



Research on the Application Pathways and Challenges of AIGC in Libraries

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Abstract. With the rapid development of artificial intelligence technology, Artificial Intelligence Generated Content (AIGC) has become an important driving force for innovative services in the field of libraries. AIGC technology, which simulates the human creative process, is capable of automatically generating various types of content, including text, images, audio, and video. This has opened up new pathways for the application of library resource management, user services, information literacy education, and the construction of smart libraries. This research begins by reviewing the basic concepts and development history of AIGC technology, and then analyzes its specific applications within libraries, including resource discovery and management, user service and interaction, information literacy education, and the construction of smart libraries. Through the analysis of practical cases from libraries both domestically and internationally, the research evaluates the effectiveness of AIGC technology applications and user feedback. Furthermore, the study delves into the potential technological challenges, legal and ethical issues, human resource challenges, and strategic management challenges that may arise from the application of AIGC technology in libraries, and proposes corresponding strategies and recommendations. The results indicate that while AIGC technology has significantly enhanced and expanded library services, its widespread application still faces a series of challenges that need to be overcome. This research provides decision support for library managers and practitioners, promotes innovation and development in library services, and offers theoretical and practical foundations for future technological applications and policy-making in libraries. As AIGC technology continues to develop and improve, libraries will face more opportunities and challenges, and this research will serve as an important reference for the library community to seize these opportunities and address these challenges.

Keywords: Artificial Intelligence Generated Content (AIGC), Library Applications, Technological Challenges, Service Innovation, Smart Libraries.

1 Introduction

With the continuous advancement of artificial intelligence technology, Artificial Intelligence Generated Content (AIGC) has become a hot topic in the field of information

management and services. AIGC technology, which simulates the human creative process, is capable of automatically generating a variety of content types, including text, images, audio, and video. In the field of libraries, the application prospects of AIGC are particularly broad, as it not only enhances the quality of library services but also promotes the transformation of libraries towards smart and digital directions. However, as the technology is applied more deeply, it also brings a series of challenges and issues that need to be addressed collectively by the library community, technology providers, and policymakers.

This study aims to explore the application pathways and challenges of AIGC in libraries. Firstly, it will review the basic concepts, development history, and applications of AIGC in other industries, providing a reference for its application in the library field. Then, it will focus on analyzing the application pathways of AIGC in library resource management, user services, information literacy education, and the construction of smart libraries. Combining actual cases from libraries at home and abroad, the study will assess the effectiveness of AIGC technology applications and user feedback. In addition, it will delve into the potential technological challenges, legal and ethical issues, human resource challenges, and strategic management challenges that may be encountered in the application of AIGC technology in libraries, and propose corresponding strategies and recommendations.

By conducting a systematic study of the application and challenges of AIGC in libraries, this research hopes to provide decision support for library managers and practitioners, promote innovation and development in library services, and offer theoretical and practical foundations for future technological applications and policy-making in libraries. As AIGC technology continues to develop and improve, libraries will face more opportunities and challenges, and this study will provide an important reference for the library community to seize these opportunities and address these challenges.

2 Definition and Classification of AIGC

AIGC (Artificial Intelligence Generated Content) refers to the utilization of artificial intelligence technologies, particularly machine learning and deep learning algorithms, to automatically generate various types of content, such as text, images, audio, and video. The core of AIGC technology is to simulate the human creative process by learning from a large number of data samples to produce new content. This content can be entirely original creations or variations based on existing content ^[1].

AIGC technology can be classified based on the type of content generated, which mainly includes the five types listed in Table 1:

Table 1. Types of Content Generated by AIGC Technology

Text Generation	AI writing: automatically generate news articles, blog posts, social media content and more.
	Code generation: automatically write or generate code snippets according to user requirements.

Image Gen-eration	Image Synthesis: Generate new images based on existing images, e.g. face generation, artwork creation, etc.
	Image Enhancement: Improvement of image quality, e.g., higher resolution, color correction, etc.
Audio Gen-eration	Music composition: generating a new musical composition based on a given style or melody.
	Speech synthesis: generating natural-sounding human speech for virtual assistants, audiobooks, etc.
Video Gen-eration	Video Editing: Automatically edit video clips to generate trailers or highlights.
	Virtual Character Generation: Create virtual characters or animations for use in games, movies, or commercials.
multimodal generation	Combine text, images, audio, and other modalities to generate content, such as automatically generating video content with narration.

The development of AIGC technology has not only driven the automation and personalization of content creation, but also provided new tools and solutions for a wide range of industries. However, as the technology evolves, it also poses challenges in terms of copyright, ethics, and quality control, requiring ongoing research and regulation to ensure the healthy development of the technology.

3 Application Pathways of AIGC in Libraries

The application pathways of AIGC technology in libraries encompass multiple facets, ranging from resource management to user services, and extending to the overall transformation towards smart libraries. The following outlines the specific application pathways of AIGC technology within libraries:

3.1 Resource Discovery and Management

In the realm of resource discovery and management, AIGC technology can significantly enhance the efficiency of libraries and the discoverability of resources. By automatically generating metadata and summaries, AIGC technology assists libraries in rapidly processing and integrating newly acquired resources. Moreover, AIGC technology can provide personalized resource recommendations based on users' search habits and preferences, thereby increasing user satisfaction and resource utilization^[2].

3.2 User Services and Interaction

AIGC technology offers notable advantages in improving the user service experience^[3]. Through intelligent question-answering systems and virtual assistants, libraries can offer round-the-clock immediate customer service to address user inquiries and provide research support. Additionally, AIGC technology can generate interactive content, such as educational games and simulated scenarios, to enhance the learning experience of users.

3.3 Information Literacy Education

In the area of information literacy education, AIGC technology can aid libraries in conducting tailored educational activities. By generating targeted teaching materials and online courses, AIGC technology helps users improve their abilities in information retrieval, evaluation, and use^[4]. Furthermore, AIGC technology can be utilized to simulate research scenarios, assisting users in better understanding and applying information resources^[5].

3.4 Construction of Smart Libraries

AIGC technology is one of the key drivers in the construction of smart libraries. By integrating AIGC technology, libraries can automate business processes, such as self-service borrowing and returning, intelligent cataloging, and inventory management. In addition, AIGC technology can be employed to analyze library usage data, forecast resource needs, and optimize resource allocation and procurement decisions, See Figure 1, thus propelling libraries towards a more intelligent and efficient direction^[6].

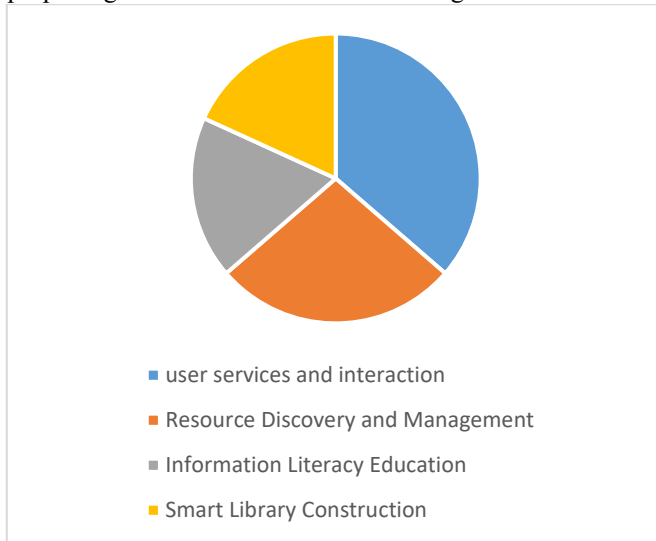


Fig. 1. AIGC technology in the library application path distribution map

3.5 Challenges and Issues

While AIGC technology offers numerous opportunities for libraries, its application also comes with a range of challenges. Technical challenges include ensuring the accuracy and reliability of AIGC-generated content, as well as the integration and maintenance of complex AIGC systems. Legal and ethical challenges involve issues of copyright, user privacy protection, and data security. Human resource challenges focus on the skill training and role transformation of library staff. Management and strategic challenges

pertain to the development of effective management strategies and policy support to ensure the responsible use of AIGC technology.

Through in-depth research and practical exploration, libraries can better utilize AIGC technology to enhance service quality, meet user needs, and address future challenges.

4 Application Case Analysis and Actual Demand Investigation

In order to more comprehensively understand the application of AIGC technology in libraries and incorporate the opinions and suggestions of more stakeholders, this study adds a practical study for different library types, sizes and regions based on the original case analysis. Needs survey. The survey used a combination of questionnaires and in-depth interviews to collect feedback from library managers, staff, users, and technology developers.

4.1 Survey on AIGC Application Cases and Needs in Domestic Libraries

Case 1: Application of intelligent question and answer system in G University Library

Implementation strategy: Through questionnaires and interviews, users' frequency of use, satisfaction and improvement suggestions for the intelligent question and answer system were collected.

Effect evaluation: According to the survey results, the intelligent question and answer system has significantly improved the response speed of consulting services, but users expect the system to better handle complex problems.

User feedback: Users generally believe that the system is convenient and fast, but they also raised concerns about privacy protection and suggested adding more interactive and personalized functions.

Case 2: Application of virtual assistant in D Public Library

Implementation strategy: Through focus group discussions, librarians' opinions and suggestions for improvement of virtual assistant functionality were collected.

Evaluation of effectiveness: Virtual assistants improve user engagement, but librarians worry they may replace traditional human interaction.

User feedback: Users are novel about the interactive experience of virtual assistants, but also emphasize the importance of interpersonal communication.

4.2 Survey on AIGC Application Cases and Needs in Foreign Libraries

Case 3: Application of personalized recommendation system in C National Library

Implementation strategy: Through user surveys, understand the impact of the personalized recommendation system on user borrowing behavior.

Effect evaluation: The recommendation system has increased the number of book borrowings, but some users are worried about the information bubble problem.

User feedback: Users appreciate the personalized service, but also suggest that the library should provide more diverse resource recommendations.

Case 4: Application of automated cataloging in University A Library

Implementation strategy: Work with technology developers to gather feedback on the technical performance and maintenance needs of the automated cataloging system.

Effect evaluation: Automated cataloging improves work efficiency and reduces the workload of librarians.

User feedback: Users are satisfied with the rapid availability of new books, but also expect the library to maintain control over content quality.

4.3 Technology Acceptance Analysis

In order to evaluate the application potential of AIGC technology in libraries, this study adopted the Technology Acceptance Model (TAM) to analyze the attitudes and usage behaviors of library users and staff towards AIGC technology. Through questionnaires and interviews, we collected data on the following variables:

Perceived usefulness (PU): We asked users whether they thought AIGC technology could improve the efficiency and quality of information they obtain. The results show that high perceived usefulness is positively related to users' positive attitude toward and intention to use AIGC technology.

Perceived Ease of Use (PEOU): We evaluated users' views on the ease of use of AIGC technology, including interface design, operation processes, etc. The survey results show that when users believe that AIGC technology is easy to use, they are more likely to accept and use the technology.

Attitude: We use user feedback to measure their overall attitude towards AIGC technology. Positive user attitudes are closely related to high perceived usefulness and high perceived ease of use.

Actual Usage Behavior (ASU): We record the frequency and duration of actual use of AIGC technology by users. Data shows that users with a positive attitude towards AIGC technology are more inclined to use the technology frequently.

Based on TAM, we can establish the following hypothesis:

$H_1: PU \rightarrow ASU$

$H_2: PEOU \rightarrow ASU$

$H_3: Attitude \rightarrow ASU$

Among them, \rightarrow means "positive influence". This means that we hypothesize that perceived usefulness, perceived ease of use, and attitude will positively affect users' actual use behavior of AIGC technology.

Through statistical analysis of the collected data, we can verify these hypotheses and accordingly propose the following strategies and recommendations:

Improve perceived usefulness: Demonstrate through education and training how AIGC technology can help users complete tasks more efficiently.

Improve perceived ease of use: Optimize the user interface and interaction design of AIGC technology to reduce the user's learning curve.

Improve attitudes: Enhance users' trust and acceptance of AIGC technology through positive user experiences and success stories.

Through these strategies, libraries can promote the acceptance and use of AIGC technology, thereby improving the quality and efficiency of library services. At the same

time, this also provides a basis for the library's future technology investment and policy formulation.

4.4 Comprehensive Analysis and Strategic Suggestions

Through actual demand surveys and case analysis of libraries at home and abroad, we found that AIGC technology has significant potential in improving library service efficiency and user experience. However, in order to better meet the needs of different stakeholders, libraries should adopt the following strategies:

Combining technology and humanities: While introducing AIGC technology, we will strengthen interpersonal communication and user training to ensure the integration of technology and humanistic services.

Privacy protection and transparency: clearly inform users how their data is collected and used, and provide privacy setting options to enhance users' trust in AIGC technology.

Continuous technology evaluation and upgrade: Regularly evaluate the performance of AIGC technology and promptly upgrade the system to adapt to changing technology and user needs.

Interdisciplinary cooperation: Encourage librarians to collaborate with computer scientists, legal experts, etc. across disciplines to jointly solve application problems of AIGC technology.

By implementing these strategies, libraries can effectively respond to the challenges brought by AIGC technology and ensure the smooth application of technology and improvement of service quality. At the same time, these measures also help libraries remain competitive and innovative in an ever-changing technological environment.

5 Challenges and Issues

Despite the innovative service models and efficient resource management that AIGC technology brings to libraries, its application also faces a series of challenges and issues that require joint efforts from the library community, technology developers, and policymakers to resolve.

5.1 Technological Challenges

Integration and Compatibility: Integrating AIGC technology with existing library systems to ensure technological compatibility and data consistency is a technical challenge. It is necessary to consider how to seamlessly connect AIGC technology with other library services and tools.

Maintenance and Upgrades: AIGC systems require regular maintenance and upgrades to adapt to evolving technology and user needs. It is important to ensure that technology updates do not affect the library's daily operations and services.

5.2 Legal and Ethical Challenges

Copyright Issues: The content generated by AIGC may involve copyright issues, especially when generating literature summaries and recommending resources. Libraries need to clarify copyright policies to ensure the legal and compliant use of AIGC technology.

Privacy Protection: The collection and analysis of user data must strictly comply with privacy protection regulations. Libraries must ensure that users' personal information is properly protected when using AIGC technology.

5.3 Human Resource Challenges

Skills Training: Library staff need training in new skills to manage and maintain AIGC systems. Training programs should be developed to enhance library staff's understanding and operational capabilities regarding AIGC technology.

Role Transformation: The application of AIGC technology may change the nature of library staff's work, requiring them to transition from traditional service providers to technology coordinators and information consultants.

5.4 Management and Strategic Challenges

Policy Formulation: Libraries need to establish clear policies to guide the application of AIGC technology, including standards for content generation and the handling of user data. Policies should reflect the latest technological developments and changes in laws and regulations.

Resource Allocation: Investing in AIGC technology requires a consideration of cost-effectiveness, with resources allocated rationally to achieve the greatest improvement in services.

5.5 Social and Cultural Challenges

User Acceptance: Users may be resistant to AIGC technology, especially skeptical of the reliability of automated services and virtual assistants^[7]. Libraries need to improve user trust and acceptance of AIGC technology through education and publicity.

Cultural Adaptability: AIGC technology needs to adapt to different cultural and social backgrounds, ensuring that the content generated aligns with users' values and expectations.

By identifying and addressing these challenges, libraries can better utilize AIGC technology to provide high-quality services while ensuring the sustainable development and social responsibility of the technology.

6 Strategies and Recommendations

To effectively address the challenges encountered in the application of AIGC technology in libraries, the following strategies and recommendations are proposed. For specific summaries, please refer to Table II:

6.1 Strategies for Technological Challenges

Continuous Technology Assessment and Upgrade: Regularly assess the performance of AIGC technology to ensure its compatibility and efficiency with library services. Upgrade systems promptly to leverage the latest algorithms and functional improvements.

Professional Technical Support: Collaborate with technology vendors to ensure necessary technical support and maintenance services. Establish an internal technical team responsible for the management and optimization of AIGC systems.

6.2 Preventive Measures for Legal and Ethical Issues

Copyright and Privacy Policies: Develop and update copyright and privacy policies to ensure the use of AIGC technology complies with laws and regulations. Educate users on copyright to raise their awareness of intellectual property rights.

Data Protection Measures: Implement strict data protection measures, including encrypted storage and access control. Conduct regular security audits to prevent data leaks and misuse.

6.3 Human Resource Development and Training Programs

Library Staff Training: Provide library staff with training on AIGC technology, including operations, maintenance, and problem-solving. Encourage library staff to participate in AIGC projects to enhance their technological adaptability.

Interdisciplinary Collaboration: Facilitate interdisciplinary cooperation between library staff and computer scientists, legal experts, etc. to jointly address the application issues of AIGC technology.

6.4 Management Strategies and Policy Formulation

Clear Management Framework: Establish a clear management framework to guide the selection, implementation, and evaluation of AIGC technology. Ensure that management has a clear understanding and planning for the development and application of AIGC technology.

Policy Support and Cooperation: Seek support from the government and industry organizations to jointly promote the application of AIGC technology in libraries. Share experiences and best practices with other libraries to form an industry cooperation network.

6.5 Social and Cultural Adaptability

User Participation and Feedback: Encourage users to participate in the design and evaluation process of AIGC technology to ensure it meets user needs. Regularly collect user feedback to improve the quality of services and content generation.

Cultural Sensitivity Training: Provide cultural sensitivity training for library staff to ensure that content generated by AIGC technology respects cultural diversity.

Table 2. Strategizing and building on AIGC's technological challenges

Strategies to address technological challenges	Continuous technology assessment and up- grading
	Professional Technical Support
Preventive measures for legal and ethical issues	Developing and updating copyright and pri- vacy policies
	Implementation of strict data protection measures
Human resources development and train- ing programs	Training of librarians
	interdisciplinary cooperation
Management strategy and policy develop- ment	Clarifying the regulatory framework
	Seek support from government and industry organizations
Social and cultural adaptation	User participation and feedback
	Cultural sensitivity training

By implementing these strategies and recommendations, libraries can effectively respond to the challenges posed by AIGC technology and ensure the smooth application of the technology and improvement of service quality. At the same time, they will also help libraries to maintain their competitiveness and innovation in the ever-changing technological environment.

7 Conclusion

Through in-depth research on the application pathways and challenges of AIGC technology in libraries, the following conclusions have been drawn:

Application Potential: AIGC technology demonstrates significant application potential in areas such as library resource discovery and management, user service and interaction, information literacy education, and the construction of smart libraries. It can improve the efficiency and quality of library services, enhance user experience, and promote the transformation of libraries towards smart technologies.

Technological Challenges: Although AIGC technology offers many opportunities, its application also comes with challenges related to technology integration, maintenance, and upgrades. Libraries need to continuously evaluate and upgrade AIGC systems to ensure compatibility and stability [8].

Legal and Ethical Issues: Copyright and privacy protection are key legal and ethical issues in the application of AIGC technology. Libraries must establish clear policies to ensure the legal and compliant use of AIGC technology and to protect users' privacy rights.

Human Resource Development: The application of AIGC technology requires librarians to have new skills and knowledge. Therefore, libraries need to develop comprehensive training programs to enhance the professional skills of librarians to adapt to technological changes.

Management and Strategy: Effective management strategies are crucial for the successful application of AIGC technology. Libraries need to formulate clear management frameworks and policies to guide the selection, implementation, and evaluation of AIGC technology.

Social and Cultural Adaptability: Libraries need to consider the social and cultural adaptability of AIGC technology, ensuring that the content generated aligns with users' values and cultural expectations, and continuously improve services through user participation and feedback.

Future Outlook: As AIGC technology continues to advance and library needs evolve, libraries will continue to explore new applications of AIGC technology to provide more personalized and intelligent services. At the same time, libraries also need to pay attention to new challenges brought by technological developments and continuously seek innovative solutions [9].

Research Limitations and Future Directions: Although this study provides a comprehensive analysis of AIGC technology in library applications, there are limitations, such as the breadth and depth of case analysis. Future research can further explore the application effects of AIGC technology in specific library environments and how to combine other branches of artificial intelligence technology, such as machine vision and natural language processing, to enhance the comprehensiveness of library services [10].

Through this study, we hope that libraries can better understand and utilize AIGC technology, while also providing strategies and recommendations for the library community to address future challenges.

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