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The Impact of Open Access Publishing on Information Security in Modern Scholarly Libraries

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Abstract: **Open access publishing refer to freely available Internet copies of peer-reviewed journal articles, conference papers, technical reports, theses, and working papers that satisfy the criteria of "Open Access". Open access refers to the availability of a published work without any cost, allowing scholars in economically challenged regions to access the latest research. The study aimed to examine the relationship between open-access publishing and information security challenges in modern scholarly libraries, and to explore how open-access publishing influences libraries' digital infrastructure and cyber security practices. Primary data is the only source utilized during this investigation. The study's theoretical framework and literature review were developed using secondary data gathered from books, journals, and magazines. Primary data was gathered via using a structured questionnaire. The research employed random sampling to identify respondents, acquired primary data via a questionnaire, and obtained secondary data from journals, publications, and published papers. The study chooses academic researchers and library administrators as the targeted population. The sample comprised 250 secondary pupils from Delhi NCR libraries. The findings propose that open-access publishing introduces significant information security challenges related to increasing the vulnerability to data breaches and unauthorised access in scholarly libraries. Furthermore, the adoption of an open-access platform demands increased cyber security measures and improvements in digital infrastructure needed to protect sensitive academic information.**

Keywords: **Open Access Publishing, Information Security, Scholarly Libraries, Cyber security, and Digital Infrastructure.**

1. INTRODUCTION

Advancements in "Information Communication Technologies (ICTs)" throughout the last thirty years have significantly transformed social communication patterns and information behavior (Darwish & Lakhtaria, 2011). The advent of the digital era has not only transformed the methods of academic communication but has also led to a substantial proliferation of scholarly literature, including books, theses and dissertations journals, reports, scholarly articles, working papers, and so on. The abundance of material presently accessible on the internet in electronic format has exacerbated the challenges linked to access and protection (Das, 2008). The exorbitant subscription fees and stringent licensing requirements of serial publication have bolstered the challenges faced by libraries in delivering optimal and comprehensive collections to their customers within limited financial resources. The use of Open Access (OA) has become an essential need for libraries to not only survive but also prosper in this challenging situation.

Open-access publishing is a medium through which most of the research is made available for use by individuals around the world hence breaking the barrier of scholarly communication. However, its adoption has been rapid and has brought a lot of information security risks for the modern scholarly libraries. With the growth of various open access facilities that are hosted and served by libraries, they are exposed to certain risks including but not limited to data thefts, unauthorized

access and other instances of piracy and wrongful appropriation of other's work. This has raised the need for more security measures as well as strong architecture in the digital platform to protect the Academic data while at the same time embracing the principle of open access. OA is the elimination of key obstacles to accessing, sharing, and reusing the resultant work of academic studies (Tennant, et al., 2016). The justification is that the investigation process is expedited by guaranteeing prompt and equitable availability of research results, therefore enabling all communities to expand upon them and engage in academic discussions.

Nevertheless, there exist two methods to get open access: gold open access as well as green open access (Tzanova, 2020). Green Open Access (OA) is the act of writers or publishers preserving copies of articles in libraries that are available to the general public. Conversely, the gold model of open access (OA) adheres to a traditional journal publishing system, whereby the author or sponsor bears the responsibility of paying an article-processing charge (APC) for publishing the final edition of a peer-reviewed journal article, rather than requiring those with subscriptions to pay for accessing it. Consequently, anyone who wishes to read the article incurs no cost (Ghane, et al., 2020).

The seismic shift in scholarly communication has a profound impact on university libraries, particularly in the realm of scholarly communication provision (Klain-Gabbay & Shoham, 2016). Library services encompass several functions in delivering scholarly information to users, such as developing collections, offering guidance on information access, overseeing subscription budgets, managing institutional collections, and reporting on resource and service usage (Oberländer & Reimer, 2019). The proliferation and unrestricted availability of open access materials have greatly transformed the approaches libraries formerly used to manage conventional information resources.

In recent years, there has been a significant proliferation of scientific literature publications (Koch, 2021). Given the increasing quantity of academic publications and their rising costs, libraries have significant challenges in effectively subscribing to an optimal number of publications for their users. In order to address this scenario, libraries are implementing different approaches such as: discontinuing subscriptions to journals, reallocating book budgets to journal subscriptions, and or engaging in various types of license solutions (Mukherjee, 2014). Amidst this dire circumstance, OA has emerged as a refuge for libraries, effectively addressing both cost obstacles and restrictions on accessing scientific material. Through the implementation of OA advocacy, libraries may get financial relief from expensive journals and enhance their library worth by offering free access to academic material (Swan, 2012).

The Gold OA in India exhibited substantial increase, but the development of Green OA was comparatively sluggish (Piryani, et al., 2021). The poor progress of Green Open Access (OA) may be attributed to insufficient government support and non-compliance from educational systems, library organizations, libraries, and financial authorities (Zhang & Watson, 2017). Based on its 2011 census, India ranks as the second most populous nation globally, together accounting for 17% of the global population. Nevertheless, a significant portion of the academic research conducted by the aforementioned entity is essentially absent from the international platform, mostly due to its publication in local journals. Additionally, the quality of the research output typically falls below the worldwide benchmark (Sahu & Arya, 2013). Hence, the scientific achievements of India are often obscured and unrecognized.

Yet, India has a very sophisticated publishing industry, with more than 15,000 authorized journals and an annual production of 70,000 publications in all 24 recognized languages of the country, of which 18 are extensively spoken by countless people. While India ranks 12th globally in terms of the quantity of journals, it ranks 5th in terms of open access (OA), significantly surpassing nations with greater levels of journal output including the Netherlands, Germany, China, and Australia (Misra & Agarwal, 2019). Fernandez explored the early origins and progress of OA in India, highlighting the contributions of the "Indian Academy of Sciences, the M.S. Swaminathan Research Foundation (MSSRF), the National Chemical Laboratory, and the Indian Institute of Astrophysics" in advancing OA in the country. Moreover, the "Indian Council of Agricultural Research (ICAR)" has formulated an OA policy to ensure unambiguous availability of their research and technical papers, books, catalogs, conference proceedings, case studies, textbooks, and other digital resources.

The title of the study on 'The Impact of Open Access Publishing on Information Security in Modern Scholarly Libraries' is significant because it seeks to fill a gap between the rising OA initiative and security risks implicated to libraries. While OA publishing undermines the restrictions of hurdles involved in accessing scholarly assets, it on the same note brings knowledge to the.public domain. But these also result in risks such as loss of sensitive user and research data, cases of break ins, unauthorized access, and theft of intellectual property. This research is critical in finding ways in which the library can provide for OA while at the same time addressing the issue of security to ensure authenticity of the information. It also

gives an understanding of how to protect resources that are online while encouraging the scholarly model of free sharing of information. Finally, it emphasizes the need to establish awareness and adopt more efficient cyber security measures so that transparency as well as security can be achieved in higher learning institutions today.

The paper is divided into seven sections. Section 1 comprises the introduction of the study. A literature review on the impact of open access publishing on information security in modern scholarly libraries is presented in section 2. Section 3, 4 & 5 delineates the research methodology, objectives and hypothesis of the study. The results are presented in Section 6. It has been succeeded by findings and discussion of the results in section 7. Section 8 contains the conclusion of the study. References have finally been included.

2. REVIEW OF LITERATURE

Open access refers to the act of providing unrestricted access to a document, allowing anybody to read it and, pursuant to the particular licensing agreement, distribute and use it. Contemporary academic publishers currently provide open access pathways for the publication of several types of journal articles, including protocols, commentaries, reviews, and outcome papers **(Logullo, et al., 2024)**. Various forms of open access exist, each characterized by its own set of advantages and disadvantages. Articles under gold open access are subject to a license that grants them unrestricted online availability upon publication. An alternative known as green open access enables writers to circumvent the need for publishing costs **(Brainard, 2021)**.

The publishing of scientific papers in journals, in which all OA has gained recognition for its ability to provide researchers with access to fresh information, therefore transforming knowledge into a valuable public resource. What seems to be having gone wrong is a profound and ingrained exclusion and prejudice that OA perpetuates by deliberately ignoring the geographical location of writers **(Sengupta, 2021)**. In their study, **Khan & Shahzad (2024)** sought to ascertain the essential characteristics of the "digital library management system (DLMS)" used in the development and administration of digital libraries. Their objective was to assess the satisfaction level of library professionals in utilizing these systems and to identify the related issues they face.

Over the last several years, the academic publishing industry has seen fast changes. Increasingly, the significance of multidisciplinary study is acknowledged for its crucial function in tackling intricate social and scientific issues **(Carvajal & Sanchez, 2023)**. Concurrently, open-access publication is seen as a powerful method for democratizing education and enables the broad distribution of information. Speakers representing the global north have mostly shaped awareness and attitudes around OA **(Nobes & Harris, 2023)**. The knowledge and application of self-archiving by means of repositories showed variability, with a mere 20% of individuals having submitted their research to an institutional repository. The study showed challenges faced by the researchers in obtaining first access to research literature.

Over the past decade, OA transmission has been rapidly increasing due to the adoption of various OA regulations by funders and organizations, along with the creation of new platforms that enable the printing and distribution of OA materials at minimal or no expense **(Simard, et al., 2022)**. Nevertheless, a negative outcome of the significant expansion of academic OA publication, which is financed by article processing fees, is the emergence of "predatory" publishers and journals. In general, predatory OA publishers are recognized for their assertive approach in seeking authorship, reviews, and editorial board services from scholars, hence generating adverse PR for genuine OA journals **(da Silva & Kimotho, 2022)**. The OA publication paradigm has the potential to enhance the outreach of researchers by virtue of its accessibility and public awareness. Thus, the OA publishing approach might be advantageous for the inclusion of female scholars in presentations. Nevertheless, there is little knowledge about the impact of gender on open access behaviors **(Nguyen, et al., 2022)**.

Some progress as well as challenges detected in the area of OA publishing was also mentioned in the course of the review of literature. Although OA increases the access to literature by scholars to a wider market, it raises questions that are yet to be addressed fully. Most of the previous studies investigate the positive aspects of OA which touch on the area of visibility and diffusion of knowledge which is well advanced in the developed countries or the high income countries. Nevertheless, the current study does not fully capture these struggles of writers and academics of colour especially in the Global South, wherein they struggle to pay high APCs and post in OA platforms. In addition, OA, which promotes itself as a way of addressing the problem of the limited dissemination of information, lacks scrutiny on how some of its principles re-produce geography- and class-based exclusions. Another changing factor is the phenomenon of predatory publishing which does not

have any positive outcome to the OA since they exploit the researchers. Furthermore, the further integration of OA with information security and digital technologies in scholarly libraries is still a prior study area. These gaps point to the necessity of subsequent research on the representation and potentiality of OA and its consequences for the distribution of scholarly amenities and fair practice in the world.

The study by **Zhang et al. (2022)** examines the worldwide patterns of reimbursement for research activities by integrating published trends from 2015 to 2020 using an APC pricing list. APC have significantly risen in six countries with varying OA policies: the United States, China, the United Kingdom, France, Netherlands, and Norway. The objective of the OA service is to enhance understanding of scientific journal publications in the "open journal system (OJS)" in order to facilitate the indexing of Google Scholar. The service deployment process consists of three distinct phases: planning, execution, and assessment. The activity data suggest that participants exhibit high levels of motivation and enthusiasm towards their involvement in the program **(Triono, et al., 2023)**.

The objective of **Huang, et al. (2024)** was to address the existing information gap about the eligibility criteria for accessing open access findings from studies and the geographical distribution of users. The impact of open access via discipline or institutional repositories was more pronounced compared to open access via publishing platforms. In their study, **Kumar et al. (2024)** investigated the complex relationship between instructional technologies and libraries, specifically examining how they may work together to improve online learning environments. Furthermore, their function goes beyond the limitations of the traditional library, establishing them as crucial participants in influencing the experience of learning online by carefully selecting and arranging digital material.

3. RESEARCH OBJECTIVES

a. To examine the relationship between open-access publishing and information security challenges in modern scholarly libraries.

b. To explore how open-access publishing influences libraries' digital infrastructure and Cyber security practices.

4. HYPOTHESIS

H 1a: There is a significant positive relationship between open-access publishing and information security challenges in modern scholarly libraries.

H 0a: There is non- significant positive relationship between open-access publishing and information security challenges in modern scholarly libraries.

H 1b: Open-access publishing has a significant impact on the upgrading and restructuring of digital infrastructure in scholarly libraries.

H 0b: Open-access publishing has no significant impact on the upgrading and restructuring of digital infrastructure in scholarly libraries.

5. METHODOLOGY

The research was carried out by employing a methodology that included the selection of respondents through the utilization of random sampling, the distribution of a questionnaire for the purpose of collecting primary data, and the collection of secondary data from existing journals, publications, and papers that had been published in the past. It has been decided that the demographic of interest for the purpose of this inquiry consists of students who are presently enrolled in higher education as well as library administrators. A sample of 250 secondary school students was taken from libraries situated in the Delhi National Capital Region for the purpose of their participation in the research. Correlation and regression will be used as the statistical technique for conducting the study. Both Microsoft Excel and SPSS were used all throughout the process of doing the statistical analysis for the study.

6. RESULTS

This section provides a concise summary of the data's findings and interpretation. To categorize the outcomes, the demographic characteristics, objectives, and hypotheses have been employed. A table that illustrates the findings and a clarification of those findings have been incorporated into the objectives as well as hypotheses.

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Table 1: Demographic Profile of the Respondents

Sr. No.	Demographic Variables	Characteristics	N	%
1	**Gender**	Male	131	52.40%
		Female	119	47.60%
2	**Age**	18-24 years	46	18.40%
		25-34 years	47	18.80%
		35-44 years	56	22.40%
		45-54 years	54	21.60%
		55 and above	47	18.80%
3	**Education Qualification**	Primary	56	22.40%
		Secondary School	67	26.80%
		Undergraduate	40	16.00%
		Postgraduate	41	16.40%
		PhD	46	18.40%
4	**Field of Study**	Science and Technology	61	24.40%
		Humanities and Social Sciences	43	17.20%
		Business and Economics	50	20.00%
		Medicine and Health Sciences	59	23.60%
		Others	37	14.80%
5	**Library Experience**	Less than 1 year	48	19.20%
		1-3 years	42	16.80%
		4-6 years	52	20.80%
		7-10 years	47	18.80%
		More than 10 years	61	24.40%
6	**Access to Open-Access Resources**	Regularly access open-access resources	58	23.20%
		Occasionally access open-access resources	60	24.00%
		Rarely access open-access resources	62	24.80%
		Never access open-access resources	70	28.00%
7	**Perceived Knowledge of Information Security**	Very knowledgeable	55	22.00%
		Somewhat knowledgeable	39	15.60%
		Neutral	51	20.40%
		Limited knowledge	52	20.80%
		No knowledge	53	21.20%

Table 1 displays the demographic characteristics of the respondents, which include their "Gender, Age, Education Qualification, Field of Study, Library Experience, Access to Open-Access Resources, and Perceived Knowledge of Information Security." These characteristics are provided in full in the table. The results of the survey are shown in Table 1, which shows that 52.40% of the respondents were male and 47.60% were female. The ages of the respondents are as summarized below: A total of 18.40% of the population is comprised of individuals who are between the ages of 18 and 24, 18.80% are between the ages of 25 and 34, 22.40% are between the ages of 35 and 44, 21.60% are between the ages of 45 and 54and the remaining 18.80%are of age 55 and above. The educational qualifications of respondents show that 22.40% have completed only primary education, 26.80% have finished secondary school, while 16.00% are undergraduates, 16.40% hold postgraduate degrees, and 18.40% have achieved a PhD. In terms of field of study, 24.40% are from science and technology, 17.20% are from humanities and social sciences, 20.00% are from business and economics, 23.60% are from medicine and health sciences, and 14.80% are from other fields. Library experience varies among the respondents, with 19.20% having less than one year of experience, 16.80% with 1-3 years, 20.80% with 4-6 years, 18.80% with 7-10 years, and 24.40% having more than 10 years of experience. Access to open-access resources is reported as follows: 23.20% regularly access open-access resources, 24.00% access them occasionally, 24.80% rarely access them, and 28.00% never access open-access resources. Regarding perceived knowledge of information security, 22.00% consider themselves very

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knowledgeable, 15.60% somewhat knowledgeable, 20.40% neutral, 20.80% have limited knowledge, and 21.20% report no knowledge of information security at all. These findings suggest a wide variation in educational backgrounds, library experience, and awareness of open-access resources and information security.

Objective 1: To examine the relationship between open-access publishing and information security challenges in modern scholarly libraries.

Table 2: Correlation Analysis

Hypothesis	Factor			Correlation		Hypothesis Result
		Mean	SD	Pearson Correlation (*r*)	Sig value	
H1	Open-access publishing	14.8880	3.19397	.240**	0.000	Supported
	Information security challenges in modern scholarly libraries	13.3160	3.76948			
**. Correlation is significant at the 0.01 level (2-tailed).						

Open access publishing as well as Information security challenges in modern scholarly libraries are associated with one another, as seen in table 2, which can be found above. A mean of 14.8880 and a standard deviation of 3.19397are found for the variable known as Open access publishing. A mean of 13.3160 and a standard deviation of 3.76948 are found for the category of Information security challenges in modern scholarly libraries. The correlation between Open access publishing as well as Information security challenges in modern scholarly libraries was found to be positive and statistically significant, as shown by the Pearson correlation coefficient ($r = .240$, $p < .05$). The value of 0.240 for the correlation coefficient between Open access publishing as well as Information security challenges in modern scholarly libraries indicates that there is a positive association between the two. Because of this, Hypothesis 1 was validated.

Objective 2: To explore how open-access publishing influences libraries' digital infrastructure and cyber security practices.

Table 3: Regression Analysis

Hypothesis	Regression Weights	Beta Coefficient	R2	F	t-value	p-value	Hypothesis Result
H2	Open-access publishing > libraries' digital infrastructure and cyber security practices	.354	0.125	35.540	5.962	0.000	Supported

A substantial relationship between the variables that were independent Open-access publishing and the dependent variable viable libraries' digital infrastructure and cyber security practices was found in the regression analysis shown in Table 3, which can be seen above. Utilizing regression, H2 is examined. A dependent relationship exists between the numerical values of the variables that are predicted and the beta coefficient. In this case, the value of the beta coefficient is .354. The coefficient of determination (R2) indicates that open-access publishing can only account for 0.125 percent of the variation in libraries' digital infrastructure and cyber security practices. In order to demonstrate that the total regression framework is statistically significant, the p-value must be lower than the significance threshold, which is often set at 0.05. When the p-value is lower than the significance threshold, which is often set at 0.05, it indicates that the total regression model might be considered statistically significant. It may be concluded that the model is of statistical significance in this instance, since its p-value is 0.000.

7. FINDINGS AND DISCUSSION

Based on the study, the following are the main findings: Open-Access Publishing is positively and significantly correlated with Information Security Challenges in contemporary scholarly libraries where the correlation coefficient value is equal to 0. 32 ($p < 0.05$, $t = .240$). This means that the more open-access publishing grows, there are more issues of information security in libraries which confirms Hypothesis 1 above. Moreover, Objective 2 results of regression analysis also reveal a direct impact of open-access publishing on the development of libraries' digital technology and cyber security measures (beta = 0. 354. Even though they explained variance is small, 12. 5%, the model is statistically significant, hence supporting Hypothesis No. 2.

In simple words, the findings propose that open-access publishing introduces significant information security challenges related to increasing the vulnerability to data breaches and unauthorised access in scholarly libraries. Furthermore, the adoption of an open-access platform demands increased cyber security measures and improvements in digital infrastructure needed to protect sensitive academic information.

Pinfield, (2008) went further in explaining how OA enhances information delivery and transforms the roles of libraries by having to adopt new wide information management responsibilities. Likewise our study also found out that open-access publishing comes with other issues such as cyber security and digital infrastructure where libraries need to step up their defenses to protect information. Libraries can learn from both studies but the main lesson that they take away is the need to focus on the operational requirements of managing Open Access. The two works recognize the revolutionary role of open-access (OA) publishing on libraries, and how the roles of libraries in the management of OA resources have changed.

Where, as per Tennant, et al., (2016), OA was also linked to wide ranging academic, economic and societal advantages including higher rate of citation and easy accessibility for the researchers from the developing world. When it comes to the information security challenges, our study also revealed that OA changes the libraries' work in the sense that they need to improve digital and IT securities. In both, the authors acknowledged that OA transforms communication of scholarly work and libraries despite, our study highlighted the risks and technology aspects of it. Both studies recognise the role that open-access (OA) publishing has played in the evolution of the scholarly system.

The study conducted by Muthuvennila & Thanuskodi, (2018) focused on the demographic factors, perception and satisfaction level towards open accessibility resources available for distance education students of Alagappa University and among them 64 percent. 1% satisfied. Of these 58% stated that they have been using them for 1 to 3 years. However, our study established higher percentages of OA publishing influencing the information security issues in the scholarly libraries with moderate impact on digital assets. The first one deals with usage and satisfaction and, on the other hand, our study deals with technological risks owing to open-access publishing.

Bailey Jr. (2024) presented an overview of the open access movement more generally and that included the purpose of open access, its approaches, the effects on libraries and the funding issues related to open access movement. It also explored the practicable change working electronic resources librarians. On the other hand, our study was more inclined towards comparing open-access publishing with the risks faced by the library information security to show the vulnerabilities open-access has introduced as well as the need to incorporate more security measures. Whereas Bailey Jr. (2024) was theoretical regarding the open access, our work focused on the practical threats which the concept brings and the necessary infrastructural investments.

8. CONCLUSION

The study finds that although OA increases the access of scholarly materials, it also poses some inherent information security concerns in the libraries. The outcomes of the research revealed the relation between the growing popularity of OA publishing and the scholars' libraries' growing susceptibility to data breaches and unlawful entry. With the increasing adoption of OA as a solution to the problem of limited access to knowledge and ever-shrinking library budgets due to the presumption of significant costs linked to maintaining subscriptions to conventional academic databases, libraries need to provide additional protection against cyber threats for the sake of preserving the integrity of the information they contain. The study highlighted the need for upgrading the digital infrastructure of the library as well as implementing modern measures of cyber security to protect against the risks associated with OA platforms. While the correlation between OA publishing and information security issues is proved statistically significant, measuring the roots of libraries' digital transformation by the use of OA, it can be stated as moderate, which means that though OA helps to make the information more available its usage and sharing involve certain security issues to be managed. The study calls upon library managers and researchers to focus on cyber security threats, stressing the need for the elaboration of efficient security measures that would cater for the opportunities of open access publishing. In conclusion, this study demonstrated the urgent significance of the current scholarly libraries to balance openness of academic environment with the issues of content's credibility and safety in the context of continuously progressing globalization.

However, some limitations are worth noting at this point. The participant number was restricted to 250 secondary school students from Delhi NCR libraries, limiting the results' generalizability to the entire population of library users. The limitation arising from the use of questionnaires was that the respondents may not be fully aware or informed of issues to

do with information security as well as open access publishing. In addition, the study mainly incorporated a quantitative approach that masks other facets that affect libraries practices and its users. Perhaps even more important for future research is the possibility to avoid these limitations and identify more aspects that might be relevant for developing measures to increase information security in scholarly libraries.

The study also presents several valuable and probable future research directions before pointing at its limitations. Further studies should investigate the impact of open access publishing on information security in the longer term across all sorts of libraries which includes public and specialized libraries in order to achieve more insight into the issues. Also, case studies that focus on particular cyber security measures that have been adopted by the libraries due to open access may provide significant knowledge concerning the suitable and efficient approaches in the field. In this respect, the study also identifies the need for conducting a qualitative exploration of the contributions that new technologies provide for information security in open-access environments like artificial intelligence and block chain.

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