Functional Positioning and Realization Mechanisms of Digital Libraries in the Construction of the University Student Innovation and Entrepreneurship Support System

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Abstract: Against the backdrop of the national innovation-driven development strategy and the wave of mass entrepreneurship and innovation, universities have become the main front for cultivating innovative and entrepreneurial talents. As the knowledge and information hub of universities, digital libraries are transcending their traditional role as literature service providers and transforming into deep-service facilitators for innovation and entrepreneurship education. This paper aims to systematically explore the core functional positioning and realization mechanisms of digital libraries within the university student innovation and entrepreneurship support system. The research posits that the functions of digital libraries should be positioned as: a strategic aggregator of innovation and entrepreneurship resources; an Embedded Support for full-chain literacy education; a creator of virtual-physical integrated maker practice spaces; and a collaborative support platform for smart services. To realize these functions, it is necessary to construct a collaborative realization mechanism centered on "resources-technology-space-librarians," which specifically includes: building a panoramic and intelligent digital resource system for innovation and entrepreneurship; creating immersive and personalized smart learning and practical training environments; providing professional, discipline-oriented Embedded Support; and establishing an open, collaborative, and sustainable ecological operation model. Combining case analysis, this study points out current challenges such as insufficient resource integration, room for improvement in service precision, a singular competency structure among librarians, and ineffective cross-boundary collaboration mechanisms. Corresponding optimization paths are proposed to provide theoretical reference and practical guidance for the deep integration of university libraries into innovation and entrepreneurship education and the construction of a high-quality support system.

Keywords: Digital Library; Innovation and Entrepreneurship Education; Functional

1. Introduction

Currently, the world is undergoing profound changes unseen in a century, with technological innovation becoming the main battlefield of international strategic rivalry. Against this backdrop, the CPC Central Committee and the State Council have placed innovation at the core of the country's overall development, explicitly proposing the implementation of an innovation-driven development strategy and continuously promoting the in-depth development of "mass entrepreneurship and innovation"[1]. As a crucial nexus combining science and technology as the primary productive force, talent as the primary resource, and innovation as the primary driving force, universities shoulder the mission of cultivating top-notch innovative talents and serving high-level self-reliance and self-improvement in science and technology. Constructing a systematic and efficient support system for university student innovation and entrepreneurship has become a key link in deepening higher education reform and enhancing the quality of independent talent cultivation. Traditional university innovation and entrepreneurship education often relies on classroom teaching and sporadic competitions, with the support system suffering from issues like fragmented resources, disjointed services, and insufficient practical platforms[2]. As the university's literature information center, knowledge service center, and academic exchange center, the digital library, with its vast digital resources, advanced information technology, professional service teams, and increasingly smart learning spaces, possesses unique advantages for deeply integrating into and reshaping the innovation and entrepreneurship education ecosystem. From providing entrepreneurship-themed databases and setting up maker spaces to embedding information literacy training into courses and conducting competitive intelligence analysis, the service boundaries of university digital libraries are continuously expanding. However, this role transformation is not merely a functional addition but requires a profound functional reshaping and mechanism innovation. How can digital libraries transform from backstage resource providers into frontstage enablers and co-creators of innovation and entrepreneurship activities? How should their core functions be precisely positioned? And what mechanisms are needed to ensure the realization and maximization of these functions' effectiveness? These are important questions urgently requiring theoretical and practical answers. Based on a systematic review of existing practices and research, this paper attempts to construct a clear functional positioning framework and delve into its dynamic, collaborative realization mechanisms, aiming to provide systematic ideas for the high-quality development of Chinese university digital library services for innovation and entrepreneurship education.

2. Theoretical Evolution and Practical Demand: The Inevitability of the Digital Library's Role Transformation

The role of university libraries is not static; its evolution is closely linked to the developmental stages of higher education and socio-economic demands[3]. Before the wave of digitalization and networking, the library's core function was the collection, organization, and lending of literature, acting as a "warehouse" and "gatekeeper" of knowledge. With the rapid development of information technology, especially the popularization of the internet and the

explosive growth of digital resources, the library's role began shifting towards an information center and knowledge portal, with its service focus moving from possessing physical resources to providing convenient resource access. Entering the second decade of the 21st century, smart technologies represented by big data, artificial intelligence, and virtual reality have developed rapidly, and society's demand for innovative and interdisciplinary talents has become increasingly urgent. The goal of higher education has shifted from mere knowledge transmission to emphasizing ability cultivation and value shaping, elevating innovation and entrepreneurship education to an unprecedented strategic height. This change places new demands on university libraries: they can no longer be merely providers of static knowledge but must become participants and supporters in the dynamic creation and application of knowledge. Practical demands are mainly reflected in the following three aspects: Firstly, university student innovation and entrepreneurship activities are characterized by a high degree of information dependence and knowledge intensity. Every stage, from idea generation, opportunity identification, team formation, and market research to product development, business plan writing, financing negotiations, and intellectual property protection, requires diverse, precise, and cutting-edge information and knowledge support. Traditional decentralized information resources can no longer meet this systematic, full-process demand. Secondly, innovation and entrepreneurship literacy is a composite ability that transcends professional skills, encompassing general competencies such as critical thinking, information discernment, risk assessment, and cross-boundary collaboration. The information literacy education long conducted by libraries is highly compatible with this, but its connotation needs to expand from"how to find literature" to"how to use information to solve real business and innovation problems" [4]. Finally, innovation and entrepreneurship are inherently practical and experiential activities. Students need to put ideas into practice, engaging in prototyping, simulated roadshows, and team collaboration. As an open public space, the library possesses the natural physical foundation to be transformed into a maker space or innovation lab that stimulates creativity, promotes collaboration, and supports practice. Therefore, the role transformation of digital libraries is an evolution from a knowledge warehouse to a knowledge workshop, and further to an innovation incubator. It is the deepening and integration of their educational and information service functions in the new era and an inevitable choice in response to national strategic demands and the connotative development of higher education.

3. Core Functional Positioning: A Four-Dimensional Empowerment Model

Based on the above analysis, within the university student innovation and entrepreneurship support system, digital libraries should transcend an auxiliary tool role and establish the following four-dimensional core functional positioning, constituting a complete empowerment system (Table 1).

Table 1. Four-Dimensional Functional Positioning Model of Digital Libraries in the Innovation and Entrepreneurship Support System

Functional Dimension	Positioning in the Matrix	Core Functional Description	Key Resource/Service Manifestations	Physical/Virtual Degree
1. Resource Aggregation Center	High resource fundamentality, Low service innovation	As a strategic knowledge foundation, responsible for broadly aggregating, deeply organizing, and navigating multi-source heterogeneous innovation and entrepreneurship resources, providing basic resource guarantee for the entire support system.	Commercial databases, academic literature, patents & standards, market reports, policies & regulations, thematic repositories, intelligent retrieval & recommendation systems.	Highly Virtualized, primarily online digital resource platforms.
2. Literacy Education Engine	Medium resource fundamentality, Medium service innovation	Deeply embedding information literacy education into the entire chain of innovation and entrepreneurship education, systematically enhancing students' innovative thinking, information utilization, and problem-solving abilities through courses, training, and consultations.	Embedded credit courses, workshops, lectures, competition-specific consultations, entrepreneurship competency assessment, online information literacy tutorials.	Virtual-Physical Combination, parallel online and offline educational services.
3. Smart Service Platform	High service innovation, Medium physicalization degree	As a collaborative hub, utilizing smart technology to integrate internal and external services and data, providing personalized, one-stop services, and connecting to external ecological resources such as industry and investment.	Unified smart service portal, cross-departmental business collaboration, university-enterprise docking platform, data analysis and decision support dashboards.	Platform-based, Networked, emphasizing integration and connection capabilities.
4. Maker Practice Space	High physicalization degree, High service innovation	Creating virtual-physical integrated spaces that stimulate creativity, support collaboration, and enable prototyping, providing tools, technology, and environmental support to translate ideas into practice.	Physical maker spaces (including tools & equipment), collaborative discussion rooms, roadshow halls, virtual innovation communities, VR/AR simulation training environments.	Highly Physical, extending into virtual spaces.

3.1. Strategic Aggregator and Navigator of Innovation and Entrepreneurship Resources

This is the foundation and core of the digital library's function. Its task is not only to procure commercial entrepreneurship databases (e.g., the Entrepreneurship Digital Library, which typically includes modules like entrepreneurship competency assessment, business plan libraries, project databases, and policy & regulation databases) but also to strategically aggregate, deeply mine, and intelligently navigate heterogeneous resources from both inside and outside the university. This includes: Integration of Academic and Industry Resources: Merging academic journals, dissertations, patent databases with industry reports, market data, and company financial statements to break down the barriers between academic and industrial information.Organization of Multi-modal Resources: Integrating text, videos based on the university's disciplinary strengths and local industry characteristics, providing students with differentiated perspectives for innovation and entrepreneurship. Intelligent Resource Discovery and Recommendation: Utilizing AI technology to proactively push

precise, highly relevant resources based on students' project stages, disciplinary backgrounds, and behavioral data, achieving a shift from people seeking information to information finding people.

3.2. Embedded Support for Full-Chain Innovation and Entrepreneurship Literacy

Libraries should seamlessly embed their professional strengths in information literacy education into the entire chain of innovation and entrepreneurship education, becoming key guides for enhancing literacy. Awareness Awakening and Competency Assessment Stage: Helping students scientifically understand their entrepreneurial personality, interests, and ability gaps through an "Entrepreneurship Competency Assessment System; fostering an innovation culture and cultivating a daring to venture, skilled at creating" spirit through activities like innovation-themed book exhibitions, lectures by successful entrepreneurs, and creative workshops.Knowledge and Skill Learning Stage: Collaborating with innovation and entrepreneurship schools and relevant departments to develop and embed credit micro-courses or specialized training. Content covers information retrieval and utilization, competitive intelligence analysis, intellectual property fundamentals, business data interpretation, ethics and law, transforming generic information skills into abilities to solve specific entrepreneurial problems.Practice and Competition Stage: Providing customized Embedded Support for teams participating in competitions like the "Challenge Cup" or "Internet+."This includes novelty verification for project topics, literature review for technical routes, competitor analysis, and patent layout suggestions, acting as the "information strategist" for project teams.

3.3. Creator of Virtual-Physical Integrated Maker Practice Spaces

Space is an important service carrier for libraries. Digital libraries should promote the functional reinvention of physical spaces and the extension of virtual spaces, creating a third space that stimulates creativity, supports collaboration, and facilitates transformation.

Physical Maker Spaces: Providing areas ranging from brainstorming zones and collaborative discussion rooms to prototyping zones equipped with 3D printers, laser cutters, and high-performance computers, as well as multifunctional halls for roadshow presentations. For example, the Nanjing University of Finance and Economics Library proposed providing advanced facilities like projection computers, 3D printers, and HTC VIVE experience machines for "dual-creation" practitioners.Virtual Innovation Communities: Utilizing online platforms to build virtual innovation communities. Students can form virtual teams, share ideas, collaboratively write documents, and receive guidance from online mentors, forming a never-ending platform for innovation exchange.Immersive Experience Environments: Employing VR/AR, virtual simulation, and other technologies to create immersive innovation and entrepreneurship simulation environments. For instance, simulating the operational decision-making or financing negotiation scenarios of a startup, allowing students to gain highly realistic practical experience in a low-risk virtual environment.

3.4. Collaborative Support Platform for Smart Innovation and Entrepreneurship Services

The digital library should become a hub and platform connecting internal and external innovation elements, integrating multiple forces through smart services.

Internal Collaborative Platform: Establishing data sharing and business linkage mechanisms with departments like the Academic Affairs Office, Student Affairs Office, Research Administration Office, and University Science Park, breaking down information silos between courses, projects, competitions, and incubation, and providing students with a one-stop service entry point.Bridge for University-Enterprise-Locality Connection: Leveraging its information channel advantages to build databases of enterprise needs, mentor pools, and investment institution pools, organizing project matchmaking events and enterprise visits to help students connect with real industry resources and markets.

Data Empowerment and Decision Support: Analyzing data on resource usage, space bookings, and consultation inquiries to gain insights into the patterns and changing needs of student innovation and entrepreneurship activities. This provides data support for the university to optimize its innovation and entrepreneurship education policies while enabling service precision and personalization[5].

4. Constructing a "Resources-Technology-Space-Librarians" Collaborative System

The four-dimensional functional positioning outlined above defines the strategic roles and objectives for digital libraries within the innovation ecosystem. However, to translate this conceptual framework into operational reality and sustained impact, a robust and coherent implementation mechanism is essential. This transition from "what" to "how" is achieved through a synergistic system where the four core elements—Resources, Technology, Space, and Librarians—interact dynamically with each other and the external environment (Figure 2). This integrated system provides the concrete means to enact each of the four functional dimensions:The Strategic Aggregator and Navigator role is fundamentally powered by intelligent Technology that curates and connects diverse Resources；The delivery of Embedded Support for Full-Chain Literacy depends on the instructional design and expert guidance of Librarians, facilitated by user-centric Technology；The Creator of Virtual-Physical Integrated Spaces manifests through the innovative design and management of Space, both physical and virtual, enabled by immersive Technology；The operation of the Collaborative Support Platform requires Librarians to act as network hubs, integrating cross-institutional Resources and data-driven Technology.In this framework, Resources form the foundational content, Technology acts as the enabling engine, Space provides the experiential carrier, and Librarians are the strategic soul orchestrating the system. The following sections detail the mechanisms for each element, beginning with the cornerstone of resource construction.

4.1. Resource Construction Mechanism

From Procurement to Co-creation, Building a Panoramic Resource Ecosystem Dynamic Procurement and Evaluation Mechanism: Establishing a user demand and usage data-driven resource procurement and performance evaluation model. Regularly analyze access volume, download statistics, and user feedback of entrepreneurship databases to adjust procurement strategies promptly.Consortium-based Co-construction and Sharing Mechanism: Actively participating in regional (e.g., Jiangsu's JALIS system) and industry-specific library consortia. Through joint procurement and co-construction of characteristic databases, costs are reduced, and resource coverage is expanded. The experience of Hubei indicates that consortium-based construction can effectively achieve economies of scale. Open Crowdsourcing and Integration Mechanism: Encouraging faculty and students to contribute excellent business plans, project cases, and competition outcomes, which, after review, are included in the institutional repository. Utilizing APIs, web crawlers, and other technologies to compliant integration free high-quality resources like open-source online tools and government open data, enriching the resource ecosystem.

4.2. Technology Empowerment Mechanism

Driving Service Upgrades with Smart Technologies.Building a Unified Smart Service Platform: Creating a comprehensive online platform integrating resource discovery, online learning, project collaboration, virtual training, booking consultations, and data visualization. This platform should possess capabilities like user profiling, intelligent recommendation, and learning path planning, akin to the concepts behind platforms like the"Internet+." "Chutian Zhihai" online learning center and modern public cultural digital service platforms developed in Hubei.Deepening Data Mining and Knowledge Services: Applying big data and AI technologies not only to analyze user behavior for optimizing recommendations but also to conduct high-level knowledge products like technology foresight, providing support for faculty and student research innovation and entrepreneurial direction selection.Expanding the Application of Immersive Experience Technologies: Continuously investing in and exploring application scenarios for VR/AR, digital twins, the metaverse, etc., in innovation and entrepreneurship education. This enhances the immersion and effectiveness of simulation training, creating an "immersive" innovation atmosphere.

4.3. Space Operation Mechanism: From Management to Governance, Stimulating Space Vitality

Implementing Diversified, Flexible Space Management Systems: Formulating differentiated booking, usage, and management rules based on different space functions (quiet study, group discussion, prototyping, public roadshows). Introducing student teams to participate in the autonomous management of certain spaces. Creating Branded, Project-based Space Activities: The value of space lies in activities. Proactively planning or collaborating with student clubs and entrepreneurial teams to regularly host branded events like hackathons, creative markets, founder sharing sessions, and investment simulation salons, ensuring the space maintains dynamism and appeal. The Beijing University of Posts and

Telecommunications Library successfully enhanced space vitality and participation through activities like Light & Shadow Reading.

Establishing Space Usage Evaluation and Feedback Mechanisms: Continuously collecting space usage data and user feedback through sensors, booking system data, and post-event questionnaires, using this as the basis for space optimization, renovation, and activity planning.

4.4. Librarian Development Mechanism: Cultivating a "Subject Librarian+" Interdisciplinary Team

Functional transformation ultimately relies on human execution. Librarians need to transform from traditional library custodians into innovation enablers.Restructuring Team Competency Composition: Forming specialized service teams comprising subject librarians, data analysts, intellectual property advisors, and technical support personnel. Subject librarians are responsible for liaison with departments and course embedding; data analysts handle data mining and intelligence product generation; IP advisors provide patent search and layout consultation.Establishing a Continuous Professional Development System: Adopting a combined approach of bringing in (inviting enterprise experts and successful entrepreneurs as part-time mentors) and sending out (arranging for librarians to undertake exchanges or positions in enterprises and incubators) to improve the training system for librarians, addressing gaps in their commercial practice and market understanding. Innovating Incentive and Evaluation Mechanisms: Incorporating Embedded Support, resource innovation development, and activity planning & organization into librarian performance evaluations. Establishing special awards for innovation and entrepreneurship services to stimulate librarians' intrinsic motivation[6].

5. Challenges, Countermeasures, and Future Prospects

Despite promising prospects, digital libraries face numerous challenges in constructing an innovation and entrepreneurship support system.

5.1. Main Challenges

Challenge of Resource Integration and Precise Supply: Resources come from diverse sources and exist in heterogeneous formats; "information silos" persist, and a"one-stop" acquisition experience based on deep knowledge correlation is not yet fully realized. Services remain somewhat generic; the capacity for deeply customized, precise knowledge services tailored to specific disciplines or projects needs strengthening.Challenge of Librarian Competency and Role Identity: There is a severe shortage of interdisciplinary librarians possessing business acumen, data analysis skills, and mastery of cutting-edge technologies. Some librarians have a vague understanding of their role within the new system, and the mindset shift from supporting to enabling is incomplete[7].Challenge of Cross-boundary Collaboration and Institutional Barriers: Collaboration between the library and entities such as innovation and entrepreneurship schools, science parks, and external enterprises often remains at the project level, lacking stable, institutionalized collaborative working mechanisms and benefit-sharing models, and encountering certain institutional

barriers.Challenge of Effectiveness Evaluation and Sustainable Development: The effectiveness of library innovation and entrepreneurship services is difficult to measure using traditional quantitative metrics like circulation or download statistics. Assessing their long-term impact on student entrepreneurial success rates or innovation capability enhancement is complex, leading to pressure in justifying sustained internal resource allocation.

5.2. Coping Strategies and Future Prospects

To address the aforementioned challenges, the following targeted strategies are recommended, along with future development directions:Targeting the Challenge of Resource Integration and Precise Supply: Build a Deeply Integrated Knowledge Resource Platform. Move beyond simple aggregation to construct a deeply interconnected resource network based on unified semantic standards and knowledge graphs. By leveraging technologies like user profiling and project lifecycle analysis, shift from a user-seeks-resources model to one where resources adapt to users and projects, providing a dynamic, precise, and forward-looking knowledge resource supply chain；Targeting the Challenge of Librarian Competency and Role Identity: Implement a Role Transformation and Competency Leap Plan. Clearly establish new positions such as Innovation and Entrepreneurship Service Librarian and design systematic competency development pathways. Rapidly enhance librarians' business analysis, data literacy, and technical service capabilities through internal training, cross-boundary practice, and joint programs with business schools or enterprises. Simultaneously, through practical engagements like the Project-based service model (see below)[8], allow librarians to confirm and reinforce the value of their new role as "innovation enablers" in real-world scenarios；Targeting the Challenge of Cross-boundary Collaboration and Institutional Barriers: Promote the Establishment of an Institutionalized Collaborative Ecosystem. Proactively develop and sign long-term cooperative framework agreements with key partners, including internal units like innovation and entrepreneurship colleges and technology transfer centers, as well as external incubators and investment institutions, clarifying the responsibilities, rights, and resource-sharing mechanisms of all parties. Explore establishing physical or virtual Joint Innovation Support Centers, institute regular liaison meetings and project matching systems, and elevate ad-hoc project cooperation into stable strategic alliances to overcome institutional barriers；Targeting the Challenge of Effectiveness Evaluation and Sustainable Development: Design and Implement an Impact-Oriented Evaluation System. Construct a multi-dimensional evaluation model combining quantitative indicators (e.g., number of projects served, teams involved, adoption rate of precise resource recommendations) and qualitative evidence (e.g., tracking of successful startup cases, in-depth user interviews, testimonials from partners). Regularly compile Library Innovation and Entrepreneurship Support Impact Reports, focusing on demonstrating the specific contributions of services in facilitating idea generation, project incubation, and competency development, using this as the core basis for securing sustained investment and optimizing service decisions.

Digital libraries should transcend the traditional document service framework and strive to become an indispensable knowledge innovation engine within the university's innovation and entrepreneurship ecosystem. By deeply applying technologies like artificial intelligence

and big data for intelligent upgrading, and deepening cross-border integration through institutional innovation, the ultimate goal is to build a sustainable development support system centered on user needs, featuring precise resource flow, deeply empowered librarians, and collaborative internal and external ecosystems. This will enable digital libraries to play an irreplaceable strategic role in cultivating innovative talent and promoting the translation of research outcomes.

6. Conclusion

Under the requirements of the era for the connotative development of higher education and the cultivation of new quality productive forces, the construction of a university student innovation and entrepreneurship support system has become a strategic project. Relying on their unique advantages in resources, technology, space, and professionalism, university digital libraries are fully capable and must move from the periphery to the center, redefining their core value within this system. The four-dimensional functional positioning (resource aggregator, literacy guide, space creator, collaborative platform) and the four-dimensional collaborative realization mechanism (resources, technology, space, librarians) proposed in this paper aim to provide a systematic theoretical framework and practical pathway for this transformation.The key to its success lies in the library's need to undergo a fundamental shift in mindset: from passive response to active empowerment, and from resource manager to ecosystem co-builder. By persistently deepening smart construction, vigorously cultivating interdisciplinary talent, and actively building cross-boundary collaborative networks, digital libraries will undoubtedly be able to effectively address current challenges in the support system such as resource fragmentation, service discontinuity, and practice virtualization. They can truly become the knowledge fertile ground and innovation engine that nurtures university students' innovative thinking and supports their entrepreneurial dreams, laying a solid talent foundation for China's implementation of the innovation-driven development strategy and the construction of an education powerhouse and a technologically strong nation.

References

[1] Zhang Yufang. The Path of Precise Services for College Students' Innovation and Entrepreneurship by University Libraries Based on Resource Advantages[J]. Journal of Luohe Polytechnic, 2025, 24 (05): 88-91.

[2] Ye Hongxin Mass Innovation and Entrepreneurship and University Library Services[J]. Journal of Library and Information Science, 2015(01): 134-135.

[3] Wu Jianzhong New normal direction of new indicators - wu jianzhong report on the library society of China in 2012 [EB/OL]. [2017-02-08]. http://blog.sina.com.cn/doctorwu11.

[4] You Mei, Huang Feng, Lu Ye. Practice of Characteristic Information Services of Libraries from the Perspective of Innovation and Entrepreneurship Education[J]. Journal of Agricultural Library and Information Science, 2012, 24(12): 118-119.

[5] Sun Ruiying, Wang Hao. Research on the Development of Redundant Resources and

Information Services in University Libraries Oriented to "Mass Entrepreneurship and Innovation" Practices[J]. Information Science, 2018, 36(11): 48-53.

[6] Deng Tengbin, Cao Xueyan, Li Xuemei, et al. The Role and Function of University Libraries in College Students' Innovation and Entrepreneurship[J]. Library and Information Work, 2016, 60(S1): 19-22.

[7] Xie Ling, Huang Yongkai. Space Construction and Service Practice of University Libraries Driven by Innovation: A Case Study of the Library of Wuhan University[J]. Library, 2018(10): 45-49.

[8] Weng Changping. Practice and Analysis of the Maker Space Construction in Gao Xiao Library[J]. Digital Character Library Forum, 2018(09): 47-51.