineering students to pursue further studies in the U.S. Despite the hardships, the Southwest Associated University was still committed to integrating into the international academic community (Tsinghua University History Research Office, 1994b). In August 1945, the United States dropped atomic bombs on Hiroshima and Nagasaki, Japan, shocking the world and prompting China to begin paying attention to the development of nuclear energy. To adapt to global technological trends and the urgent needs of national construction, after demobilization Tsinghua University actively planned to develop nuclear science, but due to obstruction from the United States and factors such as the domestic political situation, this plan was not implemented.

Overall, before the founding of the People's Republic of China (PRC), the internationalization of engineering education at Tsinghua University showed distinct characteristics of "transplantation and dependence." Its engineering education system as a whole drew on the American model, with teaching content and faculty sources highly dependent on the United States. Essentially, it was a selective replication of advanced Western engineering education models. However, this reliance was not entirely passive and blind; the group of returned overseas students actively combined American educational concepts and knowledge systems with the practical needs of Chinese engineering, gradually promoting the localization of engineering education. Key internationalization events and their significance at Tsinghua University from 1911 to 1949 are shown in Table 1.

Transformation and Reconstruction: Exploration of the Soviet Model and Independent Education (1949–1976)

After the founding of New China, in the face of the devastation left by long-term wars, restoring and developing the national economy and promoting innovations in education, culture, and science and technology became urgent tasks for building a people's democratic state. During this period, Tsinghua University actively adapted to the needs of national economic construction. Its international direction underwent a fundamental shift, abandoning American-style general education in favor of comprehensive study of the Soviet model. Through departmental restructuring, it transformed from a comprehensive university into a multi-disciplinary industrial university, establishing departments such as Mechanical Manufacturing, Power Machinery, Civil Engineering, Hydraulic Engineering, Architecture, Electrical Engineering, and Radio Engineering, as well as specialized programs, cultivating a large number of high-level technical talents for the country's industrialization. In the early years of the founding of the country, the university actively carried out cultural exchanges and scientific and technological cooperation with the Soviet Union and Eastern European socialist countries. In 1950, 33 students from five Eastern European countries—Czechoslovakia, Poland, Hungary, Bulgaria, and Romania—enrolled, becoming the first group of foreign students to be admitted to Tsinghua University after the founding of New China (Chen et al., 2018).

In order to adapt to the urgent need for technical talents in large-scale economic construction, Tsinghua University immediately carried out a teaching reform with the main content of "learning from the advanced experience of Soviet education" after the adjustment of the departments, including issuing Soviet teaching plans and other reference materials, inviting Soviet experts to hold seminars, and translating Soviet teaching syllabi (Shi, 2010). According to statistics, between 1952 and 1961, 68 experts from the Soviet Union, German Democratic Republic, and Czechoslovakia came to work at the university. The school established stable cooperative relationships with well-known institutions such as Moscow Power Institute, and also sent large numbers of overseas students and advanced teachers to study in the Soviet Union and Eastern European countries (Chen et al., 2018). To develop atomic energy, in September 1955, the Ministry of Higher Education organized a higher education inspection delegation, led by Tsinghua University President Jiang Nanxiang, to the Soviet Union to study educational practices. With central government approval, Tsinghua University has successively established new technology majors in atomic energy, semiconductors, remote automatic control, gas turbines, and electronic computers, and established departments of

Table 1: Chronological Timeline of Key Internationalization Events (1911–1949)

Year	Key Event	Significance
1908	U.S. announces return of excess Boxer Indemnity for educational purposes	Enabled large-scale Chinese students to study in the U.S.
1909	Established the Bureau of Educational Mission to the United States with an affiliated preparatory school	Initiated large-scale official overseas study in the U.S.
1911	Tsinghua Xuetang founded	Marked the birth of Tsinghua
1926	Department of Engineering established	First formal engineering education department at Tsinghua
1929	Preparatory School ends; 1,280 students sent to the U.S., of whom 404 were studying engineering	Cultivated a large number of early engineering students who studied abroad
1932	College of Engineering founded	Engineering disciplines were further expanded
1935–1936	Frank Wattendorf and Norbert Wiener teach at Tsinghua	Deepened international academic exchange and collaboration
1935–1936	Sino-German and Sino-Polish student exchange programs launched	Expanded internationalization beyond the U.S.
1937–1946	International exchanges severely curtailed	Wartime disruption but maintained its engagement in international academic activities

Source: *Compiled by the authors.*

engineering physics, engineering chemistry, engineering mechanics, mathematics, and automatic control (Fang et al., 2013), laying a solid foundation for the future layout of engineering disciplines.

Tsinghua University focused on teaching reform, actively learned from the advanced Soviet educational experience, and implemented the principle of integrating theory with practice, significantly improving students' independence and autonomy. However, it is undeniable that mechanical copying of Soviet experience led to excessive student burdens, overly detailed divisions of majors, and a single training model, which have increasingly become apparent (Tsinghua University History Research Office, 2006). In the late 1950s, as Sino-Soviet relations deteriorated and socialist construction experience gradually accumulated, the Party and the state put forward the strategic goal of developing the national economy through independence and self-reliance. In response, higher education institutions began to correct the deviation of mechanically copying the Soviet model and explore autonomous education models suited to China's national conditions. During this period, Tsinghua University actively implemented the Party's educational policies, combining education with productive labor, and students completed practice-oriented graduation projects. Through the policy of "adjustment, consolidation, enrichment, and improvement", it cultivated a large number of outstanding talents who were politically sound and professionally competent.

From an international perspective, the internationalization of Tsinghua's engineering education during this period exhibited intertwined characteristics of "track change" and "reconstruction". On one hand, it severed ties with the American engineering education system and fully shifted to the Soviet model, fundamentally replacing international cooperation partners; on the other hand, this internationalization carried strong political tones and is a direct projection of the nation's will in the field of higher education. From a historical perspective, although this stage of internationalization was strongly politically dependent, it laid the institutional framework for the construction of Tsinghua University's modern engineering education system. After the outbreak of the "Cultural Revolution" in 1966, Tsinghua University's international exchanges were almost completely interrupted, and the internationalization of engineering education stalled. In the second half of 1975, the school accepted 21 international students from nine countries including Albania, Cambodia, and New Zealand (Tsinghua University History Research Office, 2011), demonstrating limited attempts at international exchange. The decade-long turmoil of the Cultural Revolution dealt a systemic blow to China's higher education system, not only causing a gap in the emergence of scientific and technological talent but also significantly widening the gap between Tsinghua's engineering education and the world's advanced standards. Key internationalization events and their significance at Tsinghua University from 1949 to 1976 are shown in Table 2.

Integration and Expansion: Reform, Opening Up, and Accelerating International Integration (1977–2011)

After the reform and opening up, Tsinghua University's engineering education ushered in a new wave of internationalization. Unlike the "transplantation" before the founding of New China and the "transition of course" in the early years of New China, internationalization during this period centered on "alignment" and "expansion", actively integrating into the global engineering education system. In 1978, following Deng Xiaoping's important directive to send students abroad on a large scale, China sent the first batch of 52 students abroad in the new era,

Table 2: Chronological Timeline of Key Internationalization Events (1949–1976)

Year	Key Event	Significance
1950	Foreign students from five Eastern European countries enrolled	Marked the beginning of post-1949 international student mobility
1952	Departmental restructuring; shift from American to Soviet model	Fundamental reorientation of international partnership; systematic import of Soviet expertise and teaching models
1955	President Jiang Nanxiang led delegation to study Soviet educational practices	High-level policy learning from Soviet system
1955–1960s	New technology majors established (atomic energy, semiconductors, computers, etc.)	Alignment with national strategic needs in science and technology
Late 1950s	Sino-Soviet relations deteriorate; shift toward self-reliance	Transition from mechanical copying to independent exploration
1966–1976	International exchanges almost completely interrupted	Systemic disruption of internationalization efforts
1975	21 international students from nine countries admitted	Limited resumption of international exchange

Source: *Compiled by the authors.*

including 9 teachers from Tsinghua University's departments of mechanical engineering, automation, hydraulic engineering, computer science, electronics, and engineering physics. This initiative not only marked the beginning of reform and opening up in China's education sector but also became an important milestone in Tsinghua University's international cooperation and exchange. Since then, Tsinghua University has continuously expanded its international exchanges, actively sending faculty and students to study abroad, conduct inspections, conduct collaborative research, participate in international academic conferences, and establish two-way exchange mechanisms with well-known universities in multiple countries and regions, deepening academic exchange and research cooperation (Chen et al., 2018).

During this period, in accordance with the guideline that "education should be oriented toward modernization, the world, and the future", Tsinghua University clearly set the goal of building a world-class university, established a "comprehensive, research-oriented, and open" educational approach, focused on international academic frontiers, and its discipline structure showed a significant "proportion of emerging technology majors", covering frontier fields such as computer science, information systems and control technology, microelectronics, optoelectronics, nuclear energy and nuclear technology applications, new materials, and bioengineering technology. At the same time, it actively draws on the educational development and management experiences of other countries, carries out multi-level, multi-channel, and all-round international exchanges and cooperation, and promotes the coordinated enhancement of talent cultivation, scientific research, team building, and an international campus atmosphere. In 2000, the university coordinated and planned international cooperation and exchange work, formulated special development plans, increased funding, established the "985 Phase II" international cooperation construction plan, and implemented three major programs—building an international faculty team, student internationalization training, and international expansion and image building—along with seven sub-projects, promoting internationalization into a standardized and rapid development track (Chen et al., 2018).

In terms of faculty development, Tsinghua University has successively invited a large number of renowned foreign experts and scholars to teach, lecture, and conduct academic exchanges and collaborative research, gradually building an international, high-level faculty team. For example, in 2001, the university invited Academician Yu-Chi Ho and other scholars to form the "Yu-Chi Ho Chair Professorship Group" in the Department of Automation; in the same year, Professor Gavriel Salvendy, a renowned scholar in the field of industrial engineering and a member of the U.S. National Academy of Engineering, was appointed as Chair Professor and served as the first head of the Department of Industrial Engineering. In 2004, Turing Award laureate Andrew Chi-Chih Yao was appointed professor at Tsinghua Advanced Research Center and chief professor of the Chair Professor Group in the Department of Computer Science. He successively founded institutions such as the Computer Science Laboratory Class and the Interdisciplinary Information Research Institute, injecting internationally advanced concepts and academic resources into the development of related disciplines.

In the research field, Tsinghua University has established the research philosophy of "caring for the 'universe', catering to the 'land', and cultivating men of talent", conducting exploratory research at the world's academic frontiers while focusing on solving practical problems for national social development needs, achieving deep integration of research and talent cultivation. As the main force in scientific research, engineering departments closely monitor global scientific and technological trends, deeply cultivate applied basic theories and key

engineering technologies, and their overall research level continues to improve, with some reaching world-leading levels. For example, in 2000, the 10 MW high-temperature gas-cooled reactor (HTR-10) was completed at the Institute of Nuclear and New Energy Technology, Tsinghua University and achieved its first criticality. In 2003, full-power grid-connected power generation was realized (Gu, 2024), making it the world's first modular high-temperature gas-cooled reactor.

In terms of talent cultivation, Tsinghua University aims to cultivate high-quality, high-level, diverse, and innovative talents, fully utilizing international cooperation resources to build a global student training platform and gradually improve the global competency talent development system. Take the Department of Industrial Engineering as an example: since its establishment in 2001, it has gradually explored a path for cultivating "international interdisciplinary industrial engineering talents". By introducing widely used foreign language textbooks from top international universities, conducting joint master's programs abroad, and implementing summer exchange students with mixed classes, it has developed a systematic international training model that has gained high international recognition (Tsinghua University Department of Industrial Engineering, 2015). Meanwhile, as China's economy develops and its international status rises, Tsinghua's global influence continues to expand, and the number of international students attending the university increases year by year (Chen et al., 2018).

At this stage, Tsinghua's engineering education internationalization shows a typical "catch-up" stance, with the core goal of aligning with international standards and integrating into the global engineering education system. But unlike previous passive transplantation, this "alignment" is an active benchmarking while maintaining the principal role of self-managed education, reflecting an important transition from "learning from others" to "self-constructing". Key internationalization events and their significance at Tsinghua University from 1977 to 2011 are shown in Table 3.

Independence and Innovation: Global Strategy and Deep International Participation (2012–2026)

Since entering the new era, faced with the strategic needs of national development and the significant changes and opportunities of higher education, Tsinghua University has inherited and carried forward its fine tradition of an "open" education model, further widening its vision for university management, and formulated the Global Strategy of Tsinghua University in 2016 to heighten its level of internationalization in all aspects. As the overall strength of the school expands and its global influence grows, Tsinghua's engineering education has entered a stage of deep internationalization characterized by "independent innovation" (Tsinghua University International Affairs Office, 2022). In 2017, Tsinghua University released a first-class university construction plan, which, through systematic integration and consolidation of strengths in the field of engineering science and technology, formed more than ten mutually supportive discipline clusters including architecture, civil engineering and hydraulic engineering, nuclear science and safety, environment, and computer science. At the same time, disciplines with independent and highly competitive knowledge systems, such as electrical engineering, mechanics, power engineering, engineering thermophysics, and control science and engineering, have been continuously strengthened as key units (Tsinghua University, 2017).

To accelerate the construction of the "Double First-Class" initiative and enhance the international influence of engineering, in 2019 the university issued the "Implementation Opinions of Tsinghua University on Continuously Deepening Reform and Enhancing the Development Level of Engineering" (Tsinghua University, 2019). The opinion clarifies that Tsinghua's engineering department should take serving major national strategies, promoting cutting-edge technological innovation, and cultivating high-level engineering and scientific talent as its core mission, deeply participate in the national innovation-driven development strategy, and enhance innovation and social service capabilities (Tsinghua University, 2019). At the same time, phased progression goals have been set: by 2020, engineering will overall reach world-class standards, with several disciplines entering the global ranking; by 2030, engineering will enter the world's top tier, with some disciplines reaching the world's top level; by 2050, engineering will reach a world-class level, achieve global leadership, and form a development model with Chinese characteristics (Tsinghua University, 2019).

In response to the new wave of technological revolution and industrial transformation such as artificial intelligence, Tsinghua University has focused on national strategic urgent needs and cutting-edge technology directions, successively establishing new teaching and research institutions such as the School of Vehicles and Transportation, the School of Integrated Circuits, and the School of Artificial Intelligence, promoting the transformation of disciplinary organization from traditional single disciplines to interdisciplinary, interdisciplinary integration, and platform-based approaches. In terms of educational and teaching reform, the university launched the college-based talent cultivation model in 2014, and from 2020 to 2025, it successively built 15 colleges, including Weixian College and Dushi College, which are engineering-themed academies, demonstrating the school's exploration and practice of cultivating leading

Table 3: Chronological Timeline of Key Internationalization Events (1977–2011)

Year	Key Event	Significance
1978	Deng Xiaoping issued instructions to send largescale groups of overseas students. China dispatched the first batch of overseas students in the new era	This marked the beginning of China's reform and openingup in education and stands as a major milestone for international cooperation and exchanges at Tsinghua University
Post–1978	Tsinghua University steadily expanded international exchanges. It also established twoway exchange mechanisms with renowned universities across multiple countries and regions	It deepened academic exchanges and research collaboration and facilitated Tsinghua University's gradual integration into the global engineering education system
2000	The university carried out overall planning for international cooperation and exchanges, formulated special development plans	It steered internationalization work onto a track of standardized and rapid development.
2000	The Institute of Nuclear and New Energy Technology at Tsinghua University completed the 10MW hightemperature gascooled reactor (HTR10), which achieved its first criticality	It yielded a major worldleading scientific research achievement in the field of nuclear energy
2001–2004	Invited or appointed Academician Yu-Chi Ho, Professor Gavriel Salvendy, and Turing Award winner Professor Andrew Chi-Chih Yao to teach at Tsinghua University.	Recruit leading international scholars to infuse engineering programs with cuttingedge global ideas and scholarly resources.
2000–2011	Pioneered by the Department of Industrial Engineering, a systematic international talenttraining model took shape and won high international recognition	It provided replicable experience for internationalized talent training in other engineering departments across the university

Source: *Compiled by the authors.*

talents in the new era (Tsinghua University, 2026). In addition, Tsinghua University is accelerating the construction of a global educational cooperation and exchange network, from overseas base construction to university alliance collaboration, from jointly building Belt and Road countries to the international multilateral stage, continuously enhancing its internationalized educational capabilities (Qiu, 2026). The UNESCO International Centre for Engineering Education (ICEE), jointly established by the Chinese Academy of Engineering and Tsinghua University, is dedicated to building a global community of engineering education that is equal, inclusive, and win-win.

In terms of faculty and research, Tsinghua's engineering departments emphasize both recruitment and training, bringing together top scholars represented by Turing Award winners and academicians of the two academies, forming a well-structured and well-connected high-level faculty team. For example, Professor Huajian Gao, a top expert in the fields of mechanics, materials, and engineering sciences, and Professor Seeram Ramakrishna, an internationally renowned materials scientist known as the "Father of Electrospinning", and others joined Tsinghua full-time (Qiu, 2026). At the same time, Tsinghua University's engineering departments closely align with the main battlefield of national economic development, accurately grasp global technological frontiers, deeply tackle key core technologies, continuously improve research and innovation capabilities, and achieve historic leaps with multiple achievements.

Through the positive interaction between research and discipline development, Tsinghua has gradually formed a group of leading domestically and internationally influential engineering disciplines. According to the 2025–2026 World University Subject Rankings by U.S. News, Tsinghua ranks first in the world in fields such as artificial intelligence, chemical engineering, computer science, energy and fuels, environmental engineering, and materials science (U.S. News, 2025), fully demonstrating Tsinghua's global competitiveness in engineering. This fully demonstrates that at this stage, Tsinghua's engineering education internationalization has undergone a fundamental transformation in both depth and nature, shifting from passive acceptance to proactive responsibility, from local practice to global contribution, officially entering a new phase of "development and innovation". Key internationalization events and their significance at Tsinghua University from 2012 to 2026 are shown in Table 4.

CONCLUSION: THE HISTORICAL LOGIC AND FUTURE DIRECTIONS OF TSINGHUA UNIVERSITY'S CENTURY-LONG INTERNATIONALIZATION OF ENGINEERING EDUCATION

Looking back at the century-long internationalization process of Tsinghua University's engineering education, its development trajectory reveals a clear internal logic. First, transplantability and adaptability were the core characteristics of the internationalization of Tsinghua University's engineering education before and in the early years of the People's Republic of China. In the historical context of a weak nation and poor people, the internationalization of Tsinghua University's engineering education was essentially the transplantation and adaptation of models from advanced industrial countries. Whether it was the early American model or the Soviet model after the founding of the PRC, the core logic was

Table 4: Chronological Timeline of Key Internationalization Events (2012–2026)

Year	Key Event	Significance
2016	Global Strategy of Tsinghua University formulated	Comprehensive internationalization framework established
2017	First-class university construction plan released	Systematic integration of engineering strengths
2019	Implementation Opinions on Deepening Engineering Reform issued	Phased goals set for 2020, 2030, and 2050
2020–2025	15 colleges established, including engineering-themed Weixian and Dushi Colleges	New paradigm for cultivating leading engineering talents
2019–2024	Schools of Vehicles and Transportation, Integrated Circuits, and Artificial Intelligence established	Response to new technological revolution and industrial transformation

Source: *Compiled by the authors.*

to "learn from the strong" in order to quickly make up for the knowledge, institutional, and talent gaps. Second, transformation and autonomy were the main characteristics of internationalization after the reform and opening-up. With the improvement of the country's comprehensive strength and autonomous capability, the internationalization of Tsinghua University's engineering education shifted from merely "learning and borrowing" to "equal dialogue", always maintaining the university's autonomous management status while exploring engineering education paths suited to China's national conditions. Third, innovation and openness are the core traits of internationalization in the new era. In the new era, Tsinghua University's engineering education is driven by proactive innovation and cutting-edge exploration, deeply participating in the internationalization process. The university has gradually moved from "following" to "running alongside" and even "leading" in the global engineering education system by establishing a uniquely distinctive curriculum system, promoting engineering education reform, and strengthening interdisciplinary international cooperation projects, thus contributing Chinese wisdom to the development of global engineering education.

The century-long internationalization of Tsinghua University's engineering education vividly illustrates the evolutionary path of Chinese higher engineering education from a late-developing, externally influenced modernization to a self-innovative paradigm. In the early years, the introduction of the American educational model laid the foundation for the initial form of modern Chinese engineering education through borrowing, transplantation, and local adaptation; during the departmental adjustment period, the Soviet model was referenced, using national strategies to institutionalize the engineering education system; after the reform and opening-up, the approach shifted from passive alignment to active participation in the global engineering education system; in the new era, it is deeply integrated into global engineering education, continuously enhancing international discourse power and influence. Looking to the future, the internationalization of Tsinghua University's engineering education will continue to advance amid a dynamic balance between rooting itself in China and connecting with the global landscape, continually fulfilling its role as both participant and builder in the construction of the global engineering education community.

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