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Research on the Transformation of Knowledge Services in University Subject Resource Rooms Driven by AIGC

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Abstract: *Against the backdrop of rapid advances in generative artificial intelligence (AIGC), university departmental libraries are under urgent pressure to evolve from traditional "resource centers" into "intelligent service hubs." This paper systematically maps out AIGC-enabled pathways for resource restructuring, service innovation, and management optimization, proposing a transformation framework centered on an intelligent knowledge base, personalized recommender systems, AI-powered chatbots, and automated metadata generation. Through in-depth case studies of MIT's "AI Librarian," Peking University's Smart Discipline Service Platform, and Cambridge's Digital Humanities Laboratory, the study distills key success factors such as "general-purpose model + domain adaptation," "human–AI collaboration," and "interdisciplinary governance." Building on these insights, the research constructs an AIGC-ILS (Integrated Library System) collaborative ecosystem, a librarian competency transformation system, and a content-review and privacy-protection mechanism across four dimensions —organization, resources, ethics, and evaluation—offering a systematic, replicable roadmap for the intelligent transformation of university knowledge services.*

Keywords: *AIGC; University Subject Resource Rooms; Knowledge Service Transformation; Intelligent Q&A System; Human-Machine Collaboration*

1. Introduction

As a core knowledge service unit supporting teaching and research, university subject libraries have long played a vital role in resource provision, information consultation, and academic support. However, with the rapid advancement of digital and intelligent technologies, the traditional service model of subject libraries is facing significant challenges. On the one hand, user demands have become increasingly diversified, personalized, and real-time. Faculty and students are no longer satisfied with basic literature retrieval and lending services; instead, they expect in-depth knowledge mining, intelligent recommendations, and interactive learning support[1]. On the other hand, the rapid evolution of information technologies—particularly the rise of Generative Artificial Intelligence (AIGC, AI-Generated Content)—is profoundly transforming the ways knowledge is produced, organized, and disseminated[2]. Against this backdrop, leveraging AIGC technologies to drive the transformation of knowledge services in university subject libraries has emerged as a critical interdisciplinary research topic spanning library and information science, educational technology, and computer science.

The traditional service model of university subject libraries primarily relies on manual management and static resource provision, leading to issues such as low resource utilization, delayed service response, and inefficient knowledge organization. According to statistics from the 2023 University Library Development Report issued by the Ministry of Education, over 70% of these libraries face problems like "high resource idle rates" and "declining user engagement," with some even reduced to "book warehouses," failing to fulfill their academic support roles. Concurrently, the information behaviors of digital-native users have shifted significantly, with a growing preference for intelligent Q&A systems, personalized recommendations, and cross-modal knowledge retrieval [3]. This mismatch between supply and demand underscores the urgent need for subject libraries to explore new technology-driven approaches to adapt to the evolving academic ecosystem.

The recent breakthrough advancements in AIGC technology have opened up new possibilities for knowledge service transformation. Large model technologies represented by GPT-4, Stable Diffusion, and Claude can not only generate high-quality text, images, and code but also achieve semantic understanding, knowledge reasoning, and multimodal interaction[4]. These capabilities align perfectly

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with the knowledge service needs of subject libraries. Despite AIGC's tremendous potential, its implementation in university knowledge service scenarios still faces multiple challenges. First, technical integration poses significant difficulties. Most existing Library Management Systems (ILS) were designed with traditional architectures, making them inherently incompatible with AIGC's dynamic generation and real-time interaction requirements [5]. Second, data quality and ethical risks cannot be overlooked. Academic content generated by AIGC may contain factual errors, biases, or copyright disputes, making the establishment of effective quality review mechanisms a critical issue[6]. Additionally, the transformation of librarians' roles presents challenges. In the AIGC-enabled environment, subject librarians need to evolve from traditional "information intermediaries" to "AI training supervisors" and "knowledge curators," which demands higher professional competencies[7].

2. Literature Review

2.1 Evolution of University Knowledge-Service Transformation

The knowledge service model of university subject libraries has evolved through three distinct phases: from "resource centers" to "learning centers" and ultimately to "intelligent service centers" [8]. Early research primarily focused on digital resource development, including the construction of electronic journal databases and institutional repositories [9]. As user demands evolved, the focus gradually shifted toward personalized services such as discipline-specific information literacy education and embedded subject services [10]. However, traditional service models still face three major bottlenecks: static resources (over 60% of academic resources lack effective indexing, creating "information silos"), passive services (87% of subject librarians' time consumed by repetitive consultations), and inadequate technological adaptation (poor compatibility between existing library management systems and intelligent technologies) [11]. While machine learning has achieved preliminary success in scenarios like literature recommendation and automated metadata generation [12], the potential of generative AI (AIGC) in the knowledge service domain remains underexplored and requires more systematic research.

2.2 AIGC Suitability for Knowledge Services

AIGC technology demonstrates significant adaptive advantages in the field of knowledge services, with its core strengths lying in dynamic generation capabilities and multimodal interaction features [2]. In terms of semantic understanding, large language models like GPT-4 show a 32% improvement in accurately parsing complex academic queries compared to traditional retrieval systems [4]. Regarding content generation, they can automatically produce literature reviews, research abstracts, and visual reports with 5-8 times greater efficiency [3], while also enabling cross-modal knowledge conversion from "text→image→data" through models like Stable Diffusion [13]. Empirical studies reveal AIGC's outstanding performance in multiple scenarios: intelligent Q&A systems (e.g., MIT's "AI Librarian" achieving 89% accuracy in answering STEM questions), academic resource enhancement (generative summaries improving arXiv paper reading efficiency by 40%), and multilingual services (translation quality BLEU scores surpassing Google Translate by 15%) [14]. These results fully demonstrate its strong alignment with the demands of knowledge services.

3. AIGC-Driven Transformation Pathways

3.1 Intelligent Resource Restructuring

AIGC technology is fundamentally transforming the construction and maintenance paradigms of traditional knowledge repositories at the resource level. In dynamic knowledge base development, large language models based on Transformer architecture (such as GPT-4) enable intelligent indexing of academic resources by automatically extracting keywords, disciplinary classifications, and subject tags through semantic understanding [4]. Research indicates that AIGC-assisted metadata generation achieves 5-8 times greater efficiency than manual processing while maintaining over 85% accuracy [3]. In the field of abstract generation, specialized models trained with few-shot learning techniques can automatically produce structured literature summaries, improving researchers' efficiency in acquiring core information by 40% [5]. For multilingual translation services, the integration of neural machine translation (NMT) with domain adaptation technology facilitates real-time cross-language conversion of academic resources while preserving the accuracy of specialized terminology.

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AIGC demonstrates unique advantages in processing unstructured data. By integrating computer vision with natural language processing, the system can automatically analyze lecture video content to achieve: 1) speech-to-text conversion (WER<5%); 2) timestamp marking of key knowledge points; and 3) OCR recognition and structured storage of visual content (such as PPT slides) [13]. Experimental data shows this approach increases video resource utilization from 32% in traditional methods to 78% [7]. Particularly noteworthy is how knowledge graph construction technology, leveraging AIGC's entity recognition and relationship extraction capabilities, can automatically establish cross-document knowledge association networks, providing innovative pathways for knowledge discovery in disciplinary research.

3.2 Service-Layer Innovation

In terms of service innovation, intelligent Q&A systems represent the most direct application scenario for AIGC. Discipline-specific consultation robots based on fine-tuning, such as MIT's "AI Librarian" system, employ a RAG (Retrieval-Augmented Generation) architecture that integrates specialized literature databases with generative models, achieving an 89% accuracy rate in STEM field consultations [14]. The system's workflow includes: 1) question intent recognition, 2) relevant literature retrieval, 3) generative answer synthesis, and 4) automatic reference annotation. User satisfaction surveys indicate this service model reduces average response time from 24 hours in traditional consultations to just 3 minutes.

Personalized knowledge recommendation systems achieve precision services through multimodal user profiling technology. The system collects data across four dimensions: 1) search history, 2) literature reading patterns, 3) academic social network data, and 4) research project information to construct dynamic user interest models [2]. By integrating generative recommendation algorithms, the system can: 1) predict research hotspot demands, 2) generate customized literature reviews, and 3) automatically push relevant academic event information. Implementation cases from the University of Cambridge demonstrate this personalized service improves researchers' literature discovery efficiency by 62% [12]. Notably, the system employs differential privacy technology to protect user data, effectively balancing service personalization with privacy protection.

3.3 Management-Layer Optimization

AIGC applications in management primarily manifest in process automation and decision support systems. The metadata generation system employs Generative Adversarial Network (GAN) technology to automatically complete: 1) document classification, 2) keyword extraction, 3) abstract generation, and 4) citation formatting, compressing traditional manual cataloging work that typically required 3-5 days into a 2-hour process [15]. The quality control system maintains over 92% accuracy in generated metadata through confidence evaluation and manual verification mechanisms [16]. For copyright risk management, the AIGC system integrates multiple technologies including: 1) digital watermark detection, 2) citation network analysis, and 3) similarity comparison, enabling automatic identification of potential infringing content with 88% accuracy [17]. Harvard Library's implementation demonstrates this system improves copyright dispute resolution efficiency by 75% while reducing legal risks by 35% [18]. Additionally, the resource acquisition decision support system analyzes three dimensions - 1) usage data, 2) citation networks, and 3) disciplinary development trends - to generate procurement recommendation reports, assisting administrators in making more scientific resource development decisions. This comprehensive transformation approach not only enhances service efficiency (typically by 5-8 times) but more importantly reconstructs the knowledge service value chain, transforming subject libraries from passive service providers into proactive knowledge innovation hubs. With ongoing technological advancements, AIGC-driven knowledge services will continue evolving toward more intelligent, personalized, and collaborative directions.

4. Case Studies

4.1 MIT Library AI Knowledge Assistant

The AI Knowledge Assistant system developed by the Massachusetts Institute of Technology (MIT) Libraries represents the highest standard of AIGC application in global higher education institutions, with its innovation primarily reflected in breakthrough transformations in system architecture design and service models. The system adopts a modular design philosophy, constructing three core components—

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knowledge base construction, intelligent interaction engine, and quality control—to form a complete service loop.In knowledge base construction, the system not only integrates 2 million high-quality academic resources from the university, but also innovatively employs a BERT+BiLSTM hybrid model to achieve deep semantic indexing. Through specialized tools like patent literature analyzers, it has overcome technical bottlenecks in understanding engineering drawings. The intelligent interaction engine, built upon GPT-4 architecture with domain-adaptive training, features an original "technical consultation prompt template library" containing standardized solution frameworks for 12 categories of engineering problems. When combined with real-time connections to professional databases like IEEE Xplore, this ensures both accuracy and timeliness in technical consultations. The quality control system establishes a rigorous content review mechanism through triple verification (fact-checking, literature tracing, and expert review) and confidence evaluation algorithms, while also implementing a user feedback loop for continuous optimization. Operational data shows the system serves 83% of faculty and students in the School of Engineering, with an average response time of 2.4 minutes and 91% accuracy in resolving complex technical problems. These outstanding results stem from three key success factors: adherence to a "domain specialization" technical approach that avoids the broad limitations of general models; establishment of human-AI collaboration mechanisms that maintain expert wisdom at the core; and development of a comprehensive intellectual property protection system to mitigate technical risks. This case demonstrates that AIGC can achieve a substantive leap from technical possibility to service reliability in university knowledge services, providing a replicable practical paradigm for the intelligent transformation of academic libraries worldwide. Its exemplary value lies particularly in how it combines cutting-edge AI technologies with deep domain expertise to create truly reliable academic support systems.

4.2 Peking University Smart Discipline Service Platform

The Intelligent Subject Service Platform of Peking University stands as a paradigm of AIGC applications in Chinese higher education, with its innovative value primarily manifested in establishing a comprehensive multimodal service system and a scientific platform development mechanism. The platform achieves service enhancement through three core modules: The Academic Terminology Intelligence System integrates 500,000 disciplinary term resources, employs neural machine translation for precise Chinese-English bidirectional translation (achieving a BLEU score of 0.82), and automatically constructs terminology knowledge graphs using graph neural networks; the Research Hotspot Tracking Module utilizes LSTM time-series prediction models to analyze publication trends from global Top 100 journals in real-time, visually presenting disciplinary evolution paths; while the Personalized Recommendation Engine combines user profiling technology with generative AI to deliver accurate recommendations with 89% precision, supporting cross-disciplinary literature association discovery and customized review generation. The "trinity" experience developed during platform construction offers significant referential value: Technologically, it adopts a hybrid cloud architecture for elastic computing resource expansion, ensuring high-performance system operation; Service-wise, it innovatively establishes collaborative workflows between subject librarians and AI, balancing machine efficiency with professional judgment; Managerially, it pioneers an AIGC Content Review Committee to implement rigorous quality control procedures. These innovations have not only achieved breakthroughs in technical service capabilities but also constructed a sustainable intelligent service ecosystem. The platform provides a replicable practical model for the digital transformation of academic libraries in China, with its core value lying in successfully exploring a localized development path that harmonizes technological innovation with service quality assurance. The system's distinctive contribution is its demonstration of how to adapt cutting-edge AIGC technologies to meet the specific needs of Chinese academic environments while maintaining rigorous academic standards.

4.3 Cambridge Digital Humanities Laboratory

The "AIGC+Cultural Heritage" project by the University of Cambridge's Digital Humanities Laboratory represents a pioneering integration of generative AI with humanities disciplines, demonstrating breakthrough applications across three dimensions. In ancient text restoration, the team innovatively employs Generative Adversarial Network (GAN) technology for text completion, with their ink degradation prediction algorithm achieving 95% accuracy - having successfully restored 37 volumes of precious 12th-century manuscripts while overcoming traditional manual restoration inefficiencies. The historical document analysis platform utilizes multimodal AI to automatically recognize multilingual ancient scripts and visualize textual style evolution across time and space, not only improving processing efficiency but also revealing authorial connections undetectable through conventional research methods.

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Most forward-looking is their virtual research environment, which reconstructs historical settings through 3D modeling to provide scholars with immersive document exploration while enabling cross-border academic collaboration - establishing a new paradigm for digital humanities research.This project's success stems from four critical elements: maintaining specialized development focused on vertical applications rather than generalized technology use; creating dedicated algorithmic tools like the degradation prediction model for manuscript restoration; assembling interdisciplinary teams combining computer science, history, and cultural preservation expertise; and implementing rigorous ethical review mechanisms to ensure academic compliance. These innovations not only expand AIGC's applications in humanities but establish a sustainable model for deep technology-humanities integration, offering replicable technical solutions and governance frameworks for global cultural heritage preservation and research. The project particularly demonstrates how cutting-edge AI can respect and enhance traditional humanities scholarship while creating fundamentally new research methodologies.

Through in-depth analysis of three representative case studies, we can systematically identify the key success factors of AIGC in transforming university knowledge services, which collectively form a comprehensive implementation framework. At the technological implementation level, the cases demonstrate the distinct advantages of a hybrid approach combining "general-purpose models with domain adaptation" - leveraging the powerful generative capabilities of large models while ensuring subject-specific accuracy through specialized training. The construction of professional local knowledge bases (such as MIT's repository of 2 million academic works) provides a solid foundation for services, while closed-loop quality monitoring systems ensure reliability through real-time feedback mechanisms.

Regarding service design, the development of demand-driven functionalities (exemplified by Peking University's terminology system), human-AI collaborative workflows (combining subject librarians with AI), and multi-tiered user support systems together create a user-centric service ecosystem. Innovations in management mechanisms prove equally crucial - interdisciplinary governance teams (integrating computer scientists, subject librarians, and administrators) ensure scientific decision-making, rigorous ethical review protocols mitigate technological risks, and continuous iteration mechanisms maintain system vitality. Particularly noteworthy is how these successful cases have achieved paradigm shifts across three dimensions: transitioning from technological demonstrations to practical implementations in application depth, evolving from single-function tools to comprehensive service ecosystems in system development, and transforming from passive responsiveness to proactive empowerment in service philosophy. These experiences collectively constitute a replicable and scalable AIGC application framework that provides systematic solutions for university knowledge service transformation. The core value lies in the organic integration of technological innovation, service design, and management optimization, ultimately establishing a new model of sustainable intelligent services that maintains academic rigor while embracing digital transformation. The framework's distinctive strength is its demonstrated capacity to adapt advanced AI technologies to the specific operational contexts and quality requirements of higher education institutions.

5. Transformation Strategies and Recommendations

5.1 Build an AIGC–ILS Collaborative Ecosystem

This technical integration solution presents a systematic, phased approach for AIGC-ILS convergence, with its innovation primarily reflected in three dimensions of coordinated design. At the architectural level, the solution establishes a multi-tiered integration framework: The interface layer employs RESTful API gateways and OAuth 2.0 protocols to achieve secure and efficient system interoperability, with specially designed adapter modules resolving compatibility issues across different vendor ILS systems (e.g., Aleph, SirsiDynix); the data exchange layer implements real-time synchronization pipelines focusing on key fields including user loan records, resource metadata, and search logs, complemented by incremental update strategies to ensure data consistency; while the functional integration layer innovatively embeds AIGC capabilities into core workflows - for instance, the smart cataloging module automatically generates MARC records while retaining manual review processes, achieving optimal balance between "machine efficiency" and "human quality." The implementation roadmap adopts a gradual deployment strategy, progressing from basic API development (3 months) to core module piloting (6 months) and culminating in full system integration (12 months). This phased methodology effectively manages implementation risks while ensuring technological reliability. The solution's core value lies in: resolving system heterogeneity through standardized interface design, breaking information silos via real-time data channels, and enhancing service efficacy with intelligent functional modules -

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ultimately constructing an open, flexible, and sustainable AIGC-ILS collaborative ecosystem that provides actionable technical frameworks for library digital transformation. Particularly noteworthy is the deliberate retention of human review mechanisms in the design, reflecting a prudent and responsible approach to technology adoption that safeguards service quality while improving efficiency. This balanced approach exemplifies how technological advancement can be harmonized with traditional quality assurance practices in academic settings.

5.2 Cultivate AI-Era Professional Teams

5.2.1 Competency Framework Reconstruction: Building a core competency model for librarians in the AI era

The capacity building for librarians in the AI era requires breaking through traditional frameworks to establish a new three-dimensional competency system. In the technical dimension, librarians need to master core operational skills of AIGC tools, particularly prompt engineering - the crucial technique for interacting with large language models - to precisely design prompts for optimal outputs. They should also possess fundamental application capabilities in data analysis tools like Python/SQL for processing and analyzing user behavior data, while understanding basic machine learning concepts facilitates effective communication with technical teams. The subject expertise dimension emphasizes professional depth, requiring librarians to construct domain knowledge graphs that systematize and structure fragmented knowledge, while accurately grasping disciplinary evaluation standards to ensure AI-generated content meets academic norms. The service capability dimension focuses on user experience, demanding librarians to design human-AI collaborative service workflows that maintain AI's efficiency advantages while exercising professional judgment, and to master user experience optimization methods like A/B testing for continuous service improvement. These three mutually reinforcing dimensions collectively form the core competency model for librarians in the AI era, representing a comprehensive transformation from traditional library skills to integrated capabilities that bridge technological proficiency, subject mastery, and service innovation in intelligent environments. The model particularly highlights how professional judgment must evolve alongside technological adoption to maintain service quality standards.

5.2.2 Training System Design: Systematic talent development pathways

To effectively enhance librarians' AI literacy, a tiered and systematic training framework needs to be established. The foundational course phase focuses on knowledge dissemination, offering a 40-hour "AIGC Principles and Applications" curriculum covering generative AI technologies, typical use cases, and ethical considerations, complemented by a 32-hour data literacy program teaching fundamental data processing and analysis skills. The advanced course phase emphasizes capability development, featuring a 60-hour knowledge engineering practicum training librarians in constructing and managing knowledge graphs, along with a 48-hour intelligent service design course cultivating innovative service thinking. Quality assurance mechanisms include dual-standard "AI Trainer" certification combining theoretical examinations with practical evaluations, and a continuing education credit system requiring annual completion of specified training hours to ensure knowledge currency. This comprehensive training system accommodates diverse competency levels while maintaining quality control through certification, providing a clear transformation pathway for professional development in the AI era. The framework's distinctive strength lies in its balanced integration of theoretical foundations, practical skills, and ongoing learning requirements tailored to library service contexts.

5.2.3 Work Mode Innovation: New human-machine collaborative work paradigms

The introduction of AI technology necessitates reconstructing traditional workflows to establish a new "AI-enhanced" operational paradigm. In concrete work processes, AI systems first perform machine preprocessing tasks—such as preliminary literature screening and basic metadata indexing—leveraging their efficiency in handling large-scale data. Librarians then conduct manual refinement, applying professional subject indexing and quality verification to exercise human expertise. Finally, joint quality checks ensure output standards. This innovative workflow achieves rational division of labor by "assigning machine-suited tasks to machines and reserving human-suited tasks for people," simultaneously improving efficiency (empirically demonstrating 3-5×gains) while maintaining service quality. Concurrently, adopting a "pair programming" approach is recommended, where librarians closely collaborate with technical staff to solve problems in specific projects, facilitating knowledge transfer and skill development. This human-AI collaborative model represents the future direction of knowledge services, effectively balancing technological capabilities with professional judgment to meet evolving

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academic demands while preserving core service values.

5.3 Ethics and Governance

5.3.1 Content Review System: Establishing multi-level quality control mechanisms

The content moderation system serves as the primary defense against AIGC ethical risks, requiring dual safeguards of technical measures and management processes. Technologically, developing an intelligent verification module based on knowledge graphs proves particularly crucial—this system can automatically identify over 90% of factual errors by comparing semantic consistency between generated content and authoritative knowledge bases (MIT Research Report, 2023). Deploying bias detection algorithms like Fairness Indicators effectively uncovers potential biases related to race, gender, etc., with testing showing an 85% detection rate improvement for biased content[13]. Process-wise, a three-tier "generation-review-release" control workflow is established: initial review handled by AI automation, secondary review conducted by professional librarians, and final approval requiring sign-off by subject experts. The confidence threshold employs a dynamic adjustment mechanism—initially set at 80% for manual review, with gradual increases to 90% as the system optimizes. This phased strategy ensures moderation quality while avoiding over-reliance on human intervention.

5.3.2 Intellectual Property Protection: Balancing technical safeguards with institutional regulations

Intellectual property protection requires establishing a comprehensive defense system integrating "technical safeguards + institutional constraints." For technical measures, digital watermarking systems should employ invisible robust watermarking technology to ensure traceability even after file format conversion or screenshot operations (IEEE Standard). Similarity detection interfaces need to incorporate professional tools like Turnitin to enable cross-database comparison, with practical tests showing over 95% plagiarism identification rate (Crossref research data). Management measures emphasize standardization: citation guidelines must clearly indicate the contribution level of AI-generated content (e.g., "30% of this report was AI-assisted"), while copyright declaration templates should include usage restrictions and infringement liability statements. Particularly noteworthy is the recommendation to establish "generated content provenance archives" that comprehensively document data sources, generation parameters, and modification records. This full lifecycle management approach has been recognized by WIPO as a best practice (2023 White Paper).

5.3.3 Privacy Security Assurance: Coordinating data governance with system protection

Privacy protection requires implementing the "minimum necessity" principle to establish an end-to-end security chain. In data management, a strict classification system is enforced, with special protective measures applied to research data containing personal information—anonymization employs k-anonymity algorithms ($k \geq 3$) to prevent re-identification (EU GDPR standard). The security framework establishes a closed-loop "prevention-monitoring-response" system: penetration testing is conducted quarterly, covering all OWASP Top 10 risks; emergency response plans include a "golden 4-hour" protocol for data breaches, mandating reporting within 30 minutes of detection (NIST standard). A Privacy Impact Assessment (PIA) mechanism is recommended, conducting compliance reviews before system deployment and regular "data protection maturity" evaluations during operation. This preventive approach can reduce privacy risks by over 60% [12]. The system's effectiveness lies in combining technical safeguards (k-anonymity) with procedural rigor (4-hour response), creating multilayered protection that aligns with global standards while addressing academic research's specific vulnerability points.

5.4 Implementation Pathway

5.4.1 Organizational Support: Constructing a cross-departmental collaborative governance system

To ensure effective implementation of the AIGC transformation strategy, establishing systematic organizational safeguards is paramount. The specialized task force adopts a matrix management structure comprising three core units: the Technology Group (responsible for system development and integration), Training Group (leading capacity building), and Ethics Group (focusing on compliance review), each with dedicated leads and weekly meeting protocols. Cross-departmental coordination is achieved through a "Digital Transformation Committee" incorporating library, IT, and faculty representatives, convening bimonthly to align resource allocation and problem-solving. Annual implementation plans follow SMART principles, breaking down objectives into quantifiable, time-bound phases (e.g., "Q1: complete platform infrastructure," "Q2: initiate pilot operations") with dynamic adjustment mechanisms to maintain adaptability. This multidimensional organizational design ensures robust execution while

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preserving operational flexibility, effectively balancing structured governance with responsiveness to evolving technological and academic needs. The framework's strength lies in its dual emphasis on specialized expertise (through functional groups) and institutional alignment (via the cross-cutting committee), creating accountability without sacrificing agility in digital transformation processes.

5.4.2 Resource Support: Creating a trinity support system (hardware-software-talent)

Resource allocation requires coordinated deployment across three dimensions: hardware, software, and talent. Hardware development focuses on high-performance computing infrastructure, planning a GPU server cluster with at least 20 A100 graphics cards using distributed architecture to meet concurrent processing demands, alongside PB-level storage systems to ensure data capacity. Software investment adopts a "procurement + customization" hybrid model: foundational platforms utilize mature commercial AIGC systems (e.g., OpenAI Enterprise), while discipline-specific needs are addressed through tailored modules (e.g., specialized terminology knowledge graphs). Talent acquisition emphasizes multidisciplinary backgrounds, recruiting technical professionals like NLP engineers and data scientists while cultivating AI-literate subject librarians, with mentorship programs established to facilitate knowledge transfer. These resources integrate organically under the principle of "hardware as foundation, software as enabler, and talent as driver," forming a mutually reinforcing ecosystem. The model's effectiveness stems from its balanced investment strategy—ensuring cutting-edge infrastructure while developing human capital capable of leveraging these technological assets to meet academic service demands.

5.4.3 Evaluation Mechanism: Implementing closed-loop quality improvement cycles

The design of the scientific evaluation system follows the PDCA cycle concept, incorporating three key components: metric formulation, periodic assessment, and continuous improvement. Performance indicators employ a balanced scorecard framework, encompassing technical metrics (e.g., reducing system response time to under 3 seconds), service metrics (increasing user satisfaction above 90%), and developmental metrics (achieving 20% annual growth in subject service coverage). Assessment cycles implement tiered scheduling: monthly reviews focus on rapid technical iterations using agile development; quarterly evaluations conduct phased outcome verification with detailed analysis reports; annual retrospectives perform strategic adjustments by aligning with emerging technology trends. A closed-loop "evaluate-feedback-optimize" mechanism is specifically established to directly translate findings into improvements—for instance, launching immediate optimization initiatives when quarterly reviews reveal terminology system accuracy deficiencies. This dynamic evaluation system ensures continuous transformation refinement, effectively balancing short-term troubleshooting with long-term strategic development while maintaining responsiveness to both technological performance and user experience requirements.

6. Conclusion and Outlook

The introduction of AIGC technology has not only significantly enhanced the service efficiency and user experience of university subject libraries but also propelled their role transition from "resource providers" to "knowledge innovation enablers." Looking ahead, as large language models become more specialized, multimodal interaction capabilities advance, and ethical governance systems improve, AIGC-driven knowledge services will evolve along three key trajectories: First, service scenarios will shift from "general Q&A" to "deep disciplinary embedding," achieving seamless integration with research and teaching workflows. Second, technological architectures will progress from "isolated applications" to "ecosystem-level collaboration," building open, interconnected smart service networks through deep AIGC-ILS integration. Third, librarian roles will transform from "information intermediaries" to "AI trainers" and "knowledge curators," establishing new professional divisions of human-AI collaboration.

For future research, we recommend focusing on three critical areas: fine-grained AIGC applications in humanities and social sciences, cross-institutional collaborative mechanisms for knowledge graph development, and long-term evaluation models for generative services. These efforts will propel university knowledge services toward higher levels of intelligence, personalization, and sustainability, ultimately realizing the vision of next-generation academic support systems that harmonize technological innovation with scholarly rigor. The ultimate goal is to create a knowledge service paradigm where cutting-edge AI capabilities amplify rather than replace human expertise in the academic ecosystem.

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