QUBAHAN ACADEMIC JOURNAL
VOL. 6, NO. 2, June 2026
https://doi.org/10.48161/qaj.v6n2a2464

Managing Higher Education Development in Resource-Limited Academic Environments

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ABSTRACT: The development of higher education in resource-limited academic environments depends not only on teaching capacity and institutional governance, but also on researchers' access to scholarly information. Limited subscriptions, insufficient library budgets, and uneven digital infrastructure create barriers to research productivity and encourage the use of informal access channels, including shadow libraries. These practices reveal not only ethical dilemmas, but also deeper institutional challenges in managing research capacity. This study examines how researchers' informal access practices reflect problems in managing higher education development in resource-limited academic environments. The study focuses on access to scientific literature as a key element of research support, institutional capacity, and academic development. An online survey was conducted among 450 researchers working in resource-limited academic environments and having experience with informal access channels. Respondents were grouped by region, academic status, and disciplinary affiliation. The questionnaire included items on access to scholarly literature, frequency of use of formal and informal sources, perceived fairness of the scholarly publishing system, ethical sensitivity, and justifications for informal access. Data were analyzed using descriptive statistics, Spearman correlation analysis, Kruskal–Wallis tests, Mann–Whitney pairwise comparisons, and factor analysis. The findings show that informal access practices are associated with several management-related constraints: limited institutional access to legitimate resources, insufficient convenience and speed of formal access channels, perceived unfairness of the publishing system, and weak alignment between academic values and institutional support mechanisms. Information-access constraints were the most frequent explanation, reported by 67.2% of respondents, followed by pragmatic considerations, ethical fairness claims, perceived breach of academic expectations, and civil disobedience. STEM researchers demonstrated the highest frequency of informal access use, while humanities researchers more often emphasized ethical justifications. Significant regional differences indicate that access-management problems vary across academic environments. Informal access to scientific literature should be understood not only as an individual ethical choice, but also as a signal of institutional and systemic weaknesses in managing higher education development. The findings suggest that universities and policymakers in resource-limited environments should strengthen library infrastructure, develop open-access strategies, support inter-institutional resource sharing, and provide ethical guidance for

researchers. Effective management of scholarly information access is therefore an important condition for sustainable higher education development.

Keywords: Higher Education Management, Resource-Limited Academic Environments, Scholarly Information Access, Research Capacity, Academic Libraries, Information Behavior.

I. INTRODUCTION

The development of higher education in resource-limited academic environments depends not only on institutional governance, funding, and teaching quality, but also on the ability of universities to support research activity. One of the key conditions for research productivity is stable access to scholarly information. In environments with limited financial resources, insufficient library infrastructure, restricted journal subscriptions, and uneven digital access, researchers often face barriers that directly affect their ability to produce, publish, and disseminate scientific knowledge. Therefore, access to scientific literature becomes not only an academic issue, but also a management challenge for higher education development [1, 2].

The modern system of scientific communication is distinguished by a fundamental conflict between the need for open access to knowledge and the commercial interests of publishing corporations. Approximately 75% of the scientific literature remains behind paywalls [1], posing particularly acute challenges for researchers in developing countries and resource-poor institutions [2]. In response to these limitations, alternative access mechanisms have emerged [3, 4], including shadow libraries such as Sci-Hub and LibGen, which provide free access to millions of scientific publications. This situation creates complex ethical and managerial dilemmas for the academic community. Researchers are faced with a choice between copyright observance and the need to access relevant scientific information to continue their research [2, 5–7]. This problem is especially pressing in resource-limited academic environments, where institutional subscriptions are either unavailable or do not cover the necessary range of publications [8]. In this context, informal access practices may be interpreted not only as individual ethical decisions, but also as indicators of institutional limitations in research support and access governance. Existing studies report on the widespread use of shadow libraries, but do not sufficiently examine the moral mechanisms by which researchers justify the use of these platforms [9]. Moreover, many studies focus on the technical or legal aspects of access, while ethical, psychological, and managerial factors influencing decision-making remain less explored [10-13]. This limits the understanding of how informal access practices are connected with broader debates on open science, knowledge justice, digital ethics, and the management of higher education in resource-constrained settings.

The object of this study is higher education development in resource-limited academic environments, while the research focus is scholarly information access as a component of research capacity and institutional support. The novelty of the study lies in reframing the use of shadow libraries not merely as a problem of digital piracy or copyright infringement, but as an indicator of broader challenges in managing access to knowledge. The study introduces a multi-layer moral rationalization framework that combines information constraints, pragmatic needs, ethical fairness claims, psychological contract breach, and civil disobedience. The purpose of the present study was to identify the moral foundations and institutional factors affecting the practice of accessing scientific literature through shadow libraries in resource-limited academic environments.

II. RELATED WORK

Scholarly information access is an important component of higher education development management, especially in resource-limited academic environments. Universities are expected to support research productivity, international publication activity, and academic collaboration; however, these goals depend on the availability of reliable access to scientific literature. In contexts where library budgets, institutional subscriptions, interlibrary loan systems, and digital infrastructures are limited, access to knowledge becomes

not only a technical or legal issue, but also a managerial challenge. From this perspective, the use of informal access channels can be interpreted as an indicator of weaknesses in institutional research support and access governance. Research over the past decade shows a growing use of shadow libraries in the academic community. Himmelstein et al. [1] found that major pirate platforms provide access to approximately 69% of all scientific literature, servicing hundreds of thousands of requests daily. Similar data are presented in the works of Greshake [12] and other studies on scholarly piracy, which reveal the use of informal channels to access recent publications from prestigious journals. This indicates that such platforms are often used strategically rather than accidentally. Zukerfeld et al. [14], in their study on Argentine scientists, found that illegal access channels do not replace but rather complement traditional library resources, forming hybrid models of access to knowledge. This conclusion is supported by Nicholas et al. [15], who report an increase in the use of Sci-Hub among young researchers in different countries, although institutional resources continue to be used. These findings are important for higher education management because they show that researchers do not necessarily reject formal institutional channels; rather, they use informal access when formal systems are insufficient, slow, or incomplete.

Existing studies explain the use of shadow libraries through several approaches. However, these approaches should not be treated as identical. Some of them explain behavior, such as information-seeking behavior and pragmatic access choices, while others explain moral legitimation, such as Moral Foundations Theory, psychological contract breach, and civil disobedience. This distinction is important because the present study examines not only how researchers access literature, but also how they justify informal access under conditions of institutional constraint. The core theoretical basis of this study is Moral Foundations Theory. It is adapted to the academic context to explain how researchers morally rationalize access to scientific literature when formal rules conflict with perceived professional needs, fairness, and the value of open knowledge. In this study, Moral Foundations Theory is complemented by information-seeking behavior, psychological contract theory, and civil disobedience theory. Together, these approaches form a multi-layer moral rationalization framework for understanding informal access practices in resource-limited academic environments.

Table 1. Theoretical framework for informal scholarly access in resource-limited academic environments

Construct	Theoretical basis	Type of theory	Meaning in this study	Management interpretation
Information-access constraints	Information-seeking behavior	Behavioral	Use of shadow libraries due to lack of legitimate access	Indicates gaps in institutional subscriptions and library infrastructure
Pragmatic access needs	Pragmatic approach	Behavioral	Preference for speed, convenience, and reduced time costs	Indicates inefficiency of formal access systems
Moral fairness claims	Moral Foundations Theory	Normative	Justification through fairness, right to knowledge, and benefit to science	Indicates perceived injustice in scholarly communication
Psychological contract breach	Psychological Contract Theory	Normative-organizational	Reaction to disillusionment with academic values and publishing practices	Indicates mismatch between institutional expectations and academic support
Civil disobedience	Civil disobedience theory	Normative-political	Conscious rule-breaking as protest against restrictive publishing systems	Indicates legitimacy problems in access governance

In addition to the five theoretical constructs, structural factors of the academic environment play a significant role in understanding informal access practices. Academic status, discipline, and regional context are not only demographic characteristics, but also indicators of unequal access to institutional research support. Junior researchers, including doctoral students and postdoctoral researchers, often have fewer

resources and weaker institutional positions, which may increase their reliance on alternative access channels compared with senior researchers who have broader professional networks, funding opportunities, and library access. The presented approaches demonstrate the multifactorial nature of shadow library use. In countries with scarce institutional subscriptions and lower levels of research infrastructure, it is reasonable to expect a predominance of information-access constraints and pragmatic motives [16-24]. However, empirical data suggest a more complex picture. Studies on Korean researchers show that convenience and speed of access may be valued above copyright observance even when alternative legal channels are available [25-27]. Similar results were obtained by Rezende et al. [19] in a survey of Brazilian graduate students, where users cited both economic constraints and ease of access.

Lawson [21] suggests that moral mechanisms allowing researchers to legitimize the use of shadow libraries can be viewed through the lens of civil disobedience. Rossello and Martinelli [20] offer a related framework of ideological breach of psychological contract. According to this approach, researchers form implicit expectations about academic values, including openness of knowledge and fair access to information. When the publishing system is perceived as excessively commercialized, a gap emerges between the declared values of science and the actual organization of scholarly communication. Regional differences in the use of shadow libraries are also significant. Segado-Boj et al. [25] show that piracy platforms are more widely used in low- and middle-income countries. Disciplinary differences are also important: STEM researchers are more likely to use alternative access channels than researchers in the social sciences and humanities. This may reflect epistemic urgency in fast-evolving disciplines, where delayed access imposes knowledge-obsolescence costs. However, it remains an open question whether resource constraints are the only determinants, or whether ethical, ideological, and professional foundations also shape informal access practices.

Thus, the literature reveals three major gaps. First, there is a lack of systematic research connecting moral foundations of informal access with higher education development management. Second, cross-regional studies rarely compare how information constraints, pragmatic motives, ethical claims, and ideological factors vary across academic environments. Third, the relationship between disciplinary affiliation and dominant moral rationalizations remains understudied. The present study addresses these gaps by testing whether resource-limited academic environments are dominated only by economic and pragmatic motives, or whether researchers use a broader multi-layer moral rationalization framework. Based on the theoretical framework, the following hypotheses were formulated:

- H1: Information-access constraints are the dominant foundation for informal access to scientific literature in resource-limited academic environments.
- H2: Pragmatic access needs are positively associated with information-access constraints and informal access behavior.
- H3: Moral fairness claims are positively associated with psychological contract breach in the justification of informal access.
- H4: Disciplinary affiliation influences the type of justification: STEM researchers rely more on pragmatic justifications, whereas humanities researchers rely more on ethical justifications.
- H5: Regional context significantly affects both the frequency of informal access and the dominant moral foundations used by researchers.

III. MATERIAL AND METHOD

1. STUDY DESIGN

This study used a diagnostic cross-sectional survey design to examine how informal access to scholarly literature reflects broader challenges in managing higher education development in resource-limited academic environments. The methodological logic of the study was based on the assumption that researchers' use of shadow libraries is not only an individual ethical or legal behavior, but also an empirical indicator of institutional limitations in scholarly information access, research support, and access governance.

The study aimed to fill the identified gaps through a systematic analysis of the moral foundations and institutional factors shaping researchers' access practices across different regions and academic traditions. The conceptual model of the study relied on the theoretical approaches discussed in the literature review and included the following components: resource-limited academic environments, structural access constraints, respondents' regional affiliation, academic status and disciplinary field, moral foundations of informal access, and frequency of shadow library use. The model interpreted information-access constraints, pragmatic access needs, ethical fairness claims, psychological contract breach, and civil disobedience as interrelated dimensions of researchers' moral rationalization. At the same time, region, discipline, and academic status were treated as contextual factors that may explain variation in these dimensions.

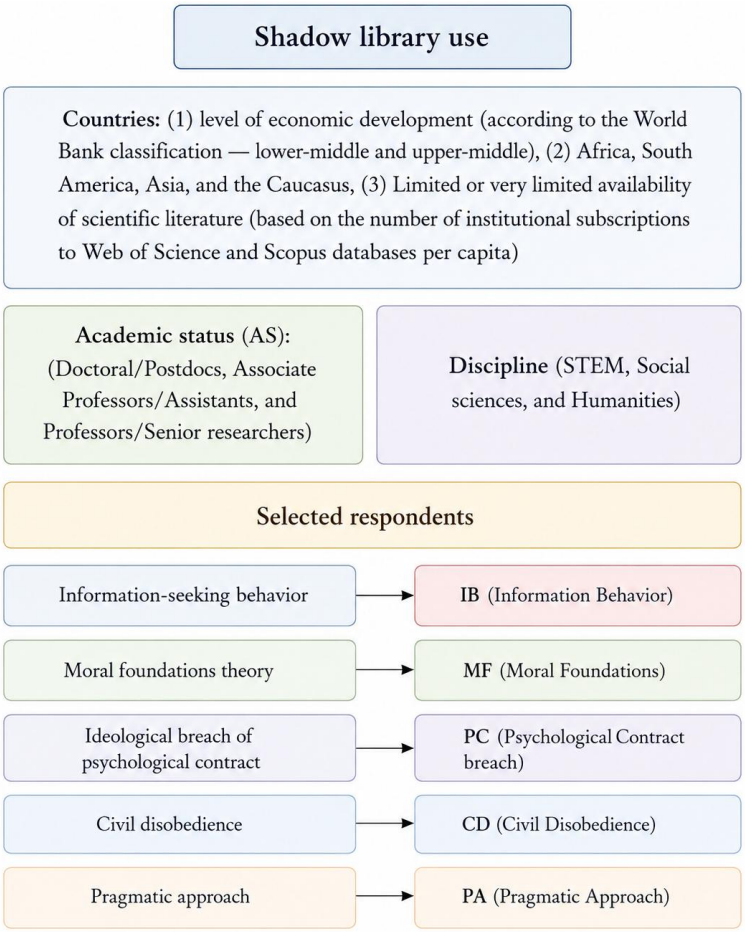

FIGURE 1. Structural model of informal scholarly access in resource-limited academic environments.

Region, academic status, and disciplinary affiliation were included as contextual variables that may moderate the relationship between access constraints and moral justification. This design allowed the study to move beyond a purely descriptive analysis of shadow library use and to examine informal access practices as indicators of management problems in scholarly information provision.

2. RESEARCH DESIGN

The research procedure included several consecutive stages, from the development of the theoretical framework to the interpretation of empirical results. To make the methodological logic clearer, the procedure is presented in Figure 2.

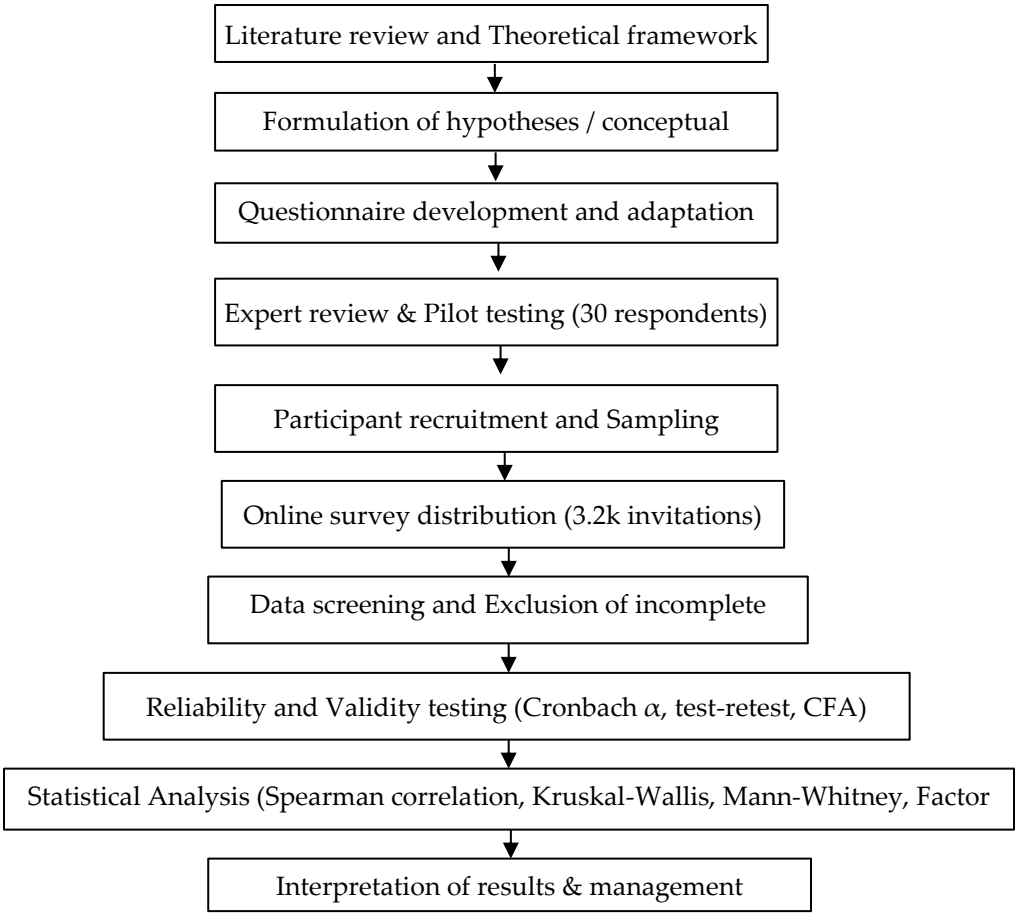

FIGURE 2. Research procedure.

At the first stage, the literature review was used to identify theoretical approaches explaining informal access to scholarly literature. These approaches were then converted into measurable constructs. At the second stage, a structured questionnaire was developed on the basis of validated scales and adapted to the academic context. At the third stage, the questionnaire was pilot-tested to assess clarity, wording, and technical functionality. The fourth stage involved respondent recruitment and online data collection. At the final stage, the dataset was screened, reliability and validity were tested, and statistical analysis was conducted.

3. DATA COLLECTION PROCEDURES

The first stage of data collection involved developing a structured online questionnaire. The tool was created by adapting existing validated scales and consisted of 47 questions grouped into five blocks: (1) demographic characteristics and academic status, 9 questions; (2) a scale for the frequency of use of different sources of access to literature, 12 questions; (3) a modified version of the Moral Foundations Scale by Graham et al. [28], adapted to the academic context, 15 questions; (4) the Ethical Sensitivity Scale in Academic Activities [29, 30], 7 questions; and (5) questions on the perceived fairness of the current system of scientific publications, 5 questions.

The average time to complete the questionnaire was 12–15 minutes. A pilot study was conducted with 30 respondents to test the clarity of the wording, the internal logic of the questionnaire, and the technical functionality of the online form. Minor wording changes were made after the pilot stage to improve the

clarity of items related to moral justification and perceived fairness. The main constructs and measurement instruments are presented in Table 2.

Table 2. Constructs and measurement instruments.

Construct	Measurement source	Number of items	Scale	Main meaning in the study
Frequency of access practices	Author-adapted access behavior scale	12	1–5 Likert scale	Frequency of using institutional databases, open access sources, personal networks, and shadow libraries
Moral foundations of informal access	Adapted Moral Foundations Scale by Graham et al. [28]	15	1–5 Likert scale	Moral rationalization of informal access through fairness, academic benefit, harm reduction, and right to knowledge
Ethical sensitivity	Ethical Sensitivity Scale in Academic Activities [29]	7	1–5 Likert scale	Awareness of ethical tensions in academic access practices
Perceived fairness of scholarly publishing	Author-developed scale	5	1–5 Likert scale	Perception of fairness, accessibility, and legitimacy of the current publication system
Demographic and academic characteristics	Author-developed items	9	Categorical	Region, academic status, disciplinary affiliation, and other academic characteristics

4. SAMPLING, RECRUITMENT, AND QUESTIONNAIRE DISTRIBUTION

The second stage was the selection of participants for the survey. The inclusion criteria required respondents to be actively engaged in research activities and to have at least one publication during the last two years or to work at a university or research institute. In addition, respondents had to have experience using shadow libraries or other informal access channels for scholarly literature. Respondents were recruited using the snowball method through primary respondents, professional academic social networks, author data from Scopus and Web of Science, lists of scientific associations, and university webpages. Snowball sampling was selected because the study focused on a specific and partly sensitive population: researchers with experience using informal access channels. Since such practices may be underreported in formal institutional settings, recruitment through professional networks made it possible to reach respondents who met the inclusion criteria.

To reduce sampling concentration, invitations were distributed through several independent channels. A restriction was placed on the country of affiliation of the potential respondent if it did not correspond to the resource-limited academic environments defined in the study model. Using the selected contacts, targeted invitations to participate in the study were distributed via email. The mailing proceeded for 6 weeks, totaling approximately 3.2 thousand personalized invitations. The emails provided information on the research objectives, participation criteria, confidentiality safeguards, and a link to the online questionnaire. Respondents were given 3 weeks to complete the questionnaire, with one reminder sent after 10 days.

As a result, 512 responses were collected. Of these, 450 met the inclusion criteria and were used for further analysis. The main reasons for exclusion were the lack of experience using shadow libraries, 38 respondents, and incomplete questionnaires, 24 respondents. The final sample provided analytical representation of different regions, academic statuses, and disciplinary areas, which allowed comparative analysis of the moral foundations and institutional factors shaping informal access practices. The study does not claim statistical representativeness of the global population of researchers. Instead, it provides analytical representativeness

for comparing groups within resource-limited academic environments. This approach is appropriate because the aim of the study was to identify patterns of moral justification and institutional access constraints among researchers with relevant experience.

Table 3. Characteristics of respondents using shadow libraries (n =450).

Characteristic	n	%
Region		
Asia and Caucasus	135	30.0
South America	120	26.7
Africa	105	23.3
Other	90	20.0
Academic status		
Doctoral/Postdocs	180	40.0
Associate Professors/Assistants	162	36.0
Professors/Senior researchers	108	24.0
Discipline		
STEM	234	52.0
Social sciences	126	28.0
Humanities	90	20.0
Total	450	100.0

5. BIAS CONTROL AND ETHICAL CONSIDERATIONS

Several procedures were used to reduce potential bias. First, the invitation described the study in general terms as research on scholarly information access, rather than as a study focused only on shadow libraries. This reduced the risk of attracting only respondents with strong opinions about academic piracy. Second, participation was anonymous and voluntary, which helped reduce social desirability bias when discussing potentially sensitive access practices. Third, incomplete questionnaires were excluded from the final dataset.

Self-selection bias was addressed by using multiple recruitment channels and by distributing invitations to researchers from different regions, academic statuses, and disciplinary fields. However, because participation was voluntary, the possibility of self-selection bias cannot be fully excluded. Non-response bias was addressed by comparing early and late responses where possible. Common method bias was reduced through procedural remedies, including anonymity, neutral item wording, separation of predictor and outcome blocks in the questionnaire, and pilot testing of the instrument. All respondents received information about the purpose of the study, confidentiality safeguards, and the voluntary nature of participation before completing the questionnaire. No personally identifying information was used in the analysis.

6. ANALYSIS METHODS, RELIABILITY, AND VALIDITY

Quantitative data were analyzed in SPSS 29.0. Since the study included ordinal Likert-scale variables and group comparisons, non-parametric statistical methods were used. Descriptive statistics were applied to characterize the sample and the main access practices. Spearman's correlation analysis was used to identify associations between the main variables. The Kruskal–Walli's test was applied to detect differences between regional and disciplinary groups, while Mann–Whitney tests were used for pairwise group comparisons.

Effect sizes were reported to improve the interpretation of statistical significance. For Mann–Whitney tests, the effect size was calculated as $r = Z / \sqrt{N}$. For Kruskal–Wallis tests, effect size was reported using epsilon-squared. Where appropriate, 95% confidence intervals were calculated for key estimates. Factor analysis with varimax rotation was conducted to identify the typology of moral foundations of informal access.

To move beyond descriptive interpretation, the analysis was structured around the hypotheses formulated in the theoretical framework. Correlation analysis was used to examine associations between

pragmatic access needs, perceived unfairness, and frequency of shadow library use. Group comparison tests were used to examine disciplinary and regional differences. The reliability and validity of the questionnaire were assessed before the main statistical analysis. Internal consistency was evaluated using Cronbach's alpha, test-retest reliability was examined on a subsample of 50 respondents with a two-week interval, construct validity was assessed through confirmatory factor analysis, and convergent validity was tested through correlations with existing ethical attitude scales. The results are summarized in Table 4.

Table 4. Reliability and validity of measurement instruments

Reliability / validity criterion	Indicator	Value	Interpretation
Internal consistency	Moral foundations scale, Cronbach's α	0.84	Acceptable
Internal consistency	Ethical sensitivity scale, Cronbach's α	0.79	Acceptable
Internal consistency	Fairness perception scale, Cronbach's α	0.81	Acceptable
Test-retest reliability	Subsample of 50 respondents, two-week interval	r = 0.87	High stability
Construct validity	Confirmatory factor analysis	CFI = 0.94; RMSEA = 0.06	Acceptable model fit
Convergent validity	Correlation with existing ethical attitude scales	r = 0.73, p < 0.01	Significant convergence

These indicators demonstrate that the adapted questionnaire had acceptable reliability and validity for analyzing moral foundations and institutional factors of informal scholarly access in resource-limited academic environments.

IV. RESULTS

The results are presented in three stages. First, the relationships between the main variables were examined using Spearman correlation analysis. Second, disciplinary and regional differences were tested using non-parametric group comparisons. Third, factor analysis was used to identify the dominant types of moral foundations for informal access to scholarly literature. This structure allows the results to be interpreted not only as individual access behavior, but also as indicators of institutional challenges in managing scholarly information access in resource-limited academic environments.

Table 5. Correlation matrix of the main variables (spearman's ϱ).

Variable	1. IB	2. PA	3. MF	4. PC	5. CD	6. AS
1. IB	1.000					
2. PA	.542**	1.000				
3. MF	.631**	.467**	1.000			
4. PC	.489**	.521**	.578**	1.000		
5. CD	-.234**	-.189*	-.312**	-.267**	1.000	
6. AS	-.321**	-.298**	-.287**	-.203*	.156*	1.000

* Note: IB = information-access constraints / information behavior; PA = pragmatic access needs; MF = moral fairness claims; PC = psychological contract breach; CD = civil disobedience; AS = academic status. *p < 0.05; **p < 0.01

The variables used in the analysis were operationalized according to the theoretical framework. IB refers to information-access constraints and information behavior; PA refers to pragmatic access needs; MF refers to moral fairness claims; PC refers to perceived psychological contract breach; CD refers to civil disobedience;

and AS refers to academic status. These variables reflect different dimensions of researchers' access practices and moral rationalization.

Spearman correlation analysis identified several significant relationships between the studied variables. The strongest positive association was found between IB and MF, ϱ = .631, p < .01. This indicates that researchers who experience stronger information-access constraints are also more likely to justify informal access through fairness-based arguments and the right to knowledge. A strong positive correlation was also found between MF and PC, ϱ = .578, p < .01, suggesting that fairness claims are closely connected with perceived disillusionment with the academic publishing system. The correlation between IB and PA, ϱ = .542, p < .01, shows that limited institutional access is often accompanied by pragmatic considerations, such as speed and convenience. PA was also positively associated with PC, ϱ = .521, p < .01, indicating that practical access needs may reinforce dissatisfaction with formal scholarly communication channels.

Civil disobedience showed weak negative correlations with IB, PA, MF, and PC. This suggests that civil disobedience represents a more specific protest-oriented framing rather than a direct continuation of pragmatic or access-based motives. Academic status was negatively associated with IB, PA, MF, and PC, which may indicate that researchers with lower institutional positions experience stronger access limitations and rely more often on pragmatic and fairness-based justifications.

Inter-group differences were analyzed using the Kruskal–Wallis non-parametric test. The analysis revealed statistically significant regional differences in the frequency of shadow library use, H = 18.42, p < .05, and in the predominant types of moral foundations, H = 24.67, p < .01. These findings support the assumption that informal access practices are shaped not only by individual attitudes, but also by regional differences in institutional access conditions and research-support infrastructure.

Disciplinary differences were also significant. As shown in Table 6, STEM researchers demonstrated the highest level of information-access constraints or informal access frequency, IB = 86.8, as well as the strongest pragmatic access needs, PA = 4.2. This suggests that in fast-moving fields, delayed access to recent literature may create higher knowledge-obsolescence costs. Humanities researchers, by contrast, showed the highest level of moral fairness claims, MF = 3.9, indicating a stronger ethical framing of informal access. Social sciences occupied an intermediate position across most variables.

Table 6. Median values of variables by disciplines and the Kruskal-Walli's test.

Variable	STEM	Social sciences	Humanities	H	p	ε^2
IB	86.8	73.0	62.2	22.14	<0.001	0.045
PA	4.2	3.8	3.1	15.67	<0.001	0.031
MF	2.8	3.4	3.9	12.43	<0.01	0.023
PC	4.1	3.7	3.3	18.75	<0.001	0.037
CD	3.1	2.9	2.6	8.92	<0.05	0.015

* Note: IB is reported as a frequency/index score; PA, MF, PC, and CD are reported as median values on a 1–5 Likert scale. ε^2 = effect size for the Kruskal–Walli's test

The effect sizes indicate that disciplinary differences were statistically significant but varied in magnitude. The strongest disciplinary differentiation was observed for IB and PC, suggesting that access constraints and perceived breach of academic expectations are the most discipline-sensitive dimensions. The smaller effect for CD shows that civil disobedience was less strongly differentiated by discipline.

Pairwise comparisons using the Mann–Whitney test were conducted to identify which groups contributed most strongly to the differences detected by the Kruskal–Walli's test. The largest differences were found between STEM and humanities researchers. STEM researchers showed substantially higher IB scores, while humanities researchers showed stronger MF scores. This pattern supports the hypothesis that disciplinary affiliation influences not only the frequency of informal access, but also the type of moral justification used by researchers.

Table 7. Pairwise group comparisons and effect sizes.

Compared groups	Variable	U	p	r
STEM vs social sciences	IB	11.247	<0.001	0.43
	PA	12.089	<0.01	0.38
STEM vs Humanities	IB	8.934	<0.001	0.51
	MF	9.672	<0.001	-0.47
Asia and Caucasus vs Africa	PC	10.456	<0.001	0.42
	CD	9.823	<0.05	0.28

*Note: U = Mann–Whitney U statistic; r = effect size.

The effect sizes ranged from small-to-moderate to large. The strongest effect was observed for STEM versus humanities on IB, r = 0.51, followed by STEM versus humanities on MF, r = −0.47. This indicates that the disciplinary contrast between STEM and humanities is central to understanding both access behavior and ethical framing. Regional pairwise comparisons also showed meaningful differences between Asia and the Caucasus and Africa, particularly for PC and CD, which suggests variation in the perceived legitimacy of scholarly communication systems across regions. Finally, factor analysis identified five main types of moral foundations relied on by researchers to legitimize informal access to scholarly literature. The factor structure corresponds to the theoretical framework developed in the literature review and confirms that shadow library use in resource-limited academic environments cannot be reduced to economic necessity alone.

Table 8. Typology of the moral foundations of using shadow libraries based on factor analysis

Foundation	Description	Factor loading	% of respondents
IB	Lack of access to legitimate resources	0.78-0.85	67.2
PA	Preference for convenience and speed when alternatives are available	0.71-0.82	54.8
MF	Appeal for fairness and the right to access knowledge	0.68-0.79	43.6
PC	Protest against the commercialization of science	0.65-0.76	38.9
CD	Conscious rule-breaking as a form of protest	0.62-0.73	28.4

*Note: Factor loadings show the range of item loadings for each foundation. Percentages indicate the share of respondents for whom the corresponding foundation was identified as present or dominant.

The most frequent foundation was IB, reported by 67.2% of respondents, which supports H1 and confirms that information-access constraints remain the dominant driver of informal access in resource-limited academic environments. However, PA was also identified among 54.8% of respondents, showing that convenience and speed are important even when the problem is not only economic. MF was present among 43.6% of respondents, indicating that many researchers frame informal access through fairness, justice, and the right to knowledge. PC and CD were less frequent but theoretically important, as they show that some researchers interpret informal access as a response to the commercialization of science or as a conscious form of protest.

Overall, the results support the proposed multi-layer moral rationalization framework. Information-access constraints were the dominant foundation, but pragmatic, ethical, ideological, and protest-based justifications were also present. Disciplinary and regional differences further show that informal access practices should be understood as indicators of broader challenges in higher education development management, especially in relation to library infrastructure, subscription policy, open-access strategy, and institutional research support.

V. DISCUSSION

The obtained results paint a complex picture of moral foundations used by researchers to legitimize their access to shadow libraries in resource-limited academic environments. In line with the research objective, these findings are interpreted not only as evidence of individual ethical reasoning, but also as indicators of institutional challenges in managing scholarly information access. Contrary to the anticipated dominance of exclusively economic and pragmatic factors, empirical evidence shows the active use of all five types of moral foundations highlighted in the conceptual framework.

Factor analysis supported the proposed theoretical typology. The most common was information behavior or information-access constraints (67.2% of respondents), which confirms the hypothesis that in resource-limited environments, the dominant motivation is the lack of access to legitimate resources. This result is consistent with previous international studies showing that researchers often turn to shadow libraries when institutional subscriptions and library resources are insufficient. However, a significant proportion of respondents (54.8%) also used pragmatic foundations, indicating that even with alternative access channels available, researchers may prefer shadow libraries for convenience and efficiency reasons. This finding is consistent with the results of Korean and Brazilian studies, which revealed a priority of practical considerations over copyright and formal access procedures [18, 19].

The adapted Moral Foundations Scale and the Ethical Sensitivity Scale help explain why these practices are not perceived only as technical solutions. The presence of ethical foundations among 43.6% of respondents shows that many researchers interpret informal access through fairness, the right to knowledge, and the public value of science. This supports the adaptation of Moral Foundations Theory to the academic context, where formal copyright rules may conflict with professional values and research needs. The identified disciplinary differences are of particular theoretical interest. STEM researchers show the highest rates of shadow library use (86.8%) and pragmatic rationales, which may reflect the peculiarities of working with relevant scientific literature in rapidly developing fields. More specifically, this may reflect epistemic urgency in fast-evolving disciplines, where delayed access to recent literature creates knowledge-obsolescence costs. In contrast, scholars in the humanities are more likely to rely on Ethical Foundations (MF), which may be due to their greater reflexivity regarding the moral aspects of their actions and a traditionally more critical attitude towards the commercialization of knowledge. These differences cannot be explained solely by variations in resource availability, as all respondents come from resource-constrained environments. Rather, they are indicative of different academic cultures and normative systems within disciplines and of different expectations regarding institutional support for scholarly information access.

The significant representation of ideological foundations (38.9% of respondents) and their strong correlation with other types of moral strategies ($r = 0.578$ with ethical justifications) show that the use of shadow libraries is not an exclusively pragmatic solution. For many researchers, it is also a form of protest against the over-commercialization of science and the betrayal of their expectations regarding the openness of scientific knowledge.

The concept of ideological breach of psychological contract [20] received partial empirical support in our study. Researchers form implicit expectations about academic values, including openness of knowledge and fair access to information, and when the publishing system fails to meet these expectations, alternative access practices receive moral legitimization. The perceived fairness scale is important for interpreting this relationship. The association between moral fairness claims and psychological contract breach indicates that researchers who perceive the scholarly publishing system as unjust are more likely to morally legitimize informal access. Thus, perceived fairness functions as a link between individual moral reasoning and broader dissatisfaction with the organization of scholarly communication.

Statistically significant differences between regions in the frequency of using shadow libraries and the types of moral foundations indicate the influence of structural factors [31]. However, these differences do not follow simple economic logic. Even in the most resource-constrained regions (Africa), a significant proportion of researchers use complex moral justifications beyond mere necessity. This suggests that regional context should be understood as a combination of economic conditions, institutional access infrastructure, publishing inequalities, and academic norms.

The results have important implications for understanding institutional responses to the shadow library phenomenon. The widespread use of various types of moral foundations suggests that traditional approaches based only on legal restrictions may be insufficient [5, 31-33]. As noted by Hoy [34], librarians are faced with ethical dilemmas, knowing about the popularity of pirating resources among users but being forced to adhere to the official position on copyright enforcement. This gives rise to tension between institutional policy and researchers' practical needs, where official policies are at odds with the practical needs of users [35–38]. Moreover, Correa et al. [39] observed a positive correlation between the use of shadow libraries and the citation of articles, suggesting that wider access to literature may be associated with greater scholarly visibility [40]. However, this relationship should not be interpreted as direct evidence of improved research quality. Maddi & Sapinho [41] reported a paradoxical effect: the widespread use of pirated resources can reduce the citation advantage of open access articles, leveling access conditions across all types of publications.

The theoretical contribution of the work lies in the operationalization and empirical verification of the conceptual typology of moral foundations of the use of shadow libraries. The study extends economic-only explanations by showing that information-access constraints, pragmatic considerations, ethical justifications, psychological contract breach, and civil disobedience may coexist in researchers' reasoning. The developed methodology can be adapted to study the ethical aspects of other forms of digital behavior in the academic environment. The results also contribute to the understanding of moral foundations processes in the face of conflict between formal rules and the practical needs of professional communities.

The practical implications of the study relate to the need to develop more flexible and inclusive models of access to scientific knowledge. Publishing corporations and academic institutions should consider economic barriers [42] and deeper value contradictions underlying the use of alternative access channels that cannot be reduced to simple economic reasons [43]. The diversity of moral foundations suggests the need for a more nuanced approach to understanding the ethical dimension of access to scientific literature. For higher education management, these findings indicate the importance of strengthening library infrastructure, supporting open-access strategies, improving institutional subscription models, and developing clear ethical guidance for researchers. The transformation of the publishing system towards open access can address information needs and the ideological contradictions identified in this study.

VI. CONCLUSION

The results demonstrate that researchers rely on a complex system of moral foundations to legitimize access to scientific literature through informal channels, including five different strategies: information behavior, pragmatic considerations, ethical justifications, ideological breach of psychological contract, and civil disobedience. Among these indicators, information-access constraints were the dominant foundation, followed by pragmatic access needs, ethical fairness claims, psychological contract breach, and civil disobedience. This shows that informal access practices are shaped not only by economic necessity, but also by institutional access limitations, disciplinary expectations, and researchers' perceptions of fairness in scholarly communication.

Empirical evidence of the multifactorial nature of this phenomenon points to the need to revise traditional approaches to regulating access to scientific information. Legal restrictions alone may be insufficient in a context where the academic community has a diverse arsenal of moral foundations for its actions. The disciplinary and regional differences identified highlight the importance of a contextualized understanding of academic practices and the need for differentiated policy solutions. For higher education development, the results indicate that access to scholarly literature should be treated as a strategic component of research capacity. Universities in resource-limited academic environments need stronger library infrastructure, more effective subscription and open-access strategies, inter-institutional resource sharing, and clearer ethical guidance for researchers.

The conducted study also has several limitations. First, self-report methods can lead to socially desirable responses, especially when discussing potentially illegal activities. Second, our sample was limited to

researchers who had already used shadow libraries, which eliminated the opportunity to compare them with those who avoid such platforms altogether. Third, the cross-sectional design of the study prevented us from establishing causal relationships between different factors. Fourth, the use of snowball sampling may limit the generalizability of the results, although it was appropriate for reaching a specific and sensitive population of respondents.

Future research should focus on a longitudinal analysis of changes in moral foundations in response to the evolution of publishing practices and open access policies. In addition, qualitative research is needed to better understand the processes of formation and transformation of ethical strategies in different academic contexts. Further studies should also compare users and non-users of shadow libraries, examine institutional access policies directly, and test how changes in library funding, open-access infrastructure, and national higher education policy affect researchers' access behavior over time.

Funding Statement

This research received no external funding.

Author Contributions

All authors made an equal contribution to the development and planning of the study.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data are available from the authors upon request.

Acknowledgments

Not applicable.

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