Challenges and Differentiated Coordinated Development Pathways for Resource Development in University Libraries of Different Types under the Strategy for Building a Strong Education Nation: An Exploration

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Date: 2025-03-03T00:00:00+00:00

Abstract

[Purpose/Significance] Addressing the requirements for classified advancement of higher education reform and development proposed in the "Education Powerhouse Construction Plan Outline (2024–2035)", this study aims to resolve issues such as repetitive construction of library resources and service homogenization among research-oriented, application-oriented, and skill-oriented university libraries, explore differentiated collaborative pathways, support full-process knowledge services spanning "basic research–technology transfer–skill application", and actively respond to the education powerhouse strategy. [Method/Process] Through literature review, case analysis, and comparative research, this study systematically examines the multi-dimensional challenges confronted by the aforementioned three types of university libraries in literature resource structure, technology adaptability, service positioning, and policy coordination, thereby clarifying the needs and priorities for differentiated collaborative development. [Results/Conclusion] This paper proposes differentiated collaborative development strategies from three dimensions–resources, technology, and policy: constructing a differentiated resource layout and complementary sharing mechanism to enhance overall resource allocation efficiency; promoting intelligent transformation and cross-platform interoperability to strengthen precise resource service capabilities; and reinforcing policy coordination and ecosystem co-construction to optimize resource management mechanisms. These strategies aim to foster deep integration of library resource construction with education, technology, and talent development, provide theoretical and practical support for optimizing the knowledge service system, and contribute to realizing the education powerhouse goal.

Full Text

Preamble

Exploration of the Challenges and Differentiated Collaborative Development Paths of Library Resource Construction in Different Types of Universities under the Strategy of Building a Leading Country in Education

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Abstract:
[Purpose/Significance] In response to the requirements of promoting classified reform and development of universities proposed in the *Outline of the Plan for Building a Leading Country in Education (2024-2035)*, this study addresses problems such as redundant resource construction and service homogenization in research-oriented, application-oriented, and skill-oriented university libraries. It explores differentiated collaborative pathways to support the full-process knowledge service chain of "basic research—technology transformation—skill application," thereby actively responding to the education powerhouse strategy. [Methods/Process] Through literature review, case analysis, and comparative research, this paper systematically examines the challenges faced by these three types of university libraries across multiple dimensions, including literature resource structure, technical adaptability, service positioning, and policy coordination, while clarifying the needs and priorities for differentiated collaborative development. [Results/Conclusions] The study proposes differentiated collaborative development strategies from three perspectives: resources, technology, and policy. First, construct a mechanism for differentiated resource layout and complementary sharing to improve overall resource allocation efficiency. Second, promote intelligent transformation and cross-platform interoperability to enhance precise resource service capabilities. Third, strengthen policy coordination and ecological co-construction to optimize resource management mechanisms. These measures will promote deep integration between library resource construction and the development of education, science and technology, and talent cultivation, providing theoretical and practical support for optimizing the knowledge service system and contributing to the realization of the education powerhouse goal.

Keywords: Strategy of Building a Leading Country in Education; Classified Reform; University Libraries; Documentary Resource Construction; Differentiated Collaboration

In the development of China' s higher education, guiding universities toward classified development to resolve the contradiction between diverse social needs and singular development goals has always been a complex and arduous task [1]. Under the grand layout of the education powerhouse strategy, universities serve as critical positions for knowledge innovation and talent cultivation, mak-

ing classified development increasingly important. In January 2025, the Central Committee of the Communist Party of China and the State Council issued the *Outline of the Plan for Building a Leading Country in Education (2024-2035)*, which explicitly calls for promoting classified reform and development of universities. According to their basic educational positioning as research-oriented, application-oriented, or skill-oriented institutions, and distinguishing between comprehensive and specialized directions, universities should be driven toward differentiated development with a classified management and evaluation mechanism [2]. This classified development concept aims to guide universities to leverage their strengths and develop distinctive features in different fields and tracks, thereby enhancing the comprehensive strength of higher education, cultivating diversified talents for the nation, and building strategic leading forces. As the documentary information resource center of universities, libraries are academic institutions serving talent cultivation and scientific research, and their level represents an important indicator of the university' s overall standard [3-5]. Under the trend of promoting classified reform and development, library resource construction should follow suit, achieving differentiated collaborative development based on the functional positioning of different university types. This approach enables more precise orientation of resource construction, optimizes resource allocation mechanisms, actively participates in various resource co-construction and sharing initiatives, improves resource utilization efficiency, avoids redundant construction and waste, leverages information resource advantages, better meets the teaching, research, and learning needs of faculty and students, better serves society, and thus enhances the core competitiveness of universities.

2 The Link Between the Education Powerhouse Strategy and University Library Resource Construction

The education powerhouse strategy is a major strategic initiative implemented by China based on the development needs of the new era to achieve the great rejuvenation of the Chinese nation. Its goal is to transform China from a major education country into an education powerhouse by 2035, significantly enhancing education' s capacity to serve national strategies and generally achieving educational modernization [6]. The classified reform direction for universities proposed in the *Outline of the Plan for Building a Leading Country in Education (2024-2035)* carries far-reaching significance, reflecting the state' s strategic intention to optimize the layout of the higher education system. It also introduces, for the first time, the concept of "skill-oriented universities," creating favorable opportunities for driving the integration of vocational and general education in building a skilled society, promoting deep integration of industry and education, and constructing an integrated and coordinated mechanism for education, science and technology, and talent development [7-8].

Currently, the classification of China' s universities into research-oriented, application-oriented, and skill-oriented types is primarily based on differences

in educational positioning, disciplinary structure, talent cultivation goals, and social service functions. In university practice and general perception, research-oriented universities focus on cultivating innovative and compound talents for academic research, covering bachelor' s, master' s, and doctoral degree programs with a large proportion of graduate students. They conduct cutting-edge basic research and undertake major national strategic tasks, mainly represented by national "Double First-Class" universities. Application-oriented universities aim to serve regional economic and social development and industrial growth, emphasizing technology transformation and applied talent cultivation at the undergraduate level and above, with a focus on university-enterprise cooperation and industry-education integration, mainly represented by local undergraduate institutions and universities with industry or integration characteristics. Skill-oriented universities prioritize vocational ability cultivation, delivering technical and skilled personnel at the junior college level for frontline production and service positions, emphasizing "integration of work and learning, unity of knowledge and practice," mainly represented by higher vocational colleges and pilot vocational undergraduate institutions [9].

The concept of library resources broadly includes documentary resources, human resources, and space resources, but narrowly refers only to documentary resources collected by libraries. In terms of carrier format, these include paper documents, microform documents, digital documents, and physical documents [10]. This study focuses on library resources in the narrow sense, which constitute the prerequisite for the existence and development of libraries and the foundation for high-quality development of university libraries, supporting the orderly and sustainable delivery of all library services [11-12]. In recent years, the university library community has consistently aligned with the deployment of building an education powerhouse, focusing on topics such as serving new-quality talent cultivation and innovative development of resource construction to conduct theoretical thinking and path exploration [13], 迎接 ing the comprehensive and profound challenges brought by the education powerhouse strategy in terms of resource construction concepts, demands, and directions.

On the one hand, traditional concepts of library resource construction previously emphasized quantitative accumulation of collection resources, pursuing comprehensiveness and systematicity. Under the education powerhouse strategy, as the state attaches great importance to the quality of talent cultivation and innovation capacity in higher education, university libraries actively promote high-quality resource construction, shifting their service philosophy to a user-centered approach and moving from "quantity-focused" to "quality-focused" construction [11]. This approach emphasizes precise resource allocation according to the needs of different disciplines and user levels to improve resource relevance and applicability. On the other hand, university libraries increasingly emphasize resource integration and sharing. To improve resource utilization efficiency and avoid redundant construction, university libraries actively participate in regional or national resource sharing alliances (such as BALIS, CALIS,

and CASHL), achieving resource co-construction and sharing through interlibrary loan and document delivery, enabling faculty and students to conveniently access broader academic resources. These influences are driving profound transformations in library development models and service approaches, playing an important guiding role in university library resource construction. Moreover, to comply with the education powerhouse strategy' s requirement of promoting classified reform and development, university libraries should clarify their positioning and functions, establish strategic plans that align with the era and meet the needs of new-generation users, strengthen interdisciplinary literature resource organization and services, continuously promote the transformation and upgrading of knowledge systems, and enhance academic resource database construction. They should better fulfill the functions of academic literature information dissemination, collection, integration, editing, expansion, and sharing, build a world-class academic resource information platform with Chinese characteristics, and enhance national cultural soft power [11,14–15].

3 Challenges in Resource Construction for Different Types of University Libraries

University library documentary information resource construction capacity involves multiple aspects, including basic conditions, operating funds, librarian teams, library space, and technical strength, with considerable variation among individual libraries. A survey covering different types of university libraries, including research-oriented, application-oriented, and skill-oriented institutions, indicates that group-level problems in China' s university library documentary information resource construction are relatively prominent [16]. The survival and development environment of university libraries is continuously changing, and the education powerhouse strategy undoubtedly brings policy opportunities for their development. To further focus on solving development challenges, this study examines the main challenges currently facing research-oriented, application-oriented, and skill-oriented university libraries from both common and individual perspectives.

3.1 Common Challenges Across All University Types

3.1.1 Imbalanced Resource Supply-Demand Structure (1) Redundant Procurement and Core Resource Shortages. Homogenized procurement and uneven resource allocation are common phenomena in university library resource construction [17–21]. Resources for popular disciplines are often purchased competitively by various university libraries, resulting in redundancy and inefficient fund utilization. When funds are abundant, university libraries tend to purchase complete databases, leading to homogenized collection content and poor alignment with reader needs, causing libraries to pay for many unnecessary resources [22]. Meanwhile, some core resources face shortages. For emerging interdisciplinary or marginal disciplines, relevant professional books and cutting-edge research reports may be relatively scarce, making it difficult

to meet faculty and student needs for research and teaching.

(2) Risks in Long-Term Digital Resource Preservation. With the development of digital technology, digital resources account for an increasing proportion of university library collections, but their long-term preservation faces numerous risks [4,23–26]. First, digital resources heavily depend on storage media and technical environments, making them vulnerable to loss or inaccessibility due to hardware failures, software obsolescence, or network interruptions. Second, diverse and rapidly updating digital resource formats make data migration and format conversion costly, increasing preservation difficulties. Furthermore, legal protection issues for digital resources are complex, requiring clear definitions of copyright ownership, fair use scope, and the legality of long-term preservation to avoid potential legal disputes. Moreover, long-term digital resource preservation requires continuous financial investment, yet university libraries currently face deficiencies in funding guarantees, technical updates, and management mechanisms.

3.1.2 Funding Allocation and Copyright Constraints (1) Single-Source Funding. University library funding primarily relies on school financial allocations, resulting in a relatively single source that severely restricts libraries in resource procurement and technology upgrades [4,22,27–29]. The total funding for Chinese university libraries accounts for only about 0.5% of the total university budget on average, with a declining trend—a significant gap compared to the approximately 2% ratio in world-class university libraries [27,30]. Under these circumstances, libraries' resource purchasing power declines yearly, with many reducing paper resource purchases due to insufficient funds and struggling to build comprehensive resource systems serving teaching and research. Additionally, funding constraints force libraries to screen and reduce database subscriptions, with some resources failing to be renewed due to cost issues, affecting faculty and student use. The single funding source also leads to lagging technology upgrades, preventing timely equipment and software updates and making it difficult to meet growing user demands for integrated resource services.

(2) Copyright Barriers and Commercial Monopoly Constraints. In the digital transformation process, copyright restrictions exhibit dual characteristics of "institutional 困境" and "market suppression." Surveys show that some Chinese "Double First-Class" universities, when developing digital textbook services, have been forced to reduce service scope due to complex copyright review processes and inadequate monitoring of resource dissemination paths, significantly impacting the construction and promotion of relevant electronic resources [31–33]. More critically, commercial database vendors create academic resource monopolies through bundling sales and annual price increase agreements (even raising prices by 10%–15% annually). This monopoly pattern creates two derivative problems: on one hand, small and medium-sized universities are forced to withdraw from consortium purchases, creating a "resource gap"; on the other

hand, database vendors use DRM technology to restrict bulk downloading and interlibrary lending, reducing the efficiency of document delivery services and imposing numerous limitations on resource sharing and utilization. Notably, the 2021 case involving CNK' s alleged abuse of market dominance revealed a typical path of restricting competition through exclusive licensing agreements [34].

3.1.3 Insufficient Technology Application Effectiveness (1) Superficial Application of Intelligent Technology. The library community is highly sensitive to technology and its applications, with almost every new technology finding its way into libraries [12]. However, many university libraries' intelligent technology applications remain superficial. Regarding documentary information resource guarantee, open access resource construction primarily involves purchasing commercial products, with little self-construction, low processing and utilization levels, and mainly shallow revelation through website navigation. Although this approach is simplest, it faces issues such as frequent IP changes that require long-term dynamic monitoring and maintenance [16]. In book inventory work, although robotics technology has been introduced, its ability to handle complex environments—such as interference from iron bookshelves and special floor conditions—remains inadequate, and there is insufficient deep mining and utilization of inventory data [35]. In information consulting services, human-computer interaction technology suffers from inaccurate speech recognition and semantic understanding barriers [36]. Meanwhile, in resource organization and management, intelligent technology has yet to fully realize its potential, with resource integration difficulties making it hard to meet students' personalized learning needs [37], all of which constrain the intelligent development of university library resource construction.

(2) Low System Interoperability. Currently, university library systems exhibit low interoperability [38], manifesting in two main aspects. Internal system interoperability is insufficient, with different business systems operating independently. When the book acquisition and cataloging system purchases new books, it often ignores feedback on reader needs from the circulation system, resulting in purchased books that don' t match user demands. Updates to electronic literature in the digital resource management system are also not linked to user preferences in the circulation system. Additionally, poor coordination exists between different service area systems within libraries, such as the lack of integration between study room reservation and literature retrieval systems, and the difficulty for reference consulting service systems to seamlessly connect with other resource systems. Inter-library system interoperability is similarly inadequate, with significant differences in resource management and circulation systems among university libraries hindering resource sharing and making cross-campus resource use inconvenient for readers. Joint service systems are imperfect, with scattered academic activity information and long interlibrary loan cycles affecting resource acquisition efficiency.

3.2 Specific Challenges by University Type

3.2.1 Research-Oriented University Libraries: Need to Strengthen Basic Research Support (1) Unbalanced Discipline Coverage. Research-oriented universities, with cutting-edge scientific research as their primary goal, require comprehensive and in-depth disciplinary resources. However, some research-oriented university libraries currently exhibit imbalances in disciplinary resource coverage. While traditional advantageous disciplines are well-resourced and popular applied disciplines are over-concentrated, emerging and interdisciplinary fields suffer from scarce collection resources due to their blurred boundaries and lack of forward-looking procurement planning. Meanwhile, many classic works in basic disciplines have outdated editions, lack the latest research findings, and have insufficient subscriptions to new academic journals, making it difficult for faculty and students to access cutting-edge research information.

(2) Slow Progress in Open Access. The world has entered the era of open science, and open access is a crucial pathway for promoting academic exchange and sharing basic research resources. However, research-oriented university libraries have made slow progress in open access resource construction and utilization [16,39]. On one hand, some university libraries don' t sufficiently prioritize open access. Although the internet contains vast amounts of free open access academic literature, libraries have failed to establish effective integration platforms, making it difficult for faculty and students to conveniently access these resources through the library. On the other hand, libraries' own open access initiatives are limited, with many failing to actively promote open access to their institutions' research achievements, restricting the broad dissemination of faculty and student publications and limiting the enhancement of academic influence. Simultaneously, cooperation with international open access platforms lags, preventing timely introduction of international cutting-edge basic research resources and hindering international exchange and collaboration in basic research.

3.2.2 Application-Oriented University Libraries: Insufficient Depth in Industry-Education Integration (1) Limited Access to Industrial Resources. Application-oriented universities, aiming to cultivate applied talents and serve local industries, require substantial industrial resources for support. However, these libraries face numerous obstacles in obtaining industrial resources [40]. First, cooperation channels with enterprises are narrow. Many application-oriented university libraries have only established partnerships with a few local companies, failing to broadly expand their cooperation networks to access rich resources from different industries and scales. For example, in the intelligent manufacturing field, they cannot comprehensively collect technical reports and product development materials from industry-leading enterprises. Second, enterprises show low willingness to share resources with university libraries due to concerns about leaking core technologies and commercial secrets,

resulting in serious gaps in industrial information collection. This makes it difficult to meet faculty and student learning needs for industrial frontier knowledge and technology, thereby affecting the depth of knowledge supply for industry-education integration.

(2) Service Transformation Effectiveness Needs Improvement. Application-oriented university libraries face multiple critical constraints at the resource transformation level. First, enterprise case development mostly remains at the stage of raw data accumulation, lacking multi-dimensional tagging systems and knowledge association networks, making it difficult to provide reconstructable modular resources for case-based teaching. Second, their ability to capture industrial needs is weak, lacking a university-enterprise collaborative dynamic adaptation model for needs, particularly in vertical fields such as process improvement and technical problem-solving, where customized knowledge service capabilities are insufficient. Third, the transformation result service chain connection is not smooth, with patent databases and industry standard databases yet to form effective associations, and supporting services such as property rights evaluation in technology transfer also being inadequate, objectively creating blocking factors for industry-university-research docking. These systematic shortcomings affect the deep development of industry-education integration to varying degrees.

3.2.3 Skill-Oriented University Libraries: Lagging Skill Training Ecosystem Construction (1) Fragmented Practical Training Resources. Skill-oriented universities, with vocational skill cultivation as their core objective, prioritize practical training resources in their library resource construction. However, these libraries currently suffer from prominent fragmentation of practical training resources. On one hand, training resources come from scattered sources lacking unified planning. While universities collect training materials such as equipment operation manuals and process flow documents from multiple enterprises and institutions, these resources are not integrated according to the skill training system, making it difficult to help students build complete skill knowledge systems. On the other hand, training resources are not updated timely and lack coherence. While industry technologies continuously update, library training resources remain unchanged for long periods without connection between old and new resources, preventing students from mastering the latest skills and causing disconnections in practical operations that affect the quality and efficiency of skilled talent cultivation.

(2) Scarce Access to International Resources. With the internationalization of vocational education, skill-oriented universities need to introduce internationally advanced vocational skill standards and practical training resources. However, some skill-oriented university libraries suffer from scarce access to international resources. On one hand, they lack cooperation channels with international vocational education institutions, making it impossible to obtain the latest international vocational skill resources, introducing few internation-

ally advanced skill standards and industry norms, and preventing students from benchmarking against international advanced levels to improve their skills. On the other hand, they lack cooperation with international skill training platforms. Although many high-quality online skill training courses and virtual practical training platforms exist internationally, university libraries have failed to establish close connections with them to help students access international frontier skill training resources, limiting the international vision of skill-oriented universities and the diversified construction of skill ecosystems, and making it difficult to cultivate skilled talents adapted to global industrial needs.

4 Exploring Differentiated Collaborative Development Paths for Library Resource Construction in Different University Types

Addressing the multifaceted challenges in university library documentary information resource construction and guided by the education powerhouse strategy, research-oriented, application-oriented, and skill-oriented university libraries must base themselves on their positioning and needs, adhere to the combination of individual library construction and consortium cooperation [16], and explore differentiated collaborative development paths. By establishing the resource system as the foundation, technology empowerment as the lever, and mechanism innovation as the guarantee, they should form a three-dimensional 联动 framework and complementary advantages pattern to build a knowledge service system covering the full chain of "basic research—technology transformation—skill application." This will meet the diverse needs of faculty and students in different university types and society' s growing demand for educational sharing [41], improve the overall efficiency of educational resource utilization, and provide strong support for building an education powerhouse.

4.1 Resource System: Differentiated Positioning and Complementary Sharing

The education powerhouse construction plan and the Ministry of Education' s opinions on university establishment work provide guiding direction for university classified development, clarifying the different missions of various university types in talent cultivation [2,9]. Each type of university library should, based on its educational positioning and focusing on needs such as teaching guarantee, research support, and cultural inheritance [15,20], implement differentiated resource layout and complementary sharing. Research-oriented university libraries should focus on serving basic research and innovative talent cultivation while strengthening support for basic, emerging, and interdisciplinary disciplines [14]. They should concentrate on academic frontiers, vigorously strengthen procurement of top-tier domestic and international academic databases and rare literature resources, and lead academic frontier exploration. Additionally, they should emphasize collecting their institutions' scholars' research achievements (such as the "Tsinghua University Collection") and establish institutional reposi-

tories to promote academic exchange and inheritance. Application-oriented university libraries should closely align with industry needs, cooperate deeply with relevant enterprises, and strengthen industrial application resource construction. Taking engineering application-oriented universities as examples, they should enhance collection of engineering practice cases, industry standards, and patent literature, while emphasizing the introduction of textbooks and teaching references related to applied talent cultivation to meet teaching needs. They should also actively collect and organize local industrial policies and market dynamics to provide reliable decision-making support for precise university-local industry docking and promote deep integration of industry, academia, and research. Skill-oriented university libraries should focus on students' vocational skill cultivation needs, prioritizing the reservation of practical skill training resources such as vocational skill training textbooks, operation videos, and skill certification standards. Simultaneously, they should integrate vocational ethics education materials and present professional norm cases through multimedia resource databases to promote students' comprehensive quality improvement.

Different types of university libraries can achieve optimal resource allocation by establishing complementary sharing mechanisms. They should vigorously strengthen the construction of national or regional library alliances covering different university types, improving resource utilization efficiency and reducing procurement costs through joint purchasing, interlibrary loan, document delivery, and database sharing. Using cloud computing and big data technologies, they should build unified resource sharing platforms that break geographical and university-type restrictions, promoting interconnectivity among various university library resources. This will provide convenient and efficient knowledge services for faculty and students, enabling basic research resources, industrial application resources, and vocational skill resources to flow smoothly, complement each other, and be shared among different universities, thereby maximizing their value. They should continuously expand resource sharing "friend circles" at the university, municipal, regional, and national levels, emphasizing complementarity and forming joint forces [15].

4.2 Technology Empowerment: Intelligent Upgrading and Platform Interoperability

Technology' s influence on libraries' future development will continue to grow [12], and technology empowerment serves as the core driving force for promoting differentiated collaborative development among university libraries. Research-oriented university libraries should rely on their research strength and talent advantages to demonstrate exemplary effects in technological innovation and application. Emerging technologies increasingly applied in libraries include artificial intelligence (AI), data mining, context-aware technology, big data, cloud computing, cloud services, augmented reality, visualization technology, and 5G [12]. These can be used to deeply mine and analyze massive academic resources, providing more complex and in-depth services for faculty and student users. For

example, they can develop AI semantic analysis tools to automatically identify correlations in research literature and associations between relevant resource knowledge points and course/professional knowledge graphs, constructing resource knowledge graphs [30,42] to provide precise resource recommendations and knowledge discovery services for faculty, students, and researchers. Simultaneously, they can utilize blockchain technology to protect academic resource copyrights and security, promote academic exchange and cooperation, and facilitate the broad dissemination and application of basic research findings. Application-oriented university libraries should use technology to achieve precise matching between resources and industry needs, promoting deep integration between technology and industry. They can employ big data technology to deeply analyze industrial development trends and enterprise technology needs, providing important references for university program setting and curriculum reform to cultivate more talents meeting enterprise needs. Additionally, they should strengthen cooperation with enterprises to obtain enterprise technology development materials and market data, providing targeted services for faculty and students through data analysis. They should also utilize context-aware technology to intelligently analyze and match resources and services based on users' locations and tasks [12], such as pushing the latest industry information, technical materials, and market dynamics. Skill-oriented university libraries should focus on improving technology application capabilities, using information technology to optimize practical training resource management and teaching services. They should build virtual practical training platforms using virtual reality (VR) and augmented reality (AR) technologies to create immersive training scenarios for students, improving skill training effectiveness and safety.

Establishing technology platform interoperability mechanisms and building integrated resource service platforms [20] for different university library types will integrate diverse resources and promote technology resource sharing and collaborative development. By formulating unified technical standards and interface specifications, they can promote interconnectivity among university library technology platforms. Research-oriented universities' academic resource platforms, application-oriented universities' industry resource platforms, and skill-oriented universities' skill training platforms should connect with each other to enable one-stop retrieval and acquisition of resources. They should strengthen technology talent exchange and cooperation by organizing technical training and academic seminars to enhance professional levels and innovation capabilities among library technology staff across universities, promoting widespread application and deep integration of technology in university libraries. This will achieve collaborative development from basic research technology innovation to industrial technology transformation and then to technology application in vocational skill cultivation.

4.3 Mechanism Innovation: Ecosystem Construction and Policy Coordination

Mechanism innovation serves as an important guarantee for the differentiated collaborative development of university libraries. Research-oriented university libraries should actively participate in academic ecosystem construction, jointly building research data centers with scientific research institutions, strengthening cooperation and exchange with domestic and international academic institutions and research teams, and jointly conducting data mining, analysis, and application to provide data storage, management, and analysis services for researchers. They should fully utilize abundant academic resources to regularly organize academic conferences, lectures, and forums, and strengthen the dissemination and promotion of academic achievements through open access platforms and academic social media to promote academic resource sharing and innovation, creating a favorable ecological environment for basic research development. Application-oriented university libraries should strengthen cooperation with various departments to build characteristic resource databases according to program settings and teaching needs, such as establishing business case databases with business schools to provide rich case resources for teaching and research. Simultaneously, they should strengthen cooperation with enterprises and industry associations to establish industry-university-research cooperation mechanisms from the perspective of resource construction, actively participating in local industrial development planning and policy formulation to provide intellectual support for local economic development and achieve mutual benefits between universities and localities. This promotes industrial technology transformation and application and deeply integrates them into the industry-education integration ecosystem. Skill-oriented university libraries should strengthen cooperation with practical training centers, vocational skill certification institutions, and enterprises to establish university-enterprise cooperation mechanisms. They should jointly develop training textbooks, build practical teaching case databases, and establish training bases, providing corresponding resource support according to practical training course needs and perfecting the vocational skill cultivation ecosystem.

Under the policy guidance emphasizing classified reform and development, national and local governments should also introduce relevant policies to encourage differentiated collaborative development among different university library types. Regarding funding investment, they should tilt toward characteristic resource construction and technological innovation. For example, they should establish special funds to support research-oriented university libraries in purchasing high-end academic databases, support application-oriented university libraries in building industry-characteristic resource databases, and support skill-oriented university libraries in acquiring practical skill training resources. In terms of policy guidance, they should formulate relevant standards and norms to guide university libraries in clarifying their positioning and strengthening the relevance and coordination of resource construction. University libraries need to

continuously focus on resource ecosystem construction, providing high-quality resource support for university teaching and research through benign ecological cycles [43], adapting to university construction and development, and promoting the improvement and development of the full-chain knowledge service system.

Under the macro guidance of the education powerhouse strategy, formulating policies encouraging collaborative cooperation among different university library types and guiding research-oriented, application-oriented, and skill-oriented university libraries to establish cooperative relationships essentially achieves resource sharing, technology coordination, and mechanism innovation through positioning complementarity, technology integration, and mechanism interconnection. This drives the deep coupling of the knowledge innovation chain, industrial demand chain, and skill cultivation chain. Research-oriented university libraries should play the role of "knowledge source," application-oriented university libraries should become "technology transformation hubs,"and skill-oriented university libraries should build "skill empowerment bases." Through collaborative linkage, these three types can not only solve historical problems such as redundant resource construction and service homogenization but also transform university libraries from traditional document warehouses into strategic infrastructure within the national innovation system, jointly promoting the realization of the education powerhouse strategic goal.

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Note: Figure translations are in progress. See original paper for figures.