Berkala Ilmu Perpustakaan dan Informasi, Vol. 18, No. 2, Desember 2022, Hal. 189-203
https://doi.org/10.22146/bip.v18i2.4546
ISSN 1693-7740 (Print), ISSN 2477-0361 (Online)
Tersedia online di https://journal.ugm.ac.id/v3/BIP

Undergraduate students' use of shadow libraries as counter-enclosure of knowledge

Stanislaus Axel Paskalis[1] and Alfredo Putrawidjoyo[2]
[1]Department of International Relations, Universitas Gadjah Mada
[2]Center for Digital Society Universitas Gadjah Mada
Jl. Sosio-Yustitia, Bulaksumur No. 1, Yogyakarta 55281
E-mail: axelpaskalisap@gmail.com

Submitted: May 16, 2022, Revised: July 18, 2022, Accepted: August 19, 2022

ABSTRAK

Pendahuluan. Mahasiswa bergantung pada literatur akademik yang aksesnya sering kali dihalangi oleh *paywall*. Mereka menanggulangi keterbatasan tersebut dengan menggunakan perpustakaan bayangan, sebuah arsip literatur akademik yang tidak resmi dan dapat diakses oleh semua orang secara cuma-cuma. Penelitian ini bertujuan untuk mengetahui penggunaan perpustakaan bayangan oleh mahasiswa Universitas Gadjah Mada sebagai upaya memitigasi terbatasnya akses yang disediakan oleh lembaga.
Metode penelitian. Kami menyurvei secara daring 398 mahasiswa Universitas Gadjah Mada untuk memperoleh data statistik deskriptif mengenai penggunaan perpustakaan bayangan serta melakukan studi literatur.
Data Analisis. Menganalisis data kuantitatif dengan menggunakan alat proses statistik (Stata), dan melakukan koding terbuka terhadap data-data respons terbuka.
Hasil dan Pembahasan. Mahasiswa Universitas Gadjah Mada, sebagai bagian dari komunitas yang bergantung pada sains, dirugikan oleh kondisi ekonomi-politik industri penerbitan akademik. Meskipun beberapa mahasiswa menunjukkan ambivalensi terhadap perpustakaan bayangan atas dasar legalitas, mereka tetap menggunakannya karena kebutuhan dan kenyamanan. Terakhir, kami juga menemukan mahasiswa yang berpihak kepada perpustakaan bayangan, tidak hanya menggunakannya karena kebutuhan dan kenyamanan, tetapi sebagai bagian dari gerakan melawan pengungkungan ilmu pengetahuan.
Kesimpulan. Akses Mahasiswa UGM terhadap literatur ilmiah dibatasi oleh ekonomi politik industri publikasi akademik. Para mahasiswa mengatasi keterbatasan tersebut dengan mengakses literatur melalui perpustakaan bayangan.

Kata kunci: perpustakaan bayangan; pengungkungan ilmu pengetahuan; komunitas bergantung sains

ABSTRACT

Introduction. *University students rely heavily on academic literature, however,paywalls frequently stifle its access. To circumvent this limitation, they use shadow libraries, an unofficial archive of academic resources freely available online. We investigated how Universitas Gadjah Mada students use shadow libraries to mitigate the lack of access their institutions provide.*
Data collection methods. *We collected data using an online survey involving 398 Universitas Gadjah Mada students to gather descriptive statistical data on the usage of shadow libraries and a literature study.*
Data analysis. *We analyzed quantitative data with statistics processing software (Stata) and coded the open-ended qualitative responses.*
Results and Discussion. *Students use shadow libraries because shadow libraries are more accessible and offer more access to literature than university library. They use shadow libraries despite their ambivalence due to shadow libraries' legality. Moreover, some students also support shadow libraries, using them as part of an active effort to counter the enclosure of scholarly goods.*

Conclusion. *Our findings show that UGM students, as part of the science-dependent community, are impaired by the political economy of the academic publishing industry. The students resisting such impairment by utilizing shadow libraries to access literatures that are not available in the university library.*

Keywords: *Shadow library; enclosure of knowledge; science-dependent community*

A. INTRODUCTION

In this article, we attempt to readdress the issue of access to academic works, specifically, but not limited to, academic journals. Our argument stems from the positionality that knowledge should be free or libre to be accessed so that its production may be open. Unfortunately, however, the current condition of academic publishing is stifling such aims. Nevertheless, those concerned with the problem of production, access, and distribution have not sat on their laurels.

There have been numerous attempts to change how people access academic works and how authors publish their work for the past two decades. Namely, the Budapest Open Access Initiative, the Bethesda Statement on Open Access Publishing, and the Berlin Declaration on Open Access. There is a rainbow of Open Access (OA) types: Gold OA, Green OA, Hybrid OA, and Platinum OA. Gold OA includes readily available works but sometimes requires the payment of the Article Processing Charge (APC). Green OA includes a version of a publication archived online, for example, in a repository, and the access is still tied to an embargo agreement with the publisher. Hybrid OA usually refers to journals that offer a traditional paywalled option or OA after payment. Last is Platinum OA, where journals are immediately available for free, authors need not pay APC, and authors may also retain copyright. More recently, the European Commission and the European Research Council launched cOAlition S. Their plan, named Plan S, is to, by 2021 (it used to be 2020), make all publicly funded research publicly available through open access journals. Plan S privileges Gold OA or better—Platinum OA—allows Green OA but tries to eliminate embargo and outright states that Hybrid OA is non-compliant. Indeed, a much-needed and ambitious goal considering that, in 2017, Green estimates that around four-fifths of all scholarly articles are still out of reach for most people without robust access from a sufficiently funded institution. A year later, Green measured that around 80% of published work is still enclosed in a "paywalled garden" in a follow-up article (Green, 2018, p. 2).

However, perceiving Plan S as a solution is not cut and dry. Some have pointed out that importing Plan S to many countries in the Global South may be detrimental as they do not have the funds to pay APCs (Poynder, 2019). For example, open access advocates in Indonesia argue that Plan S, combined with existing pressures to publish in the top (read: commercial) journals, may jeopardize the existing ecosystem of less financially straining open access publishing (Irawan et al., 2017). Piron (2018) even goes as far as to argue that open access in this context furthers the dependency that scholars in the Global South have on the science of the North, a tool of neocolonialism of sorts.

As such, current models of OA, except Platinum OA, may not be able to address the issue of access across different contexts. In addition, the "prestige economy" of academia and the political economy of academic publishing reproduce the power imbalance in favor of commercial publishers. While the mainstream is ameliorating, we turn to the alternative many have used to mitigate their lack of access, Black OA. Black OA includes services that provide free, often pirated, access to publications (Björk, 2017, p. 173). Most notably Sci-Hub and Library Genesis (Libgen). However, as salient and accurate as calling them piracy websites, we refer to them as "shadow libraries" (Liang, 2012).

Suppose the function of a library is to preserve, archive, index, and provide access to the populace. Then, shadow libraries are libraries of sorts. They are comprised of an

assemblage of books, journals, and the people who run them, and they have rules and institutions along with shelves and servers. Their technologies often favor a decentralized topology, using a peer-to-peer framework. People voluntarily work as librarians, archivists, and hosts of the database. The catalog also consists of content metadata, i.e., title, author, year of publication, number of pages, and category. In addition, shadow libraries are enjoyed by many worldwide, and they are not constrained to academic publishing. One example is monoskop.com, "a wiki for the arts, media, and humanities." Nevertheless, for this research, we limit our scope to shadow libraries used to fulfill the sustenance need for academic content.

The discussion about shadow libraries has been rich in the context of intellectual property and its use among researchers in general. However, no study has been conducted on their use amongst undergraduate students. With that in mind, this study aims to observe the use of shadow libraries by UGM undergraduate students. We aim to ask why UGM students use shadow libraries to access paywalled academic papers. This issue is salient because public university students receive state subsidies to undergo their academic activities. Therefore, a study about students' consumption of academic literature and its piracy can give the policymakers and other stakeholders an essential insight. This research aims to provide context regarding the impact of scholarly production and publication's political economy on higher education institutions in Indonesia, using UGM as the case study. Discussions revolve around how students surmount inaccessibility using their institution's resources and shadow libraries.

We utilize a literature study and descriptive statistics analysis from questionnaire surveys to discuss these topics. The literature study is used to provide context. While using the questionnaire survey, we collected and described the position and attitudes of UGM undergraduate and vocational students.

B. LITERATURE REVIEW

Regarding our findings, limited research in Indonesia discussed shadow libraries as an institution or concept. Regarding Sci-Hub, we found four published scholarly works: Two undergraduate theses, one that scrutinizes Sci-Hub through Indonesian copyright laws, and another that measures Sci-Hub usage in a university in Surabaya, Indonesia (Aisyah, 2020; Amita, 2020). Lastly, one journal article analyzes copyright and academic publication using Islamic norms (Darmawati, 2018).

Joe Karaganis (2018), in the introductory chapter of the edited volume *Shadow Libraries: Access to Knowledge in Global Higher Education,* suggests that shadows libraries are—rather than being seen as a service—a proof of concept. The concept is the openness and accessibility of millions of scholarly works for those who seek it. Indeed, as Elbakyan (2016) notes, the goal is Sci-Hub in itself; it is how we manage the resource that needs to change. Ostrom & Hess (2007) envisage a way to analyze how people manage knowledge or science as a resource through institutions. Generally, Ostrom & Hess (2007, p. 42) define institutions as:

> *"... formal and informal rules that are understood and used by a community. Institutions ... are not automatically what is written informal rules. They are the rules that establish the working "do's and don'ts" for the individuals in the situation that a scholar wishes to analyze and explain."*

Kranich (2007) suggests that there have been efforts by the scholarly community to challenge the dominant institutions of knowledge production and ownership, such as the open access movement, digital repositories, digital libraries, and community preservation. At the outset, these movements are moved by normative gains that profess the absolute good of cumulative knowledge gains of society writ large-not just academics. Furthermore, Kranich (2007, p. 112) proposes ways in which newer research may contribute to the advocacy of knowledge commons enterprise: mapping

public opinions, compiling narratives of the positive impact of open information, and adverse consequences of its enclosure. Taken to its logical conclusion, these efforts can be updated to include shadow libraries. Moreover, shadow libraries are disruptive, not just towards the oligopoly of academic publishing but also toward libraries, librarians, and academics concerned with the conditions of scholarly communications. Consequently, the discourse has burgeoned concerning the usage and implication of shadow libraries.

Skeptics of shadow libraries' positive impact raise two points (Anderson, 2015; Banks, 2016). First, that shadow libraries are illegal and are not justifiable. Moreover, they do nothing to change the roots of academic publishing as they only host repositories of published scholarly works. In addition, there are also allegations that Sci-Hub uses phishing attacks to gain institutional access credentials. However, Elbakyan (2017) stated that Sci-Hub never does any phishing by itself but does not negate the possibility that out of the credentials donated may be acquired through phishing.

Proponents of shadow libraries, more so Elbakyan because of her public image, have never shied away from the issue of legality. Bodó (2016) argues that shadow libraries are politically and ideologically charged. Noting that, turned on its head, publishers' practices and business model commodifying, enclosing, and selling knowledge production is equally unethical and damaging to science and society. Larivière et al. (2015) show that the Big Five of academic publishing oligopoly (Reed-Elsevier, Wiley-Blackwell, Springer, Taylor & Francis, and SAGE) control more than 50% of papers published in 2013. Given such context, shadow libraries espouse that their actions are justified as they oppose the greed of corporate powers and the legal framework that enables it.

Besides their economic power, the structure of academic publishing is also propped up by academia itself. As scholars' success is predicated upon being published in top international journals, they are lenient about their work being kept in the walled garden, bequeathing their copyright, and their work commodified (Puehringer et al., 2021). But fortunately, not all scholars. In 2015, a group of scholars published a statement of intent in defense of shadow libraries that were and are still in danger of being sued and shut down (custodians.online)-equating journal publishers with the greedy businessman in Antoine de Saint Exupéry's *Little Prince*. Sci-hub is currently being taken to court in India by Elsevier, Wiley, and the American Chemical Society, much to the dismay of scientists, academics, teachers, and students (Maxwell, 2021).

Students' and researchers' usage of shadow libraries has also resulted in a positive uptick in citation metrics (Correa et al., 2021). These positive uptick results from the scholarly works that shadow libraries provide non-discriminately, especially towards users from the Global South (Bodó et al., 2020). Shadow libraries are constitutive of the flow of access and sharing from comparatively wealthy universities to poorer ones. Simply put, shadow libraries accentuate the rigorous attempts of students and researchers from the Global South to negotiate their terms of access from below (Karaganis, 2018, pp. 2–3). Nevertheless, the issue of access that is the crux of shadow libraries remains paramount for those in the global South.'

Those skeptical about the positive impact of shadow libraries argue that OA is improving and can only improve in the future. They purport shadow libraries as detrimental to what advocates have done for OA. They extrapolate the view that scholarly works should be free without consequences. However, that is precisely the future that Elbakyan and others advocate. A future to be embraced seeks to figure Open Access in the truest sense of the word, like free and open-source software, not just free to download (Allen et al., 2018). Bodó (2016b, p. 7) notes that OA is not a movement to transform the status quo or provide universal access. Instead, it is a polite and friendly but loyal opposition to the academic publishing behemoths. Moreover, Knoche (2020) suggests that OA publishing contorts and reproduces the formation of capitalist social and economic relations in academia.

However, OA should not be dismissed entirely. Elbakyan considers Sci-Hub a tool for open access, and one would not be remiss to view Libgen in a similar light (Elbakyan & Bozkurt, 2021). That is an OA principally for open science where throughout its research, design, process, and distribution are transparent and away from commercialization and profiteers (Irawan et al., 2017). Nevertheless, OA is not a single monolith, of the many kinds of OA shadow libraries might be best constructed with Platinum OA. However, shadow libraries are not publishers. For example, *TripleC: Communication, Capitalism & Critique* is a non-profit OA journal that does not charge for article publication nor copy-editing, layout, publishing, and hosting. Their stated production costs amount to 170 GBP for an 8,000-word article, and they only require APC payment for those that exceed 8,000 words, this fee numbers to 60 GBP per additional 1,000. Compared to OA journals run by commercial publishers that can cost thousands of dollars, tripleC's publication scheme is a big deal.

In addition, students and researchers can only access or publish as much content as their libraries or respective institutions allow. This limitation becomes a problem as journal subscriptions and APC rise or is quite expensive in the first place, and funding is either stagnant, decreasing, or nonexistent. Hence, the students' accessibility in the context of the current political economy of scientific publications will be the focus of this research.

C. RESEARCH METHODS

To get meaningful exploratory insights into the structural reasoning and students' attitudinal position about shadow libraries, we need to review pieces of literature and collect survey responses from students. Our literature review discussed the political and economic context of academic-industry publications. At the same time, the survey was directed to understand the students' attitudinal position toward shadow libraries and journal publishing.

We used a literature review to understand the context of the study. The discussion examined texts such as, but not limited to, journals, books, news, and research papers that have discussed the issue of the publishing industry and shadow libraries. This method helped us contextualize our survey data analysis.

We gathered the necessary data through online survey forms to identify students' attitudes on and use of shadow libraries. This survey was to be filled out online by undergraduate and vocational students of UGM. In addition, we utilized social media platforms to distribute the questionnaires among our peers. We also asked our peers to distribute our survey among their friends.

In order to make our data representative, we defined the minimum sample size for our research. To determine the minimum sample size required for this research (*n*), we used Yamane's formula below. If the number of the UGM student population (*N*) is 41.954, and with a margin of error of 5% (e = 0.05) , we determined the minimum sample size required for this research is 395 UGM students.

$$n = \frac{N}{1 + N(e)^2}$$

The survey consists of questions regarding the issue of shadow libraries usage. We asked our respondents close-ended questions about their sense of scientific journal accessibility and attitude towards shadow libraries. We also asked our respondents about their user preference for university library (UGM Library) and shadow libraries. These questions helped us understand students' perception of shadow libraries and why students use shadow libraries to access paywalled journals. In the last section of the questionnaire, we provided our respondents with space for anecdotes regarding their opinion on shadow libraries and how they have accessed scholarly works outside of shadow libraries and UGM Library.

After gathering the data, we sorted and treated the statistics descriptively to produce meanings from the data and understand the result. Some close-ended questions required our respondents to provide us with multiple answers. The responses are then organized into

specific categories. For example, on the question of what our respondents use shadow libraries for (Table 3), we provide three sets of choices and leave a blank for our respondents to fill. After we got their responses, we categorized them based on their commonality of interest. This data will then be visualized with graphics generated from Stata and tables.

We also analyzed and interpreted the open-ended responses to bridge the literature and the empirical evidence we found. The responses were selected and coded for our analysis. We bridged open-ended response analyses with close-ended ones to better understand the students' attitudes.

D. RESULTS AND DISCUSSION

Survey findings

We have gathered 398 responses. One hundred sixty-nine of our respondents (42.46%) were undergraduate social and political science students, making them the majority, followed by Engineering (9.05%) and Psychology students (5.78%). More about the distribution can be seen in Table 1.

Access limitations among students

We assume that journal articles are inaccessible because publishers enact a paywall scheme. This assumption is assessed by asking our respondents questions shown in Table 2. Respondents then answer on a scale from 1 (very rarely - very accessible) to 5 (very often - very inaccessible) (Likert Scale). We process the data to assess the limitations of academic publications by four questions responses below.

From the first question, we can see that most of our respondents (61.81%) often and very often find paywalled academic publications. These responses can highlight that most students are often unable to access paywalled academic publications freely. This number can also tell us the students' need for university access or shadow libraries.

Most of our respondents agree that journals are inaccessible (39.45%) to very inaccessible (14.07%). However, only a small number of the students think it is accessible (2.51%). From this data, we can assume that students sense that the accessibility of scientific journals/publications is between moderately limited and inaccessible.

Responses show that, on average, students sometimes use UGM Library to access scientific publications. When students use UGM Library, they rarely to sometimes experience failure when trying to access scholarly works. This paucity shows how UGM Library is still somewhat reliable. However, this result should be examined further as undergraduate students do not necessarily have to access the latest scientific publication. Those who must access the latest scientific journals will find it difficult to access the articles they require through UGM proxy as not all the access is updated. For example, when this article is being written, the latest update of UGM Library access to Oxford Journals (academic.oup.com) is 14 December 2021, ScienceDirect (www.sciencedirect.com) is 8 July 2020, and JSTOR (www.jstor.org) is 26 June 2019. Students who need to read Oxford Journals' latest publications released after 11 April 2019 will experience failure when accessing it through the UGM Library. This explanation might clarify why our respondents do not experience access failures often.

The average mean of the four questions' responses above is 3.305905. This finding reveals that students experience somewhat limited access to scientific publishing. We also find that the average means of limitation between shadow libraries users and non-users are different (0.28826). This result demonstrates that the shadow libraries user feels scientific publishing accessibility is more limited than those who do not use shadow libraries.

Mitigation through Shadow Libraries

In this section, we examine how students mitigate the inaccessibility of scientific publishing through shadow libraries. We also give further questions to those who use shadow libraries to look further into the complexity of its use.

We find that 345 out of 398 respondents use shadow libraries (86.18%). In Table 3, we also found that most students use shadow libraries for their coursework (91.25%), some to fulfill their reading interest (59.48%), and their

research (35.28%). Notably, a small number of students use shadow libraries to find their class readings (0.87%). This data means that shadow libraries are helping students to access scientific publications they want and need to read to advance or finish their academic requirements.

The incomplete access of UGM Library might be one of the causes why students use shadow libraries. One of our findings proves this assumption, as most of our respondents (58.31%) could access publications through shadow libraries that they could not access through UGM Library.

Most students prefer to use the "illegal" access from shadow libraries rather than the legal university access (71%). Some might argue that the ease-of-use aspect of library access explains people's preference for access (Handayani, 2021). Unsurprisingly, we find (Table 4) that most of our shadow libraries users (94%) feel that shadow libraries are indeed easy to use.

One of the consequences of students using shadow libraries is being detected by the publication website security system and getting an IP block. However, Table 4 shows that 93% of students who use shadow libraries have not experienced IP blockage by the publication website. Hence, only a minority of this group experienced being denied access by the publisher.

Analysis

Science-dependent community

The data above shows how much university students experience limitations (as shown in Table 2 and Figure 1) when accessing academic publications. Other than students' reasons behind their use of shadow libraries, Table 2 can tell us how much the students depend on the academic books and articles provided by the journal publishing. As students are pressured to follow the relevant and factual scientific discussions in their academic field, the demand for the latest academic publishing should sustain. This condition might be a similar pressure that the researchers and professors have that is '*publish or perish*' — for students, it is '*read or yield.*'

This academic pressure to pass their studies and the shortcoming of campus funding for literature subscriptions can be the leading cause of students' use of shadow libraries. Students reserve to shadow libraries to access the otherwise inaccessible scientific publications through their university library. Scientific publishing is a resource they need to survive in the academic world.

> *"It is not okay, but it is easier, and a lot of the time, we do not have the resources to buy the literature that we need to finish mandatory assignments." — R, Faculty of Psychology*

Students' need to access academic publications shows students as part of a "science-dependent community." We mean "science" as a codified, institutionalized, systematized form of knowledge resource which is produced, distributed, and governed by authoritative knowledge institutions. This institution is what Ostrom and Hess (2007) refer to as "*formal and informal rules that are understood by a community."* In the form of books and scientific articles, science is managed and governed by authoritative knowledge institutions. These institutions can be universities, research institutions, publishing industries, and even legal regulations. Hence, students rely heavily on such institutions as these institutions provide access to fulfill their varying needs (Table 3). However, as big publishers gain control over the publishing regime (Larivière et al., 2015, p. 15), students depend on publishing industries to access science.

Furthermore, given the data that shows undergraduate students constantly face paywalled articles, with 61.81% saying often and very often, one can infer the paucity of OA articles available. Because Indonesian journals are already open access from the outset (Irawan et al. 2020), it can be surmised that most of the enclosed articles are those in top international journals. These articles are part of 80% of journal articles trapped inside the walled garden (Green, 2018), where researchers are

predisposed to publish their best work. As part of the science-dependent community, if they also want to produce the best work for grades and recognition, undergraduates must also read them.

Ambivalent position toward Shadow Libraries

> *"I do not know much about this topic, but the "illegal" one is, I think, just the fundamental way to survive in a world surrounded by a corrupted illogical system called journal barrier." — S, Faculty of Psychology*

As part of the science-dependent community, students rely on access to scholarly works. This circumstance explained their attempt to access knowledge through shadow libraries out of necessity due to limited access. However, some of our respondents also use Sci-Hub for its convenience. As shown in Table 2 and Table 4, most students agreed that shadow libraries are easy to use and have become their preference for access to scientific resources.

UGM Library's tedious logins, proxy, and selection process compete with shadow libraries' unconditional and convenient service. Kranich (2007) argues that the regulations and rules concerning digital copyright ownership that the university library needs to comply with undermine their ability to provide convenient access. These regulations render it difficult for institutional libraries such as UGM Library to provide faster, more convenient, and less bureaucratic access for the students.

Since UGM Library does not have the most up-to-date published manuscripts, students may use Sci-Hub or Library Genesis as their primary access and secondarily through UGM Library (figure 2). This state of affair shows students' accepting attitude towards shadow libraries, but as our open-ended responses show, students' attitude is ambiguous. They recognize the need to access scientific resources and the convenience of shadow libraries; however, they also have sentiments about its illegality. Some also thought that researchers are paid in royalty when their article is downloaded from the official source (e.g., from the corporate publisher) while the researchers do not get paid when we pirate their article through Sci-Hub, which is false.

> *"Legality is still a problem for sites like Libgen, but the books are mostly academics and not for commercial use. I think the (legality) problem can be 'forgiven' by the jargon of the democratization of science. Books are expensive, folks." — A, Faculty of Social and Political Science*

> *"It is illegal, and we, as UGM students facilitated by the ezproxy service, should be using legal access more often through ezproxy. Nevertheless, not all journals or ebooks have been subscribed by UGM. So we are forced to use shadow libraries. Not only that, but I also think that the process to get journals legally from ezproxy is complicated compared to shadow libraries, such as Sci-Hub. We just have to copy-paste the URL/DOI. Now I am too lazy to use ezproxy.." — Sm, Faculty of Medicine, Public Health and Nursing*

Students also mentioned their safety concerns,

> *"We know that using shadow libraries is not always safe, and also illegal, but that is the only efficient way to get paywalled journals/publications that UGM have not subscribed to." — R, Faculty of Mathematics and Natural Science*

This security concern is legitimate; some students are denied access to journal articles after the publisher's website has detected them for using an illegal website such as Sci-Hub (Table 4). This restriction means the publishing industry has surveilled them without knowing they can be banned from using illegal sites. Other than that, some headlines on the internet also highlight the potential cybersecurity danger of using Sci-Hub. However, we have found no literature evidence of any incident regarding the

digital security breach or data leakage from Sci-Hub.

The ambiguity of attitude among students can be explained through their dependency upon scientific manuscripts, shadow libraries' convenient access to scientific resources, and the uncertain legal and security concern of shadow libraries. However, despite this ambivalent attitude, some students recognize the growing inaccessibility of knowledge and support using shadow libraries.

Countering knowledge enclosure

Shadow libraries are part of the movement to counter the enclosure of knowledge. Open access initiatives are still costly, especially for researchers from the Global South. Moreover, commercial publishing entities are adaptive to open access demands and coopted open access models to accumulate profit. Shadow libraries are the rebels with a cause.

Shadow libraries' cause is ever prescient even with the apparent digitation of scholarly knowledge and science writ large. The former scarcity and difficulty of transporting printed works have been mitigated, and manuscripts can be delivered to and from publishers through digital documents. Making the actual production costs close to zero. However, "looks are deceiving," writes Nancy Kranich (2007, p. 86), "while it appears that we have that we have more, we actually have less and less."

While much information is available at our fingertips with the internet's help, science is just out of reach. Copyright laws and the implementation of Digital Rights Management for published articles have created a walled garden filled with wisdom not yet read. However, the world did not stand still. Kranich (2007, pp. 94—103) identifies movements of open access, digital repositories, digital libraries, and others as forms of countering the enclosure of knowledge. Nevertheless, as described by Kranich, none has had the sheer breadth of impact and reach as shadow libraries.

Bodó (2016) suggests that shadow libraries are the possible future of libraries in an era of post-scarcity. Moreover, students play a large part in their scope. Indonesia's rapidly growing student population, relatively low GDP per capita, and underdeveloped electronic text markets, all factor into shadow libraries' plentiful usage. Moreover, one can also assume that this movement is not only localized in the context of UGM. Their participation is at once global or specifically located in the Global South (Karaganis, 2018). Although shadow libraries give access indiscriminately to all of their users, it is nevertheless still most useful for scholars and students in the Global South. This deed is the case since those scholars, students, and schools are less endowed than their counterparts in the North. Other than that, because 'publish or perish' and the prestige economics entails the need to publish in top international (paywalled) journals for career progression, publishing in local journals is often an afterthought. In the assemblage of shadow libraries, they are not mere users but also contributors to knowledge circulated beyond and against political-economic power structures.

The same structures force students to use shadow libraries in the first place. Our survey finds that paywalls often limit students accessing academic publications (Table 2). Even with the high usage rate for UGM's formal access, students still think that the access is limited. Over half of the students surveyed found that UGM Library's access is insufficient to access the literature they need (Table 4). The students' arduous process urges them to be part of the movement to counter the enclosure of scholarly commons.

Although many of the students surveyed are still ambivalent regarding the ethics of use, plenty of them prefer to use shadow libraries over university access (Figure 2). Furthermore, no small number of them actively use shadow libraries as a form of protest, protesting the commodification of public goods and the enclosure of knowledge commons. Their attitude and action signify Kranich's (2007, p. 93) ideal of an open and free creation and exchange of ideas.

> *"I disagree with the monopoly of knowledge by publishers. I do not feel guilty when using Sci-hub because the profits of journal publishers are not given to researchers in the first place." — M, Faculty of Mathematics and Natural Science*

Outside of using shadow libraries, some respondents have also shown that they are willing and able to share and request their personal repository. Once an article has been freed from the enclosure and entered the commons, they are shared based on fair use and co-production of future knowledge. They do this by sharing either the files or their shadow library links.

> *"My Ethics class professor even said to me, what is shared (in shadow libraries) is knowledge, so, we should not be needing any copyright, imagine living in a world like that!" — R, Faculty of Philosophy*

Even lecturers recommend using shadow libraries if students cannot access the needed journals with institutional credentials. However, it is a slippery slope for those in academia to promote shadow libraries as this action may be viewed negatively by enterprises that may publish their work in the future. Nevertheless, this does not push students and professional academics away from shadow libraries. Perhaps experiencing the use of shadow libraries might bring us closer to the structural and cultural transformation of academic publishing. The prestige economy and 'publish or perish' is predicated upon the longstanding notion of the commodified public good (Puehringer et al., 2021). This notion might be changed if future scholars and experts in the field are socialized to the positive experience of easy access to knowledge.

E. CONCLUSION

Students' massive use of shadow libraries can be seen due to the current publishing structure. It forces students to face an overwhelmingly expensive paywall to access the necessary scientific resources. In other words, as our research shows, UGM students' limited access to scientific publications through formal means makes them resort to the use of shadow libraries. This unrelenting activity shows students as a community that depends on science for their academic survival and success, specifically on the access to the available academic literature. Science dependency, the publishing industry's paywall obstacle, and free and convenient access from shadow libraries make many students choose shadow libraries as their main door to acquire academic literature. Although its widespread use among students, they have an ambivalent attitude towards shadow libraries. They find that shadow libraries are helpful to overcome their limitation of access, albeit worrying about the inherent illegality of access and security. However, several students actively oppose the current mainstream academic publishing regime.

ACKNOWLEDGMENTS

We would like to express our gratitude to Alexandra Elbakyan and all of the proponents of shadow libraries for their effort to tear down the (pay)wall. This research is also possible because of our respondents; our advisor, Dr. Maharani Hapsari; and our friend, who helped us find the total number of UGM student population, Syibly Adam Firmanda.

REFERENCES

Aisyah, S. (2020). *Analisis penerapan hak cipta pada platform web Sci-Hub* [Undergraduate Thesis, Universitas Sumatera Utara]. Repositori Institusi Universitas Sumatera Utara http://repositori.usu.ac.id/bitstream/handle/123456789/28531/160709008.pdf?sequence=1&isAllowed=y

Allen, L., Bodó, B., & Kelty, C. (2018). *Guerrilla open access*. Post Office Press, Rope Press and Memory of the World. https://hcommons.org/deposits/item/hc:19825/

Amita, E. (2020). *Pemanfaatan situs black open access (Sci-Hub) di kalangan mahasiswa Universitas Airlangga Surabaya.* [Undergraduate Thesis, Universitas Airlangga]. Repositori Universitas Airlangga http://repository.unair.ac.id/100668/

Anderson, R. (2015). A quiet culture war in research libraries – and what it means for librarians, researchers and publishers. *Insights the UKSG Journal*, *28*(2), 21–27. https://doi.org/10.1629/uksg.230

Banks, M. (2016). What Sci-Hub is and why it matters. *American Libraries*, *47*(6), 46–49. https://www.jstor.org/stable/26380679

Björk, B.-C. (2017). Gold, green, and black open access: gold, green, and black open access. *Learned Publishing*, *30*(2), 173–175. https://doi.org/10.1002/leap.1096

Bodó, B. (2016a). Libraries in the post-scarcity era. In H. Porsdam (Ed.), *Copyrighting Creativity: Creative Values, Cultural Heritage Institutions and Systems of Intellectual Property.* Taylor and Francis.

Bodó, B. (2016b). Pirates in the library – an inquiry into the guerilla open access movement. *Intellectual Property and Resistance. 8th Annual Workshop of the International Society for the History and Theory of Intellectual Property, CREATe, University of Glasgow, UK*. https://doi.org/10.2139/ssrn.2816925

Bodó, B., Antal, D., & Puha, Z. (2020). Can scholarly pirate libraries bridge the knowledge access gap? An empirical study on the structural conditions of book piracy in global and European academia. *PLOS ONE*, *15*(12), e0242509. https://doi.org/10.1371/journal.pone.0242509

Correa, J. C., Laverde-Rojas, H., Tejada, J., & Marmolejo-Ramos, F. (2021). The Sci-Hub effect on papers' citations. *Scientometrics, (127), 99*–126. https://doi.org/10.1007/s11192-020-03806-w

Darmawati, D. (2018). Islamic law and copyright in academic world: the dynamic debates between privatization and distribution of knowledge. *Mazahib*, *17*(1), 23–45. https://doi.org/10.21093/mj.v17i1.948

Elbakyan, A. (2016, March 11). Sci-Hub is a goal, changing the system is a method. *Engineuring*. https://engineuring.wordpress.com/2016/03/11/sci-hub-is-a-goal-changing-the-system-is-a-method/

Elbakyan, A. (2017, July 2). Some facts on Sci-Hub that Wikipedia gets wrong. *Engineuring*. https://engineuring.wordpress.com/2017/07/02/some-facts-on-sci-hub-that-wikipedia-gets-wrong/

Elbakyan, A., & Bozkurt, A. (2021). A critical conversation with Alexandra Elbakyan: is she the pirate queen, Robin Hood, a scholarly activist, or a butterfly flapping its wings? *Asian Journal of Distance Education*, *16*(1), 111–118. https://doi.org/10.5281/zenodo.4749225

Green, T. (2017). We've failed: pirate black open access is trumping green and gold and we must change our approach: how can publishers see off the pirates? *Learned Publishing*, *30*(4), 325–329. https://doi.org/10.1002/leap.1116

Green, T. (2018). We're still failing to deliver open access and solve the serials crisis: to succeed we need a digital transformation of scholarly communication using internet-era principles. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3333907

Handayani, F. (2021). Faktor penyebab rendahnya pemanfaatan jurnal elektronik di Perpustakaan Universitas Gadjah Mada oleh mahasiswa Sekolah Pascasarjana. *Berkala Ilmu Perpustakaan dan Informasi*, *17*(1), 1–11. https://doi.org/10.22146/bip.v17i1.1209

Irawan, D. E., Rachmi, C. N., Irawan, H., Abraham, J., Kusno, K., Multazam, M. T., Rosada, K. K., Nugroho, S. H., Kusumah, G., Holidin, D., & Aziz, N. A. (2017). Penerapan open science di Indonesia agar riset lebih terbuka, mudah diakses, dan meningkatkan dampak saintifik. *Berkala Ilmu Perpustakaan dan Informasi*, *13*(1), 25–36. https://doi.org/10.22146/bip.17054

Karaganis, J. (2018). Introduction: access from above, access from below. In J. Karaganis (Ed.), *Shadow libraries: Access to knowledge in global higher education* (pp. 1–24). The MIT Press; International Development Research Centre.

Knoche, M. (2020). Science communication and open access: The critique of the political economy of capitalist academic publishers as ideology critique. *TripleC: Communication, Capitalism & Critique. Open Access Journal for a Global Sustainable Information Society*, 508–534. https://doi.org/10.31269/triplec.v18i2.1183

Kranich, N. (2007). Countering enclosure: reclaiming the knowledge commons. In C. Hess & E. Ostrom (Eds.), *Understanding knowledge as a commons: From theory to practice* (pp. 85–122). The MIT Press.

Larivière, V., Haustein, S., & Mongeon, P. (2015). The oligopoly of academic publishers in the digital. *PLOS ONE*, *10*(6), e0127502. https://doi.org/10.1371/journal.pone.0127502

Liang, L. (2012). Shadow libraries. *E-Flux*, *37*. https://www.e-flux.com/journal/37/61228/shadow-libraries/

Maxwell, A. (2021, January 5). Sci-Hub: scientists, academics, teachers & students protest blocking lawsuit. *TorrentFreak*. https://torrentfreak.com/sci-hub-scientists-academics-teachers-and-students-protest-blocking-lawsuit-050121/

Ostrom, E., & Hess, C. (2007). A Framework for Analyzing the Knowledge Commons. In C. Hess & E. Ostrom (Eds.), *Understanding knowledge as a commons: From theory to practice* (pp. 41–81). MIT Press.

Piron, F. (2018). Postcolonial Open Access. In U. Herb & J. Schöpfel (Eds.), *Open divide: Critical studies on open access*. Library Juice Press. https://corpus.ulaval.ca/jspui/bitstream/20.500.11794/16178/1/Postcolonial%20Open%20Access%20-%20Piron.pdf

Poynder, R. (2019, March 6). Plan S and the Global South – what do countries in the global South stand to gain from signing up to Europe's open access strategy? *London School of Economics and Political Science Impact Blog*. https://blogs.lse.ac.uk/impactofsocialsciences/2019/03/06/plan-s-and-the-global-south-what-do-countries-in-the-global-south-stand-to-gain-from-signing-up-to-europes-open-access-strategy/

Puehringer, S., Rath, J., & Griesebner, T. (2021). The political economy of academic publishing: On the commodification of a public good. *PLOS ONE*, *16*(6), e0253226. https://doi.org/10.1371/journal.pone.0253226

FIGURE LIST

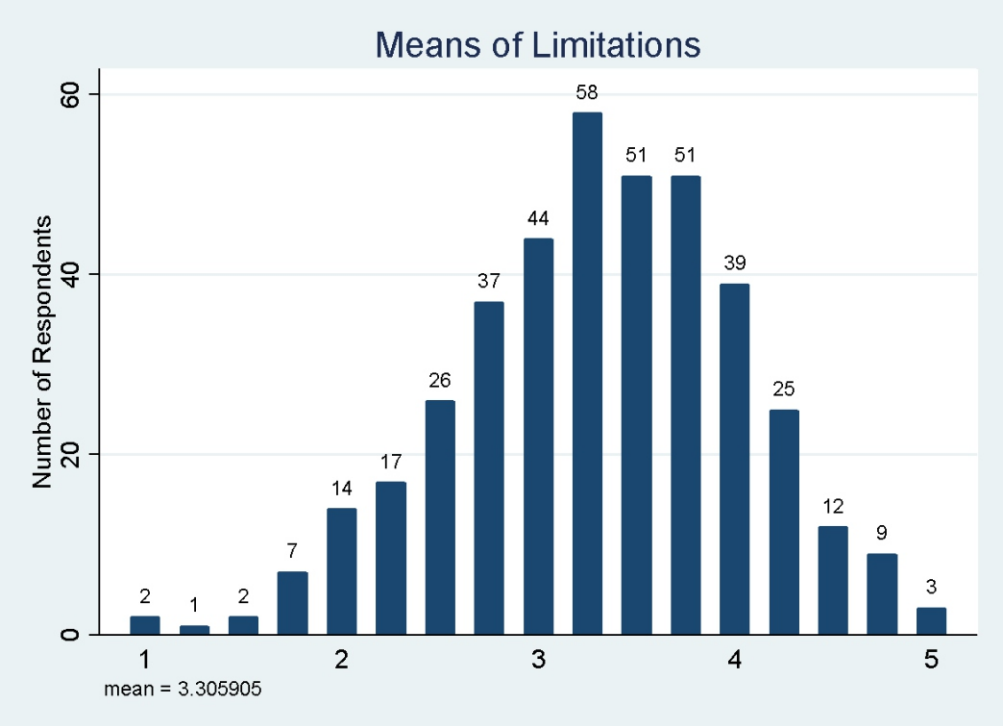

Figure 1. Means of limitations

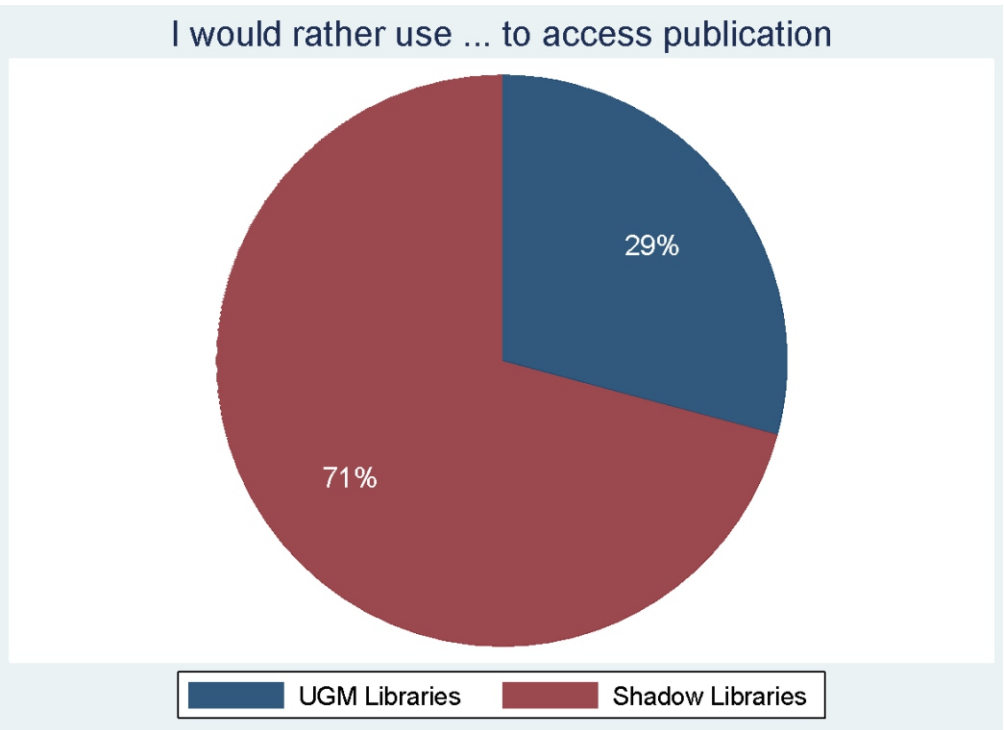

Figure 2. Preference of access

TABLE LIST

Table 1. Total Survey Respondents

Faculty	Number of Respondents	Percent (%)
Social and Political Science	169	42.46
Engineering	36	9.05
Psychology	23	5.78
Law	20	5.03
Mathematics and Natural Science	20	5.03
Cultural Science	19	4.77
Economics and Business	17	4.27
Medicine, Public Health and Nursing	14	3.52
Agricultural Technology	12	3.02
Philosophy	12	3.02
Vocational School	11	2.76
Biology	10	2.51
Geography	8	2.01
Agriculture	7	1.76
Veterinary Medicine	7	1.76
Dentistry	4	1.01
Pharmacy	4	1.01
Forestry	3	0.75
Animal Science	2	0.5
Total	398	100

Source: researchers' survey data, 2021

Table 2. Respondents' distributions for each question were measured using the Likert Scale (1-5)

Topics	Distributions (N=398) Very Rarely/Very Accessible [1] ~ [5] Very Often/Very Inaccessible					Mean	95% Conf. Interval
	1	2	3	4	5		
How often do you find paywalled academic publications?	44	43	65	136	110	3.565327	3.44 ~ 3.69
How inaccessible are scientific journals/publications?	10	53	122	157	56	3.492462	3.40 ~ 3.59
How often do you use UGM Library (UGM proxy) to access a publication/journal?	57	69	77	84	111	3.309045	3.17 ~ 3.45
How often do you experience failure when accessing academic publications through UGM Library?	53	104	124	81	36	2.856784	2.74 ~ 2.97

Source: researchers' survey data, 2021

Table 3. For what purpose do you use shadow libraries?

Answers	Frequency	Percent (%)
Coursework	313	91.25
Reading interest	204	59.48
Research work	121	35.28
Thesis/final assignment	5	1.46
Organizational purpose	3	0.87
Find class readings	3	0.87

Source: researchers' survey data, 2021

Table 4. Summary of exploratory questions for shadow libraries users

Questions	Response Distributions (N=343) Very Rarely [1] ~ [5] Very Often							
	1	2	3	4	5	Mean	Yes	No
How often do you use shadow libraries?	6	20	59	105	153	4.104956	-	-
Have you ever found any journal publication which is inaccessible by UGM libraries but accessible through shadow libraries	-	-	-	-	-	-	200 (41.69%)	143 (58.31%)
Are shadow libraries easy to use?	-	-	-	-	-	-	321 (93.59%)	22 (6.41%)
Have you ever been blocked from any publication site after using shadow libraries?	-	-	-	-	-	-	25 (7.29%)	318 (92.71%)

Source: researchers' survey data, 2021