# “A Last Resort” or “Autonomous Choice” : A Study of Factors Influencing University Students’ Intention to Use Shadow Libraries

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## Abstract

Against the backdrop of the widening digital divide and intensifying information stratification, shadow libraries, as a gray-area channel for academic resource sharing, have gradually become an important supplementary means for university students to obtain resources. Based on grounded theory, this study explores the factors influencing university students' willingness to use shadow libraries. Data were collected through semi-structured interviews, and NVivo software was used for word-frequency statistical analysis. Through open coding, axial coding, and selective coding, four core categories were extracted: user cognition, usage costs, resource factors, and platform factors. The study finds that user experience and privacy security, resource quality and richness, monetary and time costs, and openness and access speed are key factors influencing university students' willingness to use shadow libraries. Accordingly, university libraries should improve digital services by enhancing user experience and privacy security protection, improving resource quality and richness, reducing monetary and time costs, and increasing openness and access speed, so as to reduce university students' willingness to use shadow libraries, decrease their dependence on shadow libraries, and promote the lawful acquisition of academic resources and copyright protection.

## Full Text

【Resources · Sharing】

# "A Last Resort"or "Autonomous Choice": A Study of Factors Influencing University Students' Intention to Use Shadow Libraries

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【Abstract】 Against the backdrop of an intensifying digital divide and information stratification, shadow libraries, as a grey-area pathway for sharing academic resources, have gradually become an important supplementary channel through which university students obtain resources. Based on grounded theory, this study explores the factors that influence university students' intention to use shadow libraries. Data were collected through semi-structured interviews. NVivo was used for word-frequency statistical analysis, and, in combination with open coding, axial coding, and selective coding, four core categories were extracted: user cognition, usage cost, resource factors, and platform factors. The study finds that user experience and privacy security, resource quality and richness, monetary cost and time cost, and openness and access speed are key factors affecting university students' intention to use shadow libraries. On this

basis, university libraries should improve digital services by enhancing user experience and privacy-security safeguards, improving resource quality and richness, reducing monetary and time costs, and increasing openness and access speed, so as to lower university students' intention to use shadow libraries, reduce dependence on shadow libraries, and promote lawful acquisition of academic resources and copyright protection.

【Keywords】Shadow libraries; university students; grounded theory; intention to use; university library services

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## Introduction

In the digital age, problems of the digital divide and information stratification are becoming increasingly severe worldwide, and the protection of citizens' information rights and the problem of information poverty have gradually become focal concerns in society. In 2011, *Media Piracy in Emerging Economies* first proposed the concept of the shadow library (Shadow Library). As a knowledge-sharing pathway situated in the grey area of copyright law, the concept immediately triggered extensive discussion in both academia and society.[1] A shadow library refers to an online database or digital platform that uses informal means to break through copyright barriers and provide users, free of charge, with documents that are difficult to obtain through regular channels. Without lawful authorization, and in the name of academic use, it provides users over the internet with copyright-protected information content, usually including academic literature, literary works, and multimedia resources. Representative shadow-library platforms include Library Genesis, Sci-Hub, Z-Library, and Anna' s Archive. In addition, the sharing tag #ICanHazPDF, disseminated through social media, has also promoted the spread of shadow libraries to some extent.[2] The rise of these platforms is related both to inequalities in global economic development, high pricing by academic publishers, and the long-term monopolization of the publishing market; it has also benefited from the rapid development of digital technology and the improvement of internet infrastructure.

The existence and use of shadow libraries have generated wide controversy. On the one hand, the existence of shadow libraries has aroused concern and resistance. Such platforms do indeed involve copyright infringement and usage-security issues: publishers and authors may suffer economic losses because of the dissemination of illegal resources; users of shadow libraries may also face risks such as fraud by counterfeit websites or hacker attacks.[3] On the other hand, shadow libraries provide an alternative pathway for accessing literature for users constrained by economic, geographic, or policy factors. Their existence

not only reflects users' enormous demand for knowledge acquisition, but also highlights the information-access predicaments faced by some researchers and students against the backdrop of the increasing commodification of academic publications.[4] When contemporary university students use university libraries and the official digital resources of academic publishers, they often encounter problems such as complicated access procedures and restricted resources, which creates opportunities for the use of shadow libraries.[5]

In view of this, this article proposes to investigate an important user group of shadow libraries—university students—in order to clarify the key factors influencing their intention to use shadow libraries. On this basis, it explores methods and strategies for reducing university students' dependence on shadow libraries and lowering the frequency of use of pirated resources, thereby promoting, at the research level, the lawful [[unclear: text continues beyond the visible page]]

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lawful sharing and copyright protection.

# 1 Literature Review

## 1.1 Case Studies of Shadow Libraries

Current case studies of shadow libraries focus mainly on platforms such as Sci-Hub, Library Genesis, and Z-Library. Sci-Hub was founded by Elbakyan A in 2011. By using legitimate accounts donated by users, it enables the rapid collection and batch downloading of paywalled literature, providing users worldwide with free access to scholarly documents[6]. By comparison, Library Genesis and Z-Library are closer to traditional digital libraries in their classification and interface design, but both circumvent copyright controls through technical means. Studies have found that Z-Library incorporates gamified mechanisms such as rankings and points into its user-interaction design, effectively stimulating users' enthusiasm for participating in content uploading and metadata maintenance[7]. Meanwhile, with research methods such as surveys and online ethnography, scholars have gradually revealed the technical architecture, data-collection processes, and internal logic of interaction with users in shadow libraries[8].

## 1.2 Research on the Causes of Dependence on Shadow Libraries

The degree of dependence on shadow-library resources varies across disciplinary fields, and is especially evident in medicine, engineering, and related areas. Till B M et al.[9] revealed the current situation of users worldwide downloading medical-literature resources from shadow libraries, and explored the relationships between download density and national income, scientific output, and Internet penetration. They emphasized the inequality among countries with different income levels in lawful access to medical literature, and called on the publishing industry and policymakers to pay attention to this issue. Shadow libraries are widely used around the world, but download requests are particularly concentrated in developing countries such as China and India. This reflects the insufficiency of access to resources through formal academic channels in regions with relatively weak economic foundations[10]. In addition, studies have found that users' downloading behavior shows clear temporal characteristics, being concentrated mainly during working hours on local weekdays, indicating that shadow libraries have become an important tool for researchers and students in their daily acquisition of literature[11]. Machin-Mastromatteo J D et al.[12] found that researchers in Latin America rely heavily on Sci-Hub to obtain academic resources because of economic and geographical constraints. Kusuma F E et al.[13] found that Indonesian college students' dependence on shadow libraries stems from economic barriers and inadequate university library services. Some scholars at universities in Europe and the United States have also turned to shadow libraries because of insufficient institutional subscription resources or poor user experience[11]. Bodó B[5] pointed out that shadow libraries have become a force in scholarly communication that cannot be ignored; this is attributable not only to market mechanisms and technological progress, but also closely related to the continuous rise in global academic demand.

## 1.3 Research on the Impact of Shadow Libraries

Shadow libraries have positive significance in bridging gaps in knowledge access and narrowing the digital divide. They break through the dual constraints of high subscription fees and geography, helping to bridge the digital divide and enhance the inclusiveness of knowledge access[1]. Karaganis J[1] argues that shadow libraries have restructured the flow of knowledge from authors to publishers, and then to libraries and users. Especially in regions with scarce resources or lagging economies, they compensate to some extent for the shortcomings of formal channels. However, their model of "illegal openness" has also triggered many controversies concerning copyright compliance, user information security, and their own legality. Publishers such as Elsevier have pointed out that shadow libraries may bring economic losses to the publishing industry and cause confusion in copyright statistics; some scholars worry that shadow libraries may blur the boundary between Open Access and piracy, thereby negatively affecting the open-access movement[14]. Through quantitative analysis, Correa J C et al.[10]

found that papers made available for download by Sci-Hub have higher citation frequencies, with citation counts 1.72 times those of papers not available for download, and they discussed the potential impact of this phenomenon on the dissemination of scientific knowledge and the open-access movement. At the same time, the popularization of shadow libraries poses challenges to the digital services of traditional libraries, and has also prompted university libraries to promote transformation and upgrading in areas such as user experience and resource coverage.

### 1.4 Review of the Research

In summary, existing research shows that the existence of shadow libraries has its market demand and user groups. Macroscopic factors such as differences in economic conditions, uneven distribution of resources, and varying levels of regional development have led some users to depend on shadow libraries. Users of shadow libraries are concentrated mainly in regions where economic and technological development is limited, while social media and user-driven resource-sharing models constitute important components of their service systems. This explains, to a certain extent, why users tend to turn to shadow libraries when access to resources is obstructed.

However, the existing literature generally assumes that users make a passive choice—that is, that they use shadow libraries only when they have "no alternative." This explanation underestimates or even ignores the role of users' active choices and personalized needs. Individuals' subjective preferences, psychological needs, emotional cognition, and the subtle interactive relationships among platform functions and user experience may also affect whether users choose shadow libraries. On this basis, this paper starts from the user perspective and reveals the various complex factors that influence college students' willingness to use shadow libraries.

## 2 Research Design and Analytical Process

This study focuses on the factors influencing college students' willingness to use shadow libraries, especially internal influencing factors. First, semi-structured interviews were used to investigate users and collect data; then grounded theory was employed to extract categories from the data and identify the key influencing factors therein[15].

### 2.1 Selection of Interview Participants

Grounded theory emphasizes the representativeness and diversity of samples. By including research participants with different backgrounds and experiences, it ensures that the concepts and categories obtained can comprehensively cover multiple dimensions of the research phenomenon, promoting the continuous

deepening of theory and the achievement of saturation. This study strictly follows this principle and centers on the core research···

the research questions. Sample selection was completed along three core dimensions—gender, educational background, and school region—and 14 interviewees were ultimately included[16] (see Table 1).

**Table 1 Basic Information of Interviewees**

| Sample ID | Age/years | Gender | Educational background | School region |
|---|---|---|---|---|
| S1 | 21 | Male | Undergraduate student | London |
| S2 | 21 | Male | Undergraduate student | Shenzhen |
| S3 | 21 | Female | Undergraduate student | Wuhan |
| S4 | 22 | Female | Undergraduate student | Beijing |
| S5 | 20 | Male | Undergraduate student | Xi' an |
| S6 | 19 | Female | Undergraduate student | Shanghai |
| S7 | 21 | Female | Undergraduate student | Shanghai |
| S8 | 21 | Female | Undergraduate student | Shanghai |
| S9 | 22 | Male | Master' s student | Shanghai |
| S10 | 24 | Male | Master' s student | Shanghai |
| T1 | 20 | Female | Undergraduate student | Guangzhou |
| T2 | 22 | Male | Undergraduate student | Wuhan |
| T3 | 23 | Female | Master' s student | Harbin |
| T4 | 24 | Male | Master' s student | Shanghai |

In this sampling, 10 interviewees were used as the sample for the theoretical-modeling group, for open coding, axial coding, and selective coding, thereby completing construction of the core theoretical model; these samples were numbered S1–S10. The remaining four interviewees were used as the sample for the saturation-test group, for subsequent theoretical saturation testing; these samples were numbered T1–T4. The gender distribution of the two groups

was balanced. The samples covered two educational levels—undergraduate and master' s students—and their schools included overseas institutions as well as institutions in various regions of China, fully ensuring the heterogeneity and representativeness of the sample.

## 2.2 Interview Design and Implementation

Before the formal interviews, pilot interviews were first conducted; based on feedback from the pilot interviews, the formal semi-structured interview outline was optimized and finalized (see Table 2). The interviews were conducted online in a one-on-one voice format, with each interview lasting 20–30 minutes. All interviews were audio-recorded and transcribed after informed consent had been obtained from the interviewees. Ultimately, about 20,000 Chinese characters of valid raw material were obtained. Anonymization was implemented throughout the entire process, in accordance with ethical norms for social-science research.

**Table 2 Interview Outline**

| Interview dimension | Interview content and questions |
|---|---|
| Basic information | Interviewees' age, gender, educational background, school region, etc. |
| Use behavior and scenarios | In what scenarios do you usually use shadow libraries? |
| Cognition and attitudes | (1) Are you concerned about the risks faced in the process of using shadow libraries? (2) How do you evaluate the philosophy behind the establishment and development of shadow libraries? (3) How do you view the copyright issues that shadow libraries may involve? |
| Evaluation of resources and platforms | How do you evaluate the differences in resources between shadow libraries and official academic platforms? |
| Needs and suggestions for improvement | (1) If university libraries can already meet your academic needs, would you still use shadow libraries? Why? (2) In your opinion, how should university libraries improve their services to reduce students' dependence on shadow libraries? (3) What innovations do you hope to see in future models for obtaining academic resources? |

## 2.3 Grounded-Theory Analysis

### 2.3.1 Open Coding

Open coding is the initial stage of data analysis in grounded theory. Its purpose is to conceptualize the raw data through sentence-by-sentence or paragraph-by-paragraph analysis while preserving the original characteristics and context of the data. The researchers summarized and organized the data, assigned it clear analytical meanings, and, through repeated comparison and integration, removed contradictory, redundant, and overly low-frequency concepts, ultimately classifying and naming the data. This stage provided a solid foundation for the subsequent axial coding and selective coding and was a key step in the theory-building process.

In this study, the researchers conducted a sentence-by-sentence analysis of the semi-structured interview data and, through open coding, extracted a total of 26 initial concepts (see Table 3).

**Table 3 Examples of Open Coding**

| Sample ID | Typical statement | Initial concept |
|---|---|---|
| S4 | "I believe knowledge should be open to everyone; only in this way can scientific exchange and development be promoted. Many users of shadow libraries may not be very well off economically, and they should also have the right to obtain knowledge." | C1 Identification with the concept of knowledge equality |
| S6 | "Perhaps many authors of books and papers do not want their works to be shared freely online; this infringes on their copyright and will also affect their income." | C2 Opposition to piracy and copyright infringement |

| Sample ID | Typical statement | Initial concept |
|---|---|---|
| S5 | "Most of these sharing websites are privately built, and files are downloaded through their websites. The security of my downloads and my browsing privacy may not be guaranteed." | C3 Perceived security risks of shadow libraries |

**Table 3 (continued)**

| Sample No. | Typical statement | Initial concept |
|---|---|---|
| S2 | "The copyright of papers, especially English-language papers, generally belongs to major publishers, and the copyright of books also belongs to publishing houses. Some shadow libraries contain documents from all kinds of channels, making their resources more complete and extensive than those on official websites." | C4 Rich holdings of shadow-library resources |
| S9 | "I generally use them together with the existing collections of the university library. Whether for daily study or academic research, the efficiency is much higher." | C5 Mixed use of authorized and pirated resources |

| Sample No. | Typical statement | Initial concept |
|---|---|---|
| S8 | "Our university library has most of the books, and I usually do not have many academic needs, so I do not really want to use them." | C6 Rejection of using shadow libraries |

### 2.3.2 Axial Coding

In grounded theory, axial coding further explores the logical relationships among initial concepts on the basis of open coding, and classifies and organizes these concepts. This process aims to identify the internal associations among initial concepts and to merge and classify related concepts, thereby revealing higher-level themes or phenomena. Axial coding is the second stage of grounded theory. It provides a clearer structural framework for the research and helps deepen the understanding and analysis of the data. In this study, based on the 26 initial concepts obtained during the open-coding stage, they were further classified into 11 subcategories and ultimately integrated into 4 main categories (see Table 4).

**Table 4 Results of Axial Coding**

| Main category | Subcategory | Initial concepts |
|---|---|---|
| MC1 User cognition | SC1 Value cognition | C1 Recognition of the concept of knowledge equality, C5 Mixed use of authorized and pirated resources, C7 Demand for knowledge acquisition, C12 Protection of citizens' information rights |
| MC1 User cognition | SC2 Emotional cognition | C2 Rejection of piracy and copyright infringement, C6 Rejection of using shadow libraries, C9 Rejection of uncompensated sharing of works |
| MC1 User cognition | SC3 Risk cognition | C3 Perceived security risks of shadow libraries, C15 Perceived legal risks of shadow libraries |

| Main category | Subcategory | Initial concepts |
|---|---|---|
| MC2 Use cost | SC4 Monetary cost | C10 High fees for authorized academic resources, C18 High prices of authorized books |
| MC2 Use cost | SC5 Time cost | C11 Fragmented retrieval through formal channels, C16 Inconvenience of offline borrowing, C23 Time-consuming interlibrary delivery |
| MC2 Use cost | SC6 Normativity | C8 Insufficient standardization of resource classification in shadow libraries, C20 Lack of advanced search functions in shadow libraries |
| MC3 Resource factors | SC7 Completeness | C4 Rich holdings of shadow-library resources, C14 Broad sources of shadow-library resources |
| MC3 Resource factors | SC8 Literature quality | C13 Uneven quality of literature in shadow libraries, C21 Inconsistent format standards of shadow-library resources |
| MC3 Resource factors | SC9 Openness | C17 No login authentication required for shadow libraries, C24 University resources require account login authentication |
| MC4 Platform factors | SC10 Convenience | C19 Shadow libraries are easy to access, C25 Access restrictions imposed by academic publishers |

| Main category | Subcategory | Initial concepts |
|---|---|---|
| MC4 Platform factors | SC11 Stability | C22 Risk of domain-name changes for shadow libraries, C26 Risk of domain-name blocking under policy regulation |

### 2.3.3 Selective Coding

Selective coding is a further deepening of analysis on the basis of axial coding. It selects a core category and establishes relationships between it and other main categories, explaining the research phenomenon in the form of a "storyline." In this process, researchers focus on the core category, integrate and connect the various main categories, and ultimately reveal the core logical structure of the study.

When the openness, convenience, and resource completeness of shadow libraries can compensate for pain points such as the high cost and insufficient resources of formal channels, and when users' value identification exceeds their copyright resistance and security concerns, a positive willingness to use them will form. Conversely, if formal channels can meet users' needs, or if shadow libraries lack advantages in resource quality and service stability, a negative willingness to use them will arise; when formal channels partially meet needs and shadow libraries serve only as a supplement, an emergency willingness to use them will form.

This study takes "willingness to use" as the core category and, based on the four main categories obtained through selective coding—user cognition, use cost, resource factors, and platform factors—refines the key influencing factors of university students' willingness to use shadow libraries (see Table 5).

### 2.3.4 Test of Theoretical Saturation

To ensure the rigor of the grounded-theory coding results and theoretical construction, NVivo software was used to conduct line-by-line coding and comparative analysis of four independent test samples. The results show that all initial concepts extracted from the test samples could be completely covered by the 4 main categories and 11 subcategories constructed in this study, with no new core concepts or categories emerging. This indicates that the model in this study has reached theoretical saturation and that the research results possess good reliability and validity[17].

**Table 5 Results of Selective Coding**

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC1 User cognition | SC1 Value cognition | Bidirectional effect (positive + negative) | Bidirectional moderating type | Value cognition (recognition of knowledge equality and protection of information rights) constitutes a positive pull toward autonomous choice, while emotional cognition (negation of piracy and infringement) constitutes a negative constraint. The interplay between the two determines the attitudinal basis of willingness to use, belonging to a "subjective-attitude moderating relationship." |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC1 User cognition | SC2 Emotional cognition | Bidirectional effect (positive + negative) | Bidirectional moderating type | Value cognition (recognition of knowledge equality and protection of information rights) constitutes a positive pull toward autonomous choice, while emotional cognition (negation of piracy and infringement) constitutes a negative constraint. The interplay between the two determines the attitudinal basis of willingness to use, belonging to a "subjective-attitude moderating relationship." |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC1 User cognition | SC3 Risk cognition | Negative inhibition | Risk-moderating type | Concerns about website security and privacy leakage constitute a risk threshold for willingness to use, belonging to an “objective-risk constraint relationship” ; security safeguards can reduce the strength of this constraint. |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC2 Cost of use | SC4 Monetary cost | Positive drive | Economic-push type | The high pricing of authorized resources and the high selling price of books impose rigid constraints on students with limited financial means, constituting the core driving force behind a "having no other choice" decision, and belonging to an "economic-threshold driving relationship." |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC2 Cost of use | SC5 Time cost | Positive drive | Efficiency-push type | Efficiency deficiencies such as scattered retrieval through formal channels, inconvenience of offline borrowing, and time-consuming interlibrary delivery drive students who pursue convenience to turn to shadow libraries, belonging to an "efficiency-deficiency driving relationship." |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC3 Resource factors | SC6 Standardization | Negative inhibition | Standardization-moderating type | Problems such as irregular classification of shadow-library resources and the absence of advanced search functions reduce retrieval efficiency, increase users' time cost, and weaken their willingness to continue use, belonging to a "resource-standardization-defect constraint relationship"; optimizing resource organization and retrieval functions can alleviate this constraint. |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC3 Resource factors | SC7 Completeness | Positive drive | Resource-pull type | Scarce content that is difficult to obtain through formal channels, such as niche literature and foreign-language resources, constitutes the core attraction of shadow libraries, belonging to a "resource-scarcity pull relationship"; filling gaps in library collections can offset this pull. |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC3 Resource factors | SC8 Literature quality | Negative inhibition | Quality-moderating type | Uneven quality of shadow-library literature and inconsistent standards for resource formats increase the cost of use and weaken willingness to continue use, belonging to a "quality-defect constraint relationship"; standardizing resource processing can alleviate this constraint. |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC4 Platform factors | SC9 Openness | Positive drive | Convenience-pull type | The threshold-free characteristics of no login authentication and cross-scenario access satisfy the need for convenience in autonomous choice, belonging to an "access-threshold pull relationship"; simplifying the access process for authorized resources can weaken this pull. |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC4 Platform factors | SC10 Convenience | Bidirectional effect (positive + negative) | Convenience–stability moderating type | Immediate access without an institutional IP or VPN constitutes a positive convenience pull, while instability caused by domain-name changes and policy blocking constitutes a negative stability constraint. The two jointly affect the continuity of willingness to use, belonging to a "convenience–stability moderating relationship." |

| Main category | Corresponding subcategory | Direction of effect | Relationship type | Connotation of the relationship structure |
|---|---|---|---|---|
| MC4 Platform factors | SC11 Stability | Bidirectional effect (positive + negative) | Convenience–stability moderating type | Immediate access without an institutional IP or VPN constitutes a positive convenience pull, while instability caused by domain-name changes and policy blocking constitutes a negative stability constraint. The two jointly affect the continuity of willingness to use, belonging to a "convenience–stability moderating relationship." |

## 3 Research Results and Discussion

Through grounded-theory analysis, this study finds that college students' willingness to use shadow libraries is influenced by multiple factors, among which user cognition, cost of use, resource factors, and platform factors are key influencing factors. Specifically, user cognition involves college students' concerns about personal information security and privacy protection; cost of use includes monetary cost and time cost; resource factors encompass resource richness, quality stability, format clarity, and so forth; and platform factors are mainly reflected

in the degree of openness and access speed.

### 3.1 User Cognition

When choosing whether to use shadow libraries, college students are always in a state of contradiction. On the one hand, they have a clear awareness of the security risks associated with shadow libraries, also possess awareness of copyright protection, do not approve of piracy and infringement by shadow libraries, and do not agree that works can be shared without compensation [18]. As one interviewee stated: "Most of these sharing websites are privately built, and files are downloaded through their websites; the security of my downloads and the privacy of my browsing may not be guaranteed." (S5) On the other hand, they choose to use shadow libraries under the drive of other factors, and justify their behavior with reasons such as equality of knowledge, the protection of citizens' right to access information, and the fact that their purpose of use is learning rather than profit. From the perspective of user cognition, certain similarities between shadow libraries and open-access resources—such as openness and free availability—have become reasonable pretexts for college students to choose to use shadow libraries.

### 3.2 Use Costs

For users, the cost of using shadow libraries is relatively low. In terms of monetary cost, shadow libraries require almost no payment, which is highly attractive to university students with limited financial means. By contrast, obtaining legitimate academic resources through formal channels is expensive; purchasing books independently—especially some original-language editions—is even more costly. One interviewee stated: "Many textbooks at the London School of Economics easily cost several hundred yuan, and they are often unavailable for reservation through the library, so many people download them from the Internet." (S1) In terms of time cost, obtaining legitimate resources through formal channels is time-consuming and laborious. For example, resources have not been integrated across the open-access platforms of different publishers, nor is one-stop search service provided; traditional library borrowing must be completed through offline channels. When the collection resources of a student' s institution are limited, obtaining resources through interlibrary loan or document delivery often requires a long waiting time and is relatively poor in timeliness[19]. All these factors push users toward free and open online shadow libraries. This situation also reflects the core demands of university-student users in obtaining academic resources: convenience and speed, remote accessibility, low cost, and even free access.

### 3.3 Resource Factors

The impact of resource factors needs to be viewed dialectically. Shadow libraries have significant advantages in resource richness and coverage, attracting

large numbers of university students and genuinely satisfying part of their information needs. One interviewee stated: "The copyright of papers, especially English-language papers, generally belongs to major publishers, and the copyright of books also belongs to publishing houses; some shadow libraries, however, contain all kinds of literature from different channels, making their resources more complete and extensive than those on official websites." (S2) However, compared with the resources of formal databases or traditional libraries, shadow libraries are deficient in the organization and processing of information resources. Their resources are not effectively presented—for example, they lack standardized classification and do not support advanced search functions—resulting in low retrieval efficiency and poor user experience, which to some extent weakens users' willingness to continue using them. What troubles users even more is that the quality of documents in shadow libraries is difficult to guarantee effectively. Although their resources are abundant, their quality is uneven; the resources also include files uploaded by users themselves, which increases the cost of identification and judgment and brings risks and inconvenience to users in utilizing academic resources. Therefore, some users may abandon the use of shadow libraries, or use their resources only occasionally when other channels cannot meet their needs.

### 3.4 Platform Factors

Platform factors mainly refer to technical characteristics such as the degree of openness, convenience, and stability of shadow libraries. In terms of openness and convenience, shadow libraries have inherent advantages: they are highly open, allowing users to use resources without login authentication, whereas resources purchased by university libraries require user identity verification. When readers are not within the university network, or when they need to use resources not purchased by their own institution, resource use becomes somewhat difficult. One interviewee stated: "Most of these websites do not require additional login or verification to browse and download; all of us can access them, so they are more open than those databases that require login." (S7) Relying on the Internet, shadow libraries support round-the-clock access anytime and anywhere, whereas access to academic publishers' websites requires institutional IP or VPN access. For convenience of use, some users gradually weaken their dependence on legitimate academic resources and instead turn to shadow libraries. However, in terms of stability, shadow libraries may be blocked or forced to change domain names because of infringement or other reasons, requiring users to seek alternative solutions and affecting their user experience and willingness to use them.

## 4 Strategies for Reducing University Students' Willingness to Use Shadow Libraries

As centers of academic resources, university libraries are key channels for providing literature support to university students. To reduce university students'

willingness to use shadow libraries and promote the protection of academic publications and authors' copyrights, university libraries can improve the construction of digital resources and the level of services in the following four aspects.

### 4.1 Enhancing User Experience and Privacy Security

User experience and privacy security are important considerations when university students choose digital academic resource platforms. When accessing digital academic resources, university students pay close attention to the security of personal information and data: the digital academic resource platforms of university libraries offer a relatively high level of access security, but their browsing experience is not fully satisfactory; the interactive interfaces of shadow libraries can provide a better user experience, but their websites are vulnerable to attacks, hijacking, or impersonation, resulting in a lack of security guarantees when users download academic resources. University students generally expect to obtain a good browsing and downloading experience for academic resources on the premise of secure use. Therefore, university libraries should strengthen security measures, enhance user trust, and further improve the user experience of digital academic resource portals.

To balance the security of digital academic resource platforms with a good user experience, university libraries can proceed from both technical and managerial dimensions. On the one hand, they can adopt advanced end-to-end data encryption, multi-factor authentication, zero-trust architecture, and blockchain auditing technologies to strengthen data security during information transmission and storage, implement the principle of "privacy by design," and ensure that user data are strictly protected throughout the entire process of collection, use, storage, and sharing. On the other hand, they can use artificial intelligence and big-data analytics to realize intelligent retrieval, personalized recommendation, and responsive interface design, thereby improving resource access efficiency and optimizing user experience. In addition, libraries can establish regular security monitoring, vulnerability scanning, and emergency response mechanisms; strengthen collaboration with information-security experts and vendors; regularly conduct privacy and security training; and build digital academic resource platforms that are both secure and reliable and capable of meeting users' diversified needs.

### 4.2 Improving Resource Quality and Richness

Resource quality and richness directly affect university students' preferences when choosing digital academic resource platforms. The digital academic resources of shadow libraries

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Resources are abundant, but the stability of resource quality is poor, and document formats and clarity are uneven; university libraries are more standardized

in the classified management and version control of digital academic resources, but their collection scope is narrow and the total amount of resources is limited. Therefore, university libraries need to standardize the development of standards for their digital academic resource collections and strengthen quality control over digital academic resource portals. Specific improvement strategies are as follows.

First, big-data technologies should be used to conduct in-depth analysis of the utilization rate of collection resources, readers' needs, and the degree of disciplinary matching, so as to optimize acquisition and allocation strategies and achieve precise alignment between resource supply and user demand. Second, a one-stop digital academic resource platform based on OPAC expansion and cross-repository retrieval systems should be built to connect dispersed resources and improve the overall efficiency of resource use. Third, in light of the university' s disciplinary characteristics and regional cultural advantages, the construction of distinctive digital resource repositories should be promoted; a literature and information resource development committee should be established; discipline-oriented acquisition plans should be formulated to ensure that resource allocation is consistent with the university' s development strategy. Then, through new-media platforms, digital reading should be promoted, popular readings should be pushed regularly, and a user-feedback-driven evaluation mechanism should be established to continuously and dynamically optimize the collection structure. Finally, regional co-construction models and intelligent recommendation technologies should be adopted to realize cross-institutional resource sharing and personalized services, thereby providing comprehensive guarantees for the standardized construction and quality improvement of university digital academic resource platforms[20].

### 4.3 Reducing Monetary Costs and Time Costs

Monetary costs and time costs are important drivers influencing university students' use of shadow libraries. When university libraries purchase publishers' legitimate academic resources, they face such problems as long acquisition processes and high resource pricing. Therefore, university libraries need to reduce the cost for university students to obtain legitimate resources, improve the efficiency with which users search for and obtain target academic resources, promote digital transformation and multi-party collaborative innovation, and build efficient, low-cost mechanisms for resource acquisition and management.

On the one hand, integrated electronic resource platforms and intelligent collection-management systems should be constructed; cloud computing and SaaS platforms should be used to realize automated management and centralized allocation of resources. At the same time, RFID technology should be introduced to enable self-service borrowing and returning and automatic inventory checking, optimize circulation processes, shorten users' waiting time, and substantially reduce manual-intervention costs and hardware-maintenance inputs. On the other hand, libraries should actively participate in resource-

sharing alliances and carry out in-depth cooperation with other universities or institutions to avoid duplicate acquisition of resources and reduce acquisition costs. At the same time, mobile applications and online services should be developed to support users' anytime, anywhere access to collection resources and reduce the time users spend searching for and obtaining resources. In addition, for the university-student population, university libraries should add lectures and general education courses on professional academic resource retrieval, popularizing skills for obtaining legitimate academic resources[21].

### 4.4 Improving Openness and Access Speed

Openness and access speed are key factors affecting university students' choice of digital academic resource platforms. The official digital resource services of most university libraries commonly have problems such as slow access speed and complicated authorization procedures. By contrast, the barrier-free access and rapid downloading characteristics of shadow libraries are highly favored by users. Therefore, to improve the accessibility and convenience of resources, university libraries should simplify access procedures for their digital academic collections, increase the openness and access speed of digital resources, meet users' needs for convenient and efficient services, and build an overall optimization plan for integrated, intelligent, and open university digital academic resource platforms.

First, the development of smart libraries should be promoted. With the help of the Internet of Things, big data, and artificial intelligence technologies, intelligent management of resources and precise services can be realized, improving the openness and access speed of the platform. At the same time, openly available academic resources should be integrated, and a unified access portal should be constructed to enrich collection content and ensure that users can conveniently obtain the information they need[22]. Second, through cloud computing and distributed storage technologies, resources should be deployed across multiple servers to achieve load balancing; in combination with content delivery network technologies, data should be cached to multiple nodes, thereby effectively shortening access paths and improving response speed. On this basis, edge-computing nodes can be further deployed to bring computing and storage resources closer to users, reduce data-transmission latency, and enhance real-time performance. Third, drawing on the barrier-free access model of shadow libraries, university libraries can adopt a flexible identity-verification strategy that combines single sign-on with multi-factor authentication, open API interfaces, and allow third-party developers to participate in the expansion and innovation of platform functions. Finally, through big-data analysis, user behavior should be precisely studied and judged; libraries can further optimize resource-recommendation mechanisms, build a new ecology of multi-party collaboration and resource integration, and comprehensively improve resource accessibility and user experience.

## 5 Conclusion

Based on grounded theory, this study analyzed university students' willingness to use shadow libraries and its influencing factors, and proposed improvement suggestions from four dimensions: user experience and privacy security, resource quality and richness, monetary costs and time costs, and openness and access speed. These suggestions aim to help university libraries optimize digital facilities and services, enhance users' willingness to use university library services, thereby reducing university students' dependence on shadow libraries and promoting the protection of academic publications and authors' copyrights. In the future, university libraries should continue to pay attention to technological innovation and changes in user needs, continuously improve service quality, and provide students with a high-quality, efficient, and secure environment for knowledge acquisition.

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# Necessity-Driven or Voluntary-Driven:

# Factors Influencing University Students'Usage Intention of Shadow Libraries

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**Abstract** Against the backdrop of a widening digital divide and information disparity, shadow libraries, as a gray-area channel for academic resource sharing, have gradually become an important supplementary means for university students to access academic resources. This study, based on grounded theory, investigates the factors influencing university students' usage intention of shadow libraries. Through semi-structured interviews for data collection and analysis incorporating open coding, axial coding, and selective coding, four core categories were identified: user cognition, usage costs, resource factors, and platform factors. The research reveals that key determinants include user experience and privacy security, resource quality and diversity, monetary and time costs, as well as platform openness and access speed. Accordingly, recommendations are proposed for university libraries to improve digital services by enhancing user experience and privacy protection, improving resource quality and richness, reducing monetary and time costs, and increasing platform openness and access speed. These measures aim to reduce students' willingness to use shadow libraries, decrease their reliance on such platforms, promote legal access to academic resources, and strengthen copyright protection.

**Keywords** Shadow library; University students; Grounded theory; Usage intention; University library services

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