
AI translation · View original & related papers at
chinaxiv.org/items/chinaxiv-202304.00374

Data Loss and Preservation Strategies for University Libraries (Postprint)

Authors: Li Yuhai, Zhang Chi, Wang Wenzhuo

Date: 2023-04-01T16:15:47+00:00

Abstract

[Purpose/Significance] This study investigates the data preservation capabilities and loss status of libraries in selected Double First-Class universities in China, researches and analyzes the application of the Digital Preservation Capability Maturity Model (DPCMM) in reducing data loss and enhancing data preservation, and provides references for the construction and development of domestic data preservation systems. [Method/Process] By exploring the data preservation and utilization status on official websites of selected university libraries both domestically and internationally, this study analyzes dimensions including digital collection resources, digital preservation capabilities and policies, and digital preservation awareness, and proposes recommendations regarding data loss phenomena occurring during library operations. [Results/Conclusion] This paper summarizes the current status of digital preservation in selected Chinese universities, proposes the necessity and significance of enhancing digital preservation capabilities in Chinese university libraries, and provides theoretical support for data preservation in university libraries using the Digital Preservation Capability Maturity Model (DPCMM).

Full Text

Preamble

Abstract: [Purpose/Significance] This study investigates the data preservation capabilities and loss status of selected double-first-class university libraries in China, examining and analyzing the application of the Digital Preservation Capability Maturity Model (DPCMM) in reducing data loss and enhancing data preservation to provide references for the construction and development of domestic data preservation systems. [Method/Process] By exploring data preservation and utilization on official websites of university libraries both domestically and internationally, this paper analyzes dimensions including digital collection resources, digital preservation capabilities and policies, and digital

preservation awareness, offering recommendations on data loss phenomena occurring during library operations. [Result/Conclusion] The study summarizes the current state of digital preservation in selected Chinese universities, proposes the necessity and significance of improving digital preservation capabilities in Chinese university libraries, and provides theoretical support for university library data preservation using the Digital Preservation Capability Maturity Model (DPCMM).

Keywords: university library; data loss; preservation

Classification Number: G251

DOI: 10.13266/j.issn.0252-3116.2020.01.017

With the rapid arrival of the digital era, the preservation and conservation of digital resources has become a challenging issue. Digital resource management is highly complex and risky, and data preservation across various industries faces major problems such as high costs, low value density, and lack of protection policies. Libraries, museums, and art galleries, as social public organizations, play a crucial role in human data preservation, and data preservation in foreign university libraries has gradually become a hot topic. Through analysis of data-related policies and utilization levels on official websites of domestic university libraries, this study found that significant deficiencies remain in data preservation among Chinese university libraries, with data loss phenomena emerging during their operations, providing an effective basis for research. Among existing models, the Digital Preservation Capability Maturity Model (DPCMM) is the most widely used and relatively mature in the digital preservation field. This paper borrows the DPCMM model to discuss how Chinese universities can solve data loss problems and proposes scientific and effective solutions. It should be noted that the preservation mentioned herein does not refer to saving all data produced by libraries or data yet to be mined, but rather refers to preserving valuable data within their controllable scope under constraints such as high costs.

2. Library Data and Its Characteristics

Libraries generate various types of data, including mobile-based user interaction data, web-based usage data, and physical library management data. Due to the special nature of libraries, library data also exhibits multiple characteristics such as academic professionalism, rigorous business logic, service friendliness, and observability. The library data discussed in this paper refers primarily to discovered and valuable data, excluding data whose value has not yet been identified.

2.1 Data and Its Sources

Data is a collection of characters and symbols that, through logical induction, forms representational material for objective matters with significance for analysis and processing. All recorded characters and symbols with special meaning

constitute data. Data manifests in all aspects of life—for example, QQ and WeChat on mobile phones constantly generate data. In other words, any information related to human behavior and activities can be called data. In university libraries, data can be reflected in two aspects: resources and services [1], including book numbers, text in electronic databases, library temperature monitoring systems, and usage frequency of specific seats—all of which have utilization value.

In today's information environment, library data sources mainly come from three channels: (1) production and service data generated by physical libraries, (2) resource utilization data from library websites, and (3) user behavior data from mobile terminals, as shown in Figure 1 [Figure 1: see original paper].

2.2 Characteristics of University Library Data

From the perspective of data sources, university library data exhibits dynamic, seasonal, and temporal regularity characteristics. Dynamism is reflected in how library data changes with resource usage, such as book borrowing volumes and seat occupancy. Seasonality and temporal regularity are reflected in the fact that while data changes dynamically, it follows certain patterns—for example, library attendance during exam weeks is significantly higher than during other periods.

From the perspective of storage and utilization, university library data has the following characteristics: (1) **Subject professionalism based on bibliographic data:** University library collections are mostly classified by discipline, targeting university students, with authoritative textbooks and reference materials predominating. (2) **Objective rigor based on production management data:** University library data management is organized according to book retrieval types and frequencies, as well as individual borrowing counts and time periods, possessing certain objectivity that administrators analyze to adjust strategies. (3) **Good matching between reader needs and corresponding book data:** Different objects generate different data, and corresponding strategies can be derived through dataset analysis. For instance, book needs differ between freshmen and seniors, and collection categories and quantities vary across different majors (science/engineering vs. liberal arts). (4) **Periodicity based on data management services:** Data produced by libraries follows certain patterns, enabling libraries to adjust service policies accordingly.

3. Types of Library Data

Based on data loss phenomena and preservation needs, library data can be classified as follows:

3.1 By Observability

From the observability perspective, university library data can be divided into explicit data and implicit data. Explicit data refers to publicly viewable visual data, such as text in journals, magazines, and databases, book collection status, and book/journal numbers. Implicit data refers to objectively existing data visible only to certain personnel, such as browsing data generated on a specific computer in the library computer lab within a day, the number of users in a self-study area within a day, or book circulation on a particular subject shelf.

3.2 By Business Process

From the business process perspective, university library data can be divided into production data, management data, and service data. Production data refers to data generated during the organization and processing of library resources, such as barcodes of physical books, classification of electronic resources, and organization and processing of literature. Management data is used for managing literature and institutions, primarily targeting library directors, department heads, and party secretaries, including total library collections, journal database sources, management funds, and real-time monitoring data of library personnel flow. Service data mainly serves readers, such as call numbers and library seat reservation numbers.

3.3 By Data Duration

Based on existence duration, university library data can also be divided into temporary data, transitional data, and long-term data. Strict management of data preservation time according to data value facilitates resource storage and retrieval, increasing storage efficiency. For data that is difficult to preserve, a comprehensive preservation system should be constructed to strengthen data management.

3.4 By Data Generation Object

From the data generation object perspective, university library data can be divided into service request data and service response data. Service request data refers to requests made by readers and customers through manual windows or electronic equipment during library use, most commonly including book borrowing requests, electronic journal access permission requests, and book return requests. Service response data refers to responses made by library management personnel to service recipients' requests, such as borrowing period displays on electronic screens or successful borrowing/return prompts. Classifying library data by generation object helps improve library services, collect and analyze feedback information, effectively adjust service quality, and provide intelligent services.

3.5 By Manual Processing Participation

Based on the degree of human participation, data can be divided into different levels, enabling classification accordingly. For example, data with high human participation includes some management data and book borrowing information related to library personnel flow, while data with low human participation includes objectively existing data such as book call numbers and text in books.

In the process of library intelligent management, there is a trend of gradually decreasing human participation. Ancient libraries had few resources and closed management; modern libraries have become more popular and open; contemporary libraries have introduced information technology and network technology, greatly improving management efficiency [2-3].

3.6 By Data Carrier

Based on carrier type, university library data can be divided into equipment data, input data, paper data, and electronic data. Equipment data refers to automatically sensed and recorded data, such as daily personnel flow in and out of the library. Input data refers to manually entered data, such as a student's annual book borrowing information. Paper data refers to physical books and journals in the library. Electronic data can be manifested in videos, audio, text, and graphics. With the development of information technology, electronic data is becoming increasingly diverse, but its effective utilization level remains low. Long-term analysis of paper and electronic data usage facilitates the popularization of electronic resources.

4. The Necessity of Data Preservation

Data preservation involves organizing and encrypting data to prevent changes over time and storing it for subsequent analysis. University library data has preservation value. Based on data characteristics, preserving management service data facilitates long-term analysis and integration, optimizing library services and building smart libraries. Digital resource preservation enables repeated utilization of resources and value over time. Bibliographic data requires systematic and institutional updating and maintenance to provide better academic resources for university students.

The value and necessity of data preservation for libraries are reflected in the following dimensions:

4.1 Archival Value

Some data has archival value and must be preserved to function. Archival value refers to the necessity of storing and organizing certain data for future reference. For example, library collection information has archival value. When library management personnel change, new administrators can verify book, journal, and literature quantities based on preserved information for daily maintenance

and updates. From a management perspective, information on library-related personnel also needs to be archived for future accountability and personnel transfers.

4.2 Process Management

Data serves as a clue to major events and reflects the library management process. Library data's dynamic nature can reflect management progress, and data generated at any moment may have value for future reference. Like version control in software development, where a particular version may have irreplaceable advantages during iteration, version data preservation provides references for future updates. Similarly, in the revision and formulation of regulations, libraries make reasonable changes based on management progress at each stage, and subtle revisions to annual regulations should be properly preserved.

4.3 Work Efficiency

Although foreign discussions on data preservation have increased year by year (see Table 1), few in China recognize its importance and significance. Data preservation can provide important scientific basis for library decision-making (such as book purchasing strategies, development directions, and data traceability research) and development. Additionally, data preservation has extremely important research value for reviewing current development status and processes in the future, tracing original data sources, and proposing new development directions.

Data has timeliness. Proper data retention prepares for task inheritance and can greatly improve work efficiency. Preserving process data can save workload for the next stage, avoiding redundant operations. For example, library data entry, classification, and management help administrators search and utilize information. Preserving and backing up relevant documents can significantly reduce workload and facilitate modifications by relevant staff.

4.4 Personalized Services

The more comprehensively user behavior data is preserved, the more targeted personalized services become. Relevant data requires reasonable integration and classification. While personal information of library users must be properly encrypted, analysis of related behaviors facilitates subsequent customization of personalized services.

During the process of collecting and preserving user data, attention must be paid to temporal continuity, data sampling density, sample size, and data precision. First, temporal continuity is based on data's temporal regularity. User behavior data during a certain period contains hidden information, and omitting storage of any segment will affect analysis accuracy. Second, data sampling density and sample size refer to the number of sampled user groups. For similar behavioral data, sampling quantity should be reasonable—excessive precision is

sometimes meaningless. For example, when analyzing book borrowing by university freshmen, borrowing patterns over several months after enrollment need continuous collection. Data volume may be low in the first two months due to military training and adaptation periods, resulting in relatively low sampling density and sample size. Finally, data precision should be analyzed specifically based on actual sample objects and problems.

5. Data Loss Issues

Discussing data loss forms and causes, as well as the current status of data loss and preservation in university libraries both domestically and internationally, provides readers with a basic understanding of data loss situations and specific links, preparing for improvement and resolution of data loss problems.

5.1 Data Loss Forms and Causes

Management Process Loss and Causes: Management data primarily targets library administrators and often loses value or is improperly preserved due to errors in management processes.

At the leadership level, data requiring attention is often neglected due to management oversight and imperfect feedback mechanisms, such as sudden increases in book borrowing volume during certain periods without analyzing causes, or increased demand for certain databases without attention. At the organizational level, improper internal division of labor leading to key personnel departure or position vacancies causes management chaos [4], such as in batch book purchasing and database updates where 各司其职 (each should fulfill their duties). At the planning level, senior management lacks data sensitivity and experience in extracting key information, resulting in a lack of targeted management measures in university library environments. At the control level, relevant management personnel lack predictive capabilities that could be solved through software calculations.

Technical Loss and Causes: Technical data loss is objective, caused by inadequate equipment. In data collection, lagging download data updates with low sensitivity and precision affect data analysis. In data organization, the high professionalism required for university library data and lack of corresponding countermeasures and standards cause literature resource data to lose its value. In data transmission, unreliable communication channels are also important causes of data loss [5]. In data storage, failure to reasonably classify data by type results in no effective storage space for data with long-term preservation value, or over-reliance on storage mechanisms leading to unrecoverable accidental data loss without effective supervision in backup management.

Natural Loss and Causes: Natural loss includes potential demand data loss, objective pattern data loss, and related business data loss. Data has certain correlations. Under conditions of imprecise technology and imperfect management, some important implicit data goes unnoticed. Data also has temporal

regularity—for example, data during freshman enrollment periods differs from and has potential changes compared to other periods. Failure to discover data leads to management-level negligence. Library-related data also includes network center data, financial asset data, and operational management data. Analyzing library data in isolation causes relevant effective data to be overlooked.

5.2 Data Loss Status in Domestic and Foreign University Libraries

Domestic university library data loss status: Through analysis of official websites of universities including Tsinghua University, Peking University, Wuhan University, Huazhong University of Science and Technology, and Shanghai Jiao Tong University, this study examined the current status of data loss and preservation in China's double-first-class university libraries. It was found that Peking University and Shanghai Jiao Tong University have relatively distinctive library website designs with certain data preservation awareness, with Shanghai Jiao Tong University performing even better in library big data. Since 2009, Shanghai Jiao Tong University Library has published annual reports, with its 2018 annual report [6] containing numerous data points including visitor numbers, opening hours, total borrowing volume, training sessions, published papers, and service recipients, presented through visualization, demonstrating strong awareness of open data access. Additionally, Huazhong University of Science and Technology links to its characteristic entrepreneurship services, while Peking University provides distinctive services for graduate students and faculty, indicating initial progress in student data services. However, most other universities have not conducted visual analysis of their own data, and most libraries only provide directories and links to third-party databases, with very few linking to their own university databases. Chinese university libraries still require considerable time to preserve and flexibly utilize their own data. University library data preservation cannot be limited to libraries themselves; as important components of universities, they must cooperate deeply with other university departments and organizations to provide comprehensive support for university cultural dissemination, faculty development, and student comprehensive quality improvement [7-8].

Foreign university library data loss status: Analysis of official library websites of foreign universities including Cambridge University, Stanford University, Harvard University, and MIT reveals that Cambridge University has formally identified data preservation as its second-highest risk and proposed the Cambridge University Digital Preservation Strategic Plan [9]. Since 2016, Oxford and Cambridge universities have launched the Digital Preservation at Oxford and Cambridge Project, primarily aiming to create digital collections for knowledge and research within the universities, influencing the international research community and more social organizations. Cambridge, Harvard, and other libraries integrate well with their university cultures, providing faculty and students with characteristic resources with high research value, with their website construction reflecting cultural atmosphere and learning environment.

Although their data openness and utilization levels are high, their strategic plans indicate that using the DPCMM model to analyze their digital preservation status shows that libraries still have a long way to go in digital preservation planning.

6. Data Preservation Strategies

Data preservation is widely applied in the judicial domain. In library applications, its characteristics should be reasonably adapted considering library data features and support from relevant equipment and tools, with classified and precise consideration of preservation effectiveness and scope. The following discussion proceeds from library business, management, innovation, methods, and tools, with the DPCMM model applied at the end to provide considerations for library digital preservation strategies.

6.1 Based on Basic Business

Data preservation should be conducted based on basic business processes. During business operations, data types must be determined, management positions clarified, and work procedures organized, followed by setting data preservation time, precision, and value based on data generated in this process. For example, during daily maintenance of books and journals, classification should be based on type, borrowing time, frequency, and usage periods. Preserving book borrowing time helps administrators analyze temporal regularity, providing references for subsequent management. Preserving borrowing time improves librarians' work efficiency and avoids unnecessary operations. When conducting annual reports, factual data declarations, and assessments, file types should be distinguished and properly preserved, with each submitted document organized and categorized.

6.2 Based on Management Efficiency

When considering library preservation strategies based on management efficiency, time is an important parameter. Dividing management process data by time facilitates improved management efficiency, such as in data collection data, response data, and report generation time. Data collection data refers to the nature of data collection settings—during sampling, not all data needs preservation. Division by time points retains critical data while saving storage space [10]. Response data refers to responses of interrelated data. Some data responds quickly, while some requires time to obtain. Preservation of response data should be based on response time nodes. Report generation time relates to data generation efficiency. Data reports must ensure reliable data sources and determine generation time based on data complexity.

6.3 Based on Management Costs

Comprehensive consideration of data preservation strategies based on management costs can determine the degree of data preservation. From a human cost perspective, as library manual participation decreases, data generated by management personnel and machines should be classified to refine human cost levels. Generally, higher human costs indicate more complex data with higher storage value. From a financial cost perspective, some data consumes substantial resources and should be preserved more meticulously. For example, collecting foreign language journals requires significant human and material resources, with maintenance and supervision requiring greater care. From a material cost perspective, some data is based on physical materials, such as equipment consumables and regular system maintenance. Classification based on material costs is also a consideration of data value.

After classifying data according to relevant standards, preservation must consider backup time, redundant equipment configuration, and security permission levels [11]. Backup time refers to data preservation duration, generally measured in months or years for data updates. Redundant equipment configuration must consider equipment efficiency, such as whether UPS configuration at key positions can support current data storage volume and whether USB drives and mobile hard drives are safe and reliable, requiring regular inspection.

6.4 Based on Innovation Management

Facing innovative library services, these can be divided into personalized services, ubiquitous services, and smart libraries. Personalized services refer to personalized recommendations, intelligent return reminders, and location information 推送 (push) of relevant collection books, obtained through user behavior data analysis. Ubiquitous services refer to expanding service scope to create normalized services, with data sourced from needs of different grassroots personnel and corresponding service strategies. Smart libraries refer to using internet data to create intelligently managed libraries.

Library data preservation strategies based on innovation management can be considered according to corresponding management methods. For example, technological transformation and invention based on the full lifecycle of library data require collecting user data according to time nodes, obtaining real-time user data feedback, and adjusting service methods. Examples include establishing flexible book stacks based on book borrowing data, personalized recommendations based on user behavior data, and literature resource allocation based on user behavior data, which require collecting borrowing data of specific users during certain periods, classifying by user groups to obtain accurate targeted data for accumulation and analysis within a certain timeframe.

6.5 Data Preservation Methods and Tools

6.5.1 Data Preservation Methods After classifying data, preservation strategies differ under various scenarios, and corresponding preservation methods also vary. Reasonable application of methods improves work efficiency [13]. First, program design can solve event capture issues in daily office work, such as capturing the first four digits of book/journal numbers or integrating daily book borrowing categories and journal information. Second, data generated in production, management, and services requires reasonable truncation and organization. Daily office data should have unified versions to facilitate collaborative work. All data should be backed up, with preservation time set for certain data to save storage space. Primary preservation methods and scenarios for libraries are shown in Table 2 .

6.5.2 Data Preservation Tools Data preservation can utilize programmatic, platform-based, and storage tools. For data acquisition, common tools include web crawlers such as LocoySpider, Octoparse, and Bajie. Administrators can crawl relevant book information databases to obtain key information, search for related book numbers, borrowing information, and classification information. Professional management platforms can also be established to facilitate library users in querying book availability, seat usage, and study room reservation information. Librarians can quickly locate information based on borrowers' past usage histories and situations, improving work efficiency. RAID desktop storage and cloud storage platforms can also be established for data storage and retrieval, extending data preservation time.

6.6 Digital Preservation Capability Maturity Model (DPCMM)

The Digital Preservation Capability Maturity Model (DPCMM) was first proposed in 2007 by Professor L. Ashley of the University of Wisconsin and Professor C. Dollar of the University of British Columbia, Canada [14]. DPCMM divides institutional digital preservation capability into five stages: minimal, low, medium, advanced, and optimal, with 15 key audit criteria [15-16]. All 15 DPCMM criteria must comply with ISO 14721 requirements and ISO 16363 audit standard component requirements to reach the medium (Stage 3) level, as shown in Figure 2 [Figure 2: see original paper].

- (1) **Digital Preservation Infrastructure:** Includes policy, strategy, management, cooperation, technical knowledge, open standards, specific communities, and electronic records surveys.
- (2) **Digital Preservation Services:** Includes ingestion, storage, equipment/media updates, integrity, security, preservation metadata, and access.

After DPCMM describes the concepts of each audit standard in detail, it provides five levels (corresponding to 0-4 points) to score the 15 audit criteria,

thereby rating institutional digital preservation capability. Its quantitative indicators and concepts provide guidance for data preservation in Chinese university libraries.

Libraries are collection points for big data. Big data is difficult to form in the short term and requires long-term accumulation [17]. In addition to basic data characteristics, university library data has unique characteristics based on the university context. Since university libraries primarily serve university students, unlike public libraries with broad service objects and collection data, university library data storage and management have temporal regularity and professionalism, often showing volatility and relative stability along with the start and graduation seasons.

University library data is regular, valuable, and meaningful, and will inevitably form big data. Data loss in university libraries is mainly reflected in insufficient attention to relevant management data or incorrect analysis of user-related behavior data [18]. For example, during periods of concentrated data such as student exam weeks and postgraduate entrance exams, data is not properly preserved and utilized.

Currently, due to limitations in awareness and understanding, objective data loss phenomena exist. With the advancement of innovative library management and the development and utilization of smart libraries, data preservation will receive increasing attention in the context of university libraries moving toward intelligence, and data loss issues will eventually be resolved.

References

- [1] Huang Zongzhong. On the core values of libraries (Part 2) [J]. Library Tribune, 2008(1): 1.
- [2] Zhang Jinmei. Research on long-term preservation strategies for public library materials in digital environments [J]. Intelligence, 2019(2): 299.
- [3] Qiao Wenming. Information resource construction of university libraries in network environments [J]. Library Tribune, 2001(5): 59-61.
- [4] Zheng Yong. Current status and countermeasures of university library collection resource utilization from a discourse perspective [J]. Library Construction, 2009(4): 115-120.
- [5] Li Cheng. Research on data curation elements and optimization strategies for university libraries in the big data era [J]. Scientific Management, 2019(1): 58-64.
- [6] Shanghai Jiao Tong University Library 2018 Annual Report [EB/OL]. [2019-12-01]. <http://www.lib.sjtu.edu.cn/sjtu/upload/ueditor/file/20190605/Library%20Annual%20Report%202018>
- [7] Shimrays, Ramaiah C. Digital preservation strategies: An overview. (2018) [EB/OL]. [2019-12-01]. https://www.researchgate.net/publication/327221006_{{Digital}}_{{Preservation}}
- [8] Liu Bin, Huang Jing, Li Feng, et al. Data management and analysis application practice of university libraries in big data environments—Taking Beijing Normal University Library as an example [J]. Digital Library Forum, 2018(10):

54-59.

[9] Langley S. Cambridge University Libraries digital preservation strategy

[EB/OL]. [2019-12-01]. https://www.repository.cam.ac.uk/bitstream/handle/1810/291864/STR_{{CUL}}

[10] Chu Jiewang, Zhang Yu, Liu Qingqing. Strategic thinking on the “double-first-class” construction of university libraries [J]. *Journal of Academic Libraries*, 2019, 37(1): 6-16.

[11] Bote J, Fernandez-Feijoo B, Ruiz S. The cost of digital preservation: A methodological analysis [J]. *Procedia Technology*, 2012, (5): 103-111.

[12] Wang Xiaoran. Research on technical competitive intelligence service models of university libraries [D]. Nanjing: Nanjing University of Aeronautics and Astronautics, 2015.

[13] Li Lingjie. Research on optimizing allocation of collection literature information resources from the perspective of discipline construction—Taking Tianjin University of Science and Technology as an example [J]. *Library Work and Study*, 2009(6): 50-53.

[14] Sun Chao, Wu Zhenxin. Analysis and evaluation of foreign digital resource long-term preservation maturity models [J]. *Library and Information Service*, 2017, 61(1): 32-39.

[15] DPCMM white paper revised April 2014 [EB/OL]. [2019-11-26]. <http://www.securelyrooted.com/dpcmm>.

[16] Pearson D, Coufall C. Digital preservation environment maturity matrix [R/OL]. [2019-11-29]. <http://www.nsla.org.au/sites/www.nsla.org.au/files/publications/NSLA.DigPres{{Env}}>

[17] Ma Xiaoting. Data availability of libraries in the big data era: Value, challenges, and guarantees [J]. *Library Theory and Practice*, 2014(10): 5-8.

[18] Cheng Xiaolan, Ma Haiqun. Comparative study on collection procurement policies of domestic and foreign university libraries [J]. 2016(9): 73-79.

Author Contributions:

Li Yuhai: Proposed research topic and framework;

Zhang Chi: Collected and processed data and materials, wrote and revised paper;

Wang Wenzhuo: Analyzed materials and wrote paper.

Author Affiliations:

1. School of Information Management, Central China Normal University, Wuhan 430079

2. Research Center for Innovation and Development of Chinese Libraries, Central China Normal University, Wuhan 430079

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

Source: ChinaXiv — Machine translation. Verify with original.