

Article

A Study on Practical Strategies for University Libraries in Serving Industry-Education Integration

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Abstract: The evolving landscape of higher education, driven by national strategies such as industry-education integration, necessitates a fundamental shift in the role and services of university libraries. This paper focuses on the practical strategies and pathways for libraries to transition from a traditional supportive role to an active participant in this integrated educational model. Rather than presenting isolated tactics, this study proposes a holistic framework where four key dimensions—resource allocation, service integration, platform construction, and evaluation—are systematically inter-connected. The proposed strategies aim to guide university libraries in constructing a modern knowledge service system that effectively supports holistic talent development and contributes to national strategic goals.

Keywords: university library; industry-education integration; practical strategies; service optimization integrated framework

1. Introduction

The era of rapid scientific and industrial change has prompted national policymakers to prioritize the deep integration of education with industry and other societal domains [1]. This new paradigm requires universities to actively respond to national strategies, providing crucial support for economic and social development. As a cornerstone of the higher education system, university libraries must adapt to this new reality. While the theoretical necessity of library transformation has been extensively discussed, its originality lies in proposing an integrated and progressive framework. This paper argues that only through the synergistic implementation of strategies across resources, services, technology, and evaluation can libraries achieve a truly meaningful transformation. This paper aims to fill this gap by proposing concrete pathways for university libraries to optimize their services and become key players in the integration of industry and education.

With the increasing emphasis on Industry-Education Integration (IEI) worldwide, universities are expected to align educational outcomes more closely with industry needs. Internationally, countries in Europe and North America have promoted university-industry partnerships, joint research laboratories, and cooperative curricula to facilitate this integration. Domestically, China has initiated pilot programs such as “Double First-Class” universities, local industrial colleges, and applied undergraduate reforms to strengthen collaboration between higher education and industrial sectors. A figure can illustrate the development trends of IEI, including the number of university-industry cooperation projects, alignment of educational programs with industry demands, and the coverage of library services supporting IEI initiatives.

Although university libraries traditionally excel at providing academic resources and information services, existing service models are primarily passive and do not fully meet the demands of IEI for interdisciplinary, real-time, and personalized resources and data services. Therefore, it is necessary to explore strategic positioning and innovative service pathways for libraries within the IEI framework. Existing literature indicates that

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some university libraries have begun to participate in IEI through digital resource platforms, integration of laboratory information, and cross-departmental collaborations. However, systematic frameworks and widely applicable models remain limited.

2. Practical Strategies for Library Service in Industry-Education Integration

The successful transformation of the library's role is not a single action but a logical progression of interconnected stages. The following four strategies are designed to be sequential, with each step building upon the foundation of the previous one.

2.1. Optimizing Resource Allocation Systems to Enhance Professional Alignment

To effectively support industry-education integration, libraries must evolve from a collection-centric model to a demand-driven one [2]. This requires establishing a "demand-pull and dynamic adjustment" model for resource development. Libraries should create regular communication channels with academic departments to accurately understand their needs across fundamental research, technological development, and engineering applications. Priority should be given to procuring authoritative professional databases, such as IEEE Xplore, Springer Materials, and Engineering Village. Furthermore, to manage rising costs, libraries should actively participate in regional resource-sharing consortia and collaborate with high-tech enterprises to co-develop specialized databases, thereby expanding service boundaries and serving local economic development.

Having established a robust and relevant resource base, the next logical step is to move from passive provision to active delivery. This necessitates a proactive service model that embeds these resources directly into the user's workflow.

Optimizing resource allocation involves managing diverse materials such as electronic journals, printed books, specialized databases, and industry reports. A systematic approach ensures that resources are relevant, timely, and aligned with curriculum and research priorities.

For example, University X conducted a subject-specific analysis to identify gaps in engineering and computer science collections, adjusting procurement to include high-demand databases like IEEE Xplore and Springer Materials. Data-driven methods, including library borrowing statistics, citation analysis, and surveys of industry demand, guide decision-making for resource acquisition and renewal. Evaluation of effectiveness can include resource usage rates, user satisfaction surveys, and alignment with faculty research outputs to measure the impact of optimized resource allocation.

2.2. Embedding Services into Teaching and Research to Advance Proactive Engagement

The role of the library is transitioning from a "document intermediary" to an "active participant in teaching and research". This "service-forwarding" concept requires librarians to proactively engage in the entire educational and research process. In the teaching domain, libraries can collaborate with faculty to develop "information literacy modules" that are directly integrated into the curriculum [3]. For example, they can offer specialized training on analyzing industry standards, tracking cutting-edge research, and comparing patents, thereby cultivating students' advanced information analysis skills. In the research domain, services should be embedded throughout the entire lifecycle, from project initiation and data collection to outcome dissemination. Libraries can provide trend insights and patent analysis to assist faculty in grant applications.

While manual service embedding is effective, its scalability is limited. To support the entire university community efficiently, these high-touch services must be amplified by robust technology. This leads to the critical need for intelligent platforms.

Embedding services means integrating library support into courses, laboratory projects, and research activities, allowing resources to directly facilitate learning and innovation. University Y organized themed lectures, industry data training sessions, and research data management support programs to enhance students' information literacy and

faculty research efficiency. Proactive services include preparing customized information packages based on faculty and student needs, integrating resources into course modules, and providing real-time guidance during research projects. Success can be assessed by tracking participation in training sessions, utilization of embedded resources, and improvements in research outputs or course performance.

2.3. Building Intelligent Service Platforms to Expand Interaction Boundaries

The development of smart campuses provides a crucial technical foundation for the transformation of library services. By integrating big data analytics, AI recommendation systems, and natural language processing, libraries can shift from being "retrieval-response-oriented" to "problem-solving-oriented" [4]. Central to this transformation is the creation of a user behavior profiling system. By analyzing search histories, borrowing patterns, and course selections, libraries can create dynamic user models to deliver personalized and customized knowledge services. Service interactions must also extend beyond the physical library. This includes embedding library services into course management systems and research platforms, as well as deploying mobile applications and APIs to support access from various devices and locations.

Crucially, these intelligent platforms not only deliver services but also generate a wealth of data on user engagement and resource impact. This data becomes the essential fuel for the final, iterative stage of the framework: a continuous evaluation and feedback loop.

Intelligent platforms, such as knowledge graphs, AI recommendation systems, and online consultation platforms, enable libraries to extend interactions beyond physical spaces and enhance user engagement. At University Z, the library developed an AI-powered platform that connects students, faculty, and industry partners, facilitating personalized recommendations, project collaboration, and resource sharing [5]. Technical implementation includes integrating learning management systems, research project dashboards, and mobile apps to provide seamless access across devices. Metrics for evaluation include platform usage statistics, user engagement levels, and the frequency of library-industry interactions facilitated by the system.

2.4. Establishing Evaluation and Feedback Mechanisms for Continuous Service Evolution

The enhancement of service effectiveness depends on a scientific evaluation and feedback system. Libraries must shift their focus from traditional quantitative metrics, such as visitor numbers and circulation statistics, to qualitative assessments of their contribution to talent cultivation and research output. This evaluation mechanism should cover three dimensions: resource usage, teaching effectiveness, and research support. Data from database logs and user behavior heatmaps can assess resource utilization, while faculty and student feedback can gauge teaching service effectiveness. For research support, analyzing project success rates and citation counts before and after library intervention can provide a clearer measure of service impact. This process should form a closed-loop system of "assessment-diagnosis-optimization-validation" to ensure the continuous adaptation and improvement of library services.

Modern evaluation requires multidimensional metrics, including service quality, usage frequency, user satisfaction, and resource utilization, to fully reflect the library's contribution to IEL. University W conducts regular surveys, analyzes database logs, and performs follow-ups to optimize services based on user feedback. A closed-loop PDCA (Plan-Do-Check-Act) cycle ensures continuous service refinement, integrating assessment, diagnosis, optimization, and validation. Continuous monitoring and iterative improvements enhance service alignment with academic and industry needs, fostering greater user satisfaction and innovation support.

3. Challenges and Opportunities

The integration of industry and education is a core strategy for modernizing higher education and serving national development goals. This paper has argued that for university libraries, success in this new paradigm hinges not on piecemeal efforts but on a systematic, integrated approach. The four dimensions of resources, embedded services, intelligent platforms, and evaluation mechanisms are deeply intertwined; weakness in one area will inevitably undermine the effectiveness of the others. By systematically optimizing service pathways in resource allocation, service integration, platform construction, and evaluation, university libraries can become truly integral to this new paradigm. This transformation enables them to move beyond being a traditional support department and become a central hub for knowledge collaboration, playing a strategic role in fostering high-quality talent and driving innovation.

Despite these opportunities, libraries face significant challenges, including limited budgets, insufficient staff expertise, and the complex, evolving demands of diverse industries. These constraints can hinder timely access to relevant resources, reduce the effectiveness of embedded services, and limit the adoption of intelligent platforms. For example, University B found that traditional library staff struggled to support emerging technologies in engineering and data science courses, creating a gap between available resources and industry expectations. Addressing these challenges offers opportunities to strengthen library roles through government and institutional policy support, strategic university-industry collaborations, and adoption of advanced technologies such as AI recommendation systems, digital dashboards, and knowledge graphs. Staff training programs further enhance the ability to deliver specialized and proactive services. By implementing these measures, libraries can monitor performance using multidimensional indicators such as service quality, user satisfaction, resource utilization, and alignment with faculty research and industry needs, creating a feedback-driven cycle of continuous improvement.

4. Case Studies of Successful Library Practices

University libraries have implemented diverse strategies to support Industry-Education Integration (IEI). The following case studies highlight practical experiences, outcomes, and lessons learned.

Zhejiang University Library collaborated with the Graduate School of the Chinese Academy of Sciences to establish the China Education and Research Digital Library (CERDLib), enabling shared digital resources among universities in China, the United States, and other countries. Since its launch in 2002, CERDLib has accumulated approximately 1.5 million digital documents, facilitating deep collaboration in digital resource development between Chinese and American universities. The University of Tsukuba Library actively participates in teaching and research activities, offering information literacy training and research data management support. It has developed an intelligent service platform that integrates course management systems with research platforms, significantly enhancing service coverage and efficiency.

These cases demonstrate that university libraries play an increasingly important role in IEI. By leveraging resource sharing, intelligent platform construction, and proactive services, libraries can effectively promote the integration of universities and industries, improving both teaching and research outcomes. Lessons include the importance of technology adoption, staff training, and strategic university-industry partnerships.

5. Future Directions and Conclusion

As IEI continues to deepen, university libraries will face new opportunities and challenges. Future directions include leveraging advanced technologies such as artificial in-

telligence, blockchain, and knowledge graphs to enhance personalized, real-time, and predictive library services. Libraries will also explore cross-campus resource sharing, industry alliances, and multi-institution collaborative platforms to broaden their service impact.

By embracing these innovations, libraries can transform into central hubs of knowledge collaboration, supporting student skill development, faculty research, and industry innovation. They will move from traditional support functions to strategic partners in shaping the future of higher education and driving national development objectives. Continuous monitoring, feedback mechanisms, and adaptive strategies will be essential to ensure libraries remain aligned with evolving academic and industry needs, thereby maximizing their contributions to IEL.

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