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Open Access Publishing and its Academic, Economic, and Societal Impact: An Indian Perspective

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ABSTRACT

This paper examines the status of Open Access (OA) publishing in India and reviews it's academic, economic, and societal impact. The study adopted descriptive and review methods. Data was extracted from directories, online databases, and websites for analysing OA trends at the global level and in India. Studies related to the topic were also reviewed to examine the academic, economic, and societal impact of OA publishing on different stakeholders. The study's findings suggest that the number of OA journals indexed in Scopus, WoS, and DOAJ is consistently growing in India. A significant amount of research literature published in Scopus and WoS indexed journals is OA, making India one of the leading nations in the OA movement. Major funding bodies like CSIR, UGC, DST, DBT, and ICAR in India have formulated OA policies and mandated authors to make research outcomes of publicly funded research OA. The present study's results will aid policymakers in realising the difficulty associated with OA adoption, contributing to policy formulation and implementation nationwide.

Keywords: Open access; Scholarly communication; Open access journals; Open access research literature; Impact of open access

1. INTRODUCTION

The process by which scholarly works are produced, assessed for quality, communicated to the researchers, and archived for use in the future is known as scholarly communication (Association of College & Research Libraries, 2018).[1] It combines formal communication, like research articles, books, papers in conference proceedings, and chapters in edited volumes, with informal channels, including list servs, blogs, and other social media platforms. One of the pillars of academia is scholarly communication, which has recently centered on peer-reviewed journal publications. The focus of scholarly communication has recently shifted from pay-for-use to pay-for-publication (from the subscription-based to the open-access model).

Open Access (OA) is a new scholarly communication model which ensures the free dissemination of scholarly literature via the Internet to readers (Cornell University Library, 2021).[2] OA research literature can be used without financial, legal, or technical restrictions. Within the bounds of the legal agreements, anyone may read, download, copy, distribute, print, search for, or use it in any other manner for educational purposes. OA projects support the right to freely and for the public's benefit distribute information, primarily academic and scientific research, without worrying about copyright limitations or licensing fees. With the Creative Commons licenses, authors can protect some of their rights while allowing for widespread usage of their work (Simmons University Library, 2022).[3]

Different OA scholarly communication models have emerged during the last two decades, and the most common among them are gold, green, and hybrid.[4] An article published in an OA journal and freely available immediately after publication by the journal publisher on its website is an example of gold OA.[5] Self-archiving preprints of submitted, accepted or published manuscripts by authors in the subject-specific repository, institutional repository, or academic, social network platform is called green OA.[6] In a hybrid OA model, the publishing charge is paid by the author, institution, or funder for an article to be published in a journal that needs a subscription, and the article is then made immediately and freely available to everyone.[7]

OA publishing has several benefits, including wider access to research where a large audience can access research without the reader having to pay a fee, thereby increasing the reach of the articles. OA publishing also increases the citation rate and academic impact as OA

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articles have a more significant impact and are cited more often when compared to subscription-only articles. Readers become aware of authors who publish in OA journals, and institutions can host OA repositories to increase visibility. Immediate access to research results inspires other researchers to innovate. This improves interdisciplinary and multidisciplinary research endeavors. Research results via OA mode are available immediately to everyone once published and typically easier to locate.

2. OBJECTIVES OF THE STUDY

As OA has become an important topic of debate among scholarly publishing stakeholders, including publishers, policymakers, governments, research funders, librarians, learned societies, researchers, and academic communities, it is important to analyse the OA publishing trends and investigate its academic, economic and societal impact. There is little agreement on how OA might be useful for different stakeholders. By reviewing the literature and analysing data related to OA publishing, this paper examines the OA publishing trends in India and investigates its academic, economic, and societal impact.

3. REVIEW OF LITERATURE

Much research has been conducted to investigate different aspects of OA in India and abroad. Matheka[8], *et al*. examined the opportunities and challenges of OA publishing in Kenya, where multidisciplinary efforts have been established to improve access. The study discovered that OA initiatives in Kenya could be enhanced and emulated in other African nations to promote African research, increase access for African academics to international research, and provide social and economic benefits to the region. Additionally, the study suggested ways to overcome the obstacles to OA implementation in Africa by taking urgent action from African governments to mandate OA for publicly funded research in their region. The study also suggested further research into how OA might benefit Africa's social and economic development.

Mwambari[9], *et al.* investigated the impact of OA journals on academics in Kenya and found that OA could potentially improve Kenya's knowledge consumption and production. Further, the study found that individual, institutional, and systemic inequities in epistemology cannot be solved by OA, which can decrease the effectiveness of information created in Kenya and other Global South countries, leading to the proliferation of low-quality knowledge on particular OA platforms.

Demeter[10], *et al.* examined the growth of OA publishing in nine scholarly fields and seven regions from 2000 to 2019. The study's findings indicated a significant increase in OA journals in two decades. They also developed an OA publishing trends model on different geographical levels and disciplines. Yousaf[11], *et al.* investigated the OA status of research publications in the Kingdom of Saudi Arabia (KSA) from 1980 to 2020.The study found that Saudi Arabia has the position of 41st in the world in terms of the number of OA publications and also has the most significant proportion of OA publications out of all the nations in the world, especially last decade is the golden decade. The study also advocated the citation advantage of OA literature, with the most in 2015. OA publishing is on the rise, according to Laakso[12], who examined the increase of OA publications produced between 1993 and 2009. According to a study by Pandita[13], India has contributed more to OA publishing throughout time, and the rise of Indian OA journals has outpaced the average growth rate globally. Roy[14], *et al.* also observed a significant increase in OA content in India. A study by Gargouri[15], *et al.* that looked at the green and gold categories of OA publications discovered that both categories are expanding, and their percentages are more significant. Similarly, Hajjem[16], *et al.* investigated how OA publishing spread across disciplines and found that OA publications had a more substantial influence on citation rates than non-OA articles. Piwowar, *et al.* (2018)[4] categorised 67 million OA papers into three groups and investigated the academic impact of OA publications. The study found that research publications with OA received 18 % more citations than those with closed access. Piryani[17], *et al.* analysed Indian research output for examining OA levels and trends using WoS research publication data from 2014 to 2018. According to the study, 24 % of research output in India is OA, compared to 30 % worldwide. There are more publications in gold OA. Additionally, different fields have different percentages of papers with OA. Compared to medical science, physics, and biology, arts and humanities, social science, and information science have a lower OA rate. Nazim[18] also investigated OA adoption by academic and research organizations in India using published data from 36 universities from the database of the Centre for Science and Technology Studies Leiden Ranking. About 23 % of academic and research articles in India were freely available. Nearly 43 % of Indian universities and research organizations have a substantially lower percentage of OA publications than the global (around half). With a prevalence of 17 %, green OA was the most prevalent, and Biomedical and Health Sciences had the greatest average prevalence of any field (34.37 %).

Poltronieri[19], *et al.*conducted a case study in Italy from 2010 to 2012 to examine the OA journals' impact factor and the analysis of subject discipline related to these journals. The study's findings indicate that Journal Citation Reports had a 4.93 % growth in the total number of journals between 2010 and 2012, while the directory saw an 18.51 % increase in the total number of journals. The field with the most significant growth was medicine. Marinov[20] studied the different forms and methods for accessing OA scholarly works.The study discovered that due to its economic effectiveness, OA might also have advantages for other organizations besides users and authors, such as publishers, scientific institutions, specific businesses, etc. The economic effects of OA

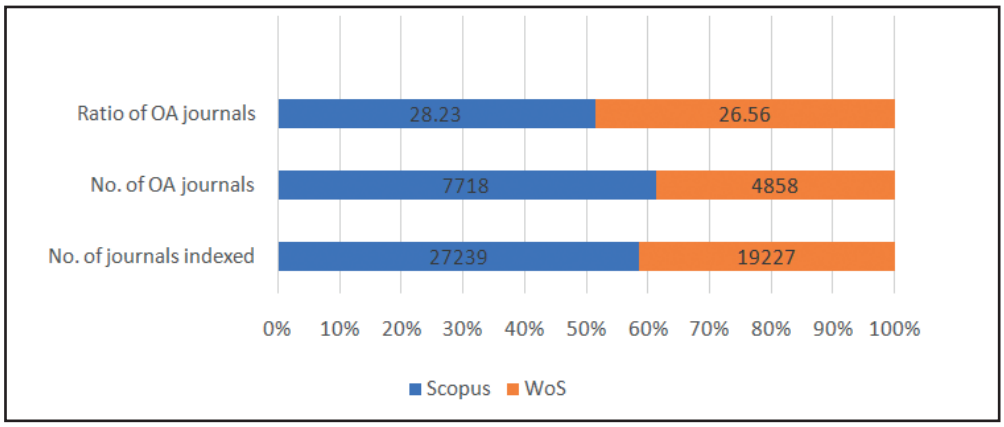

Figure 1. OA journals indexed in scopus and web of science: Global trends.

are examined through the idea of its advantages, which can generally be divided into two groups: individual and collective. In addition to the financial advantages, one must consider OA's "cost" and what it cannot accomplish. OA benefits the advancement of science, and its application may also be viewed as enhancing societal well-being. Fell[21] looked at the evidence on what kinds of economic effects (both good and bad) open science can have, how they happen, and how to get the most out of them. Findings of the study indicate that OA can lead to lower costs for access, labour, and transactions and some instances of how open science has facilitated new ventures in business, research, and collaboration.

4. METHODOLOGY

The study adopted descriptive and review methods. Data for analysing OA trends at the global level and in India was extracted from directories, online databases, and websites. Studies related to the topic were also reviewed to examine the academic, economic, and societal impact of OA publishing on different stakeholders.

5. RESULTS AND FINDINGS

5.1 OA Publishing: Global Trends

OA Journals: As shown in Table 1, the DOAJ included 17800 OA journals. Out of that, 12371 journals publish research outputs without APC. A total of 7576912 research articles have been published in 17800 journals contributed by 130 countries.

Figure 2 shows the global trends of OA journals included in the Scopus and Web of Science (WOS). Of the 27239 journals indexed in Scopus and 19227 journals indexed in WoS, 7718 (28.23 %) journals are OA indexed in Scopus, and 4858 (25.56 %) OA journals are indexed in WoS.

Figure 1 shows the global trends of OA availability of literature. Of the total 4,77,58,085 articles published in Scopus indexed journals, 1,44,84,803 (30.32 %) articles are OA. Of the total 3,95,29,046 research articles published in WoS indexed journals, 1,17,20,681 (29.65 %) articles are OA. The findings indicate that around 30 % of the published literature is OA.

Table 1. OA journals indexed in DOAJ

OA journals	Journals without APC	Total articles	Country represented
17800	12372	7576912	130

5.2 OA Publishing: Indian Scenario

OA Journals: A total of 326 OA journals from India are listed in DOAJ as of 16 June 2022. Of the 484 Indian journals indexed in the Scopus database, 202 (42 %) journals are OA. Of the 224 Indian journals indexed in the WoS database, 129 (57 %) journals are OA. Findings indicate that India has progressed significantly in publishing OA journals.

Digital Repositories: Of the 5880 digital repositories listed in Open DOAR, 105 digital repositories (1.78 %) are from India.

OA availability of Indian Literature: Figure 3 shows the OA availability of Indian literature. A total of 22,17,537 papers were communicated to Scopus-indexed journals by Indian authors. Out of that 501744 (22.62 %), research articles are OA, while 12,46,576 research papers contributed by Indian authors were published in WoS- indexed journals and Out of that, 278013 (22.30 %) are OA.

OA Mandates and Policies: According to data from ROARMAP, 18 funders and academic and research organizations in India have adopted OA mandates and policies.

5.3 OA Mandates and Policies of Major Funding Bodies in India

The OA scenario in India appears to be highly promising, with policymakers willing to boost the OA movement.[22] India has adopted a few major OA initiatives to speed up access to scientific publications produced by publicly financed research projects.

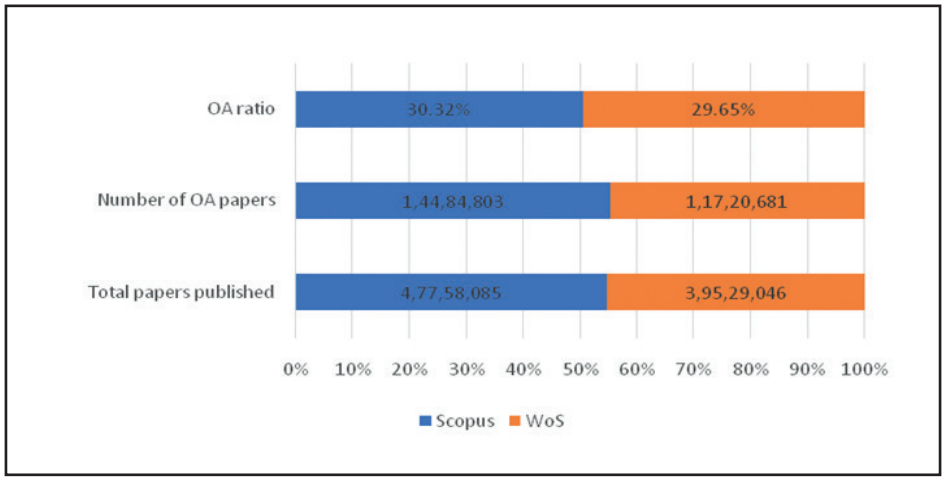

Figure 2. Availability of OA literature: Global trends (2002-2021).

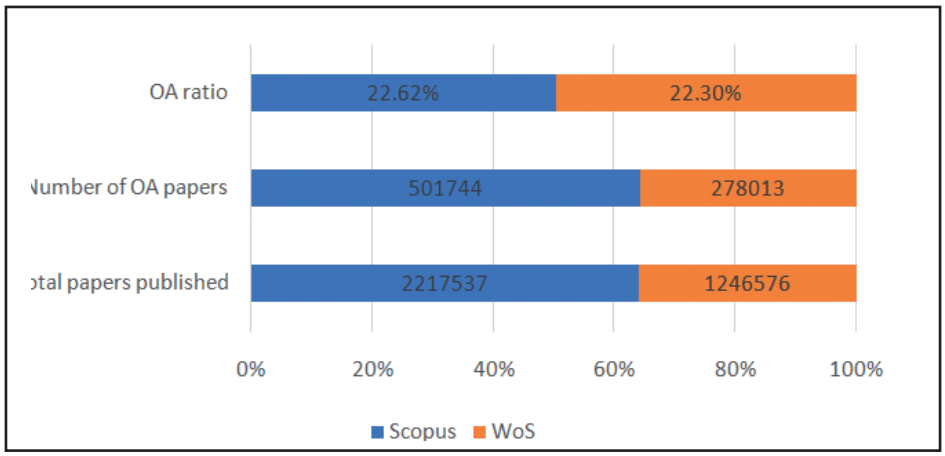

Figure 3. Availability of OA literature: Indian scenario.

Five major funding bodies have policies related to OA availability of funded research in India. An attempt is made to discover different characteristics provided by the various policies adopted by different funding agencies in India. In 2009 UGC adopted a regulation related to the award of M.Phil & Ph.D.degrees. This regulation allows an institution to deposit an electronic version of the theses and dissertations in Shodhganga immediately after awarding a degree.

Under the "Open Data Use License" initiative, the Indian government adopted a National Data Sharing and Accessibility Policy in March 2012 with the goal of "facilitating access to shareable data and information owned by the government of India in both human-readable and machine-readable forms through a nationwide network, thereby enabling a wider accessibility and use of public data and information". The policy states that non-sensitive data will be easier to access for registered users, easier to share, and more readily available for advancements in social, economic, and scientific fields. The DST investigates policy coordination, creation, application, and oversight worldwide.

In september 2013, ICAR implemented an OA policy for its publications. Under the terms of the policy, each ICAR institute was required to maintain a digital repository for OA materials. The ICAR has established KRISHI, a centralised repository that houses all its knowledge resources. In 2014, DBT and DST, under the auspices of the Ministry of Science and Technology, enacted an OA (funder) policy. Under the DST-DBT policy on OA, all institutes must establish their own OA repositories. Within two weeks of publication, DST and DBT-funded researchers must deposit their articles in their institution's repository or a central repository (such as science central).

The CSIR has released similar OA guidelines to support authors who want to share their work for free. According to the policy, all CSIR-funded research articles must be made OA by either publishing them in an OA journal or uploading the complete text and metadata in an IR. For OA research articles, electronic theses, and dissertations, each CSIR laboratory will establish its interoperable institutional repository. The CSIR Unit for Research and Development of Information Products (URDIP) will gather the text and metadata for these papers using a centralised harvester.

5.4 One Nation, One Subscription, and Centralised Funding for Paying APC

The One Nation, One Subscription policy aims to make scientific literature and research papers freely available to all citizens of the nation. Researchers would be encouraged to submit their research to OA journals that charge APC as the government is planning to create a central fund for paying APC. However, it requires significant upfront investments and would not solve fundamental problems like raising the standard of research output, creating more useful research indicators, or discouraging commercial publishers from monetising publicly funded research. Instead, a digital publishing platform with open peer review could assist in resolving access and quality issues while avoiding the expenses associated with ONOS. Policymakers can use such a platform to create and use improved research impact measures. Additionally, it can assist advance the tenets and objectives of open science and OA publishing.

5.5 Impact of OA

5.5.1 Academic Impact of OA

Since OA publishing is widely accessed and used, it has an academic impact. Anyone widely reads academic research if it is free to use. Traditional journal subscriptions do not include the right to data mining; however, OA journals do. The institution and the researcher both benefit from the increased impact of research. Compared to non-OA publications, OA articles are consistently cited more frequently and promptly. Research on the academic impact of OA publications varies widely depending on the difference in different disciplines. Analysis of studies that looked into the citation benefit of OA publications based on their findings indicates that OA publications have a significant citation advantage[23].

A study published in F1000 research examined the academic impact of OA publishing and concluded that the degree of impact of OA publications on citation varies by discipline. OA articles in biology get 36 % more citations. OA articles have 600 % greater citations in the agricultural sciences. Six months after publication, non-OA articles are twice as likely to have no citations. Compared to green OA articles, gold OA articles have a greater overall academic impact (Tennant, *et al.,* 2016).[23]

5.5.2 Economic Impact of OA

The subscription cost of journals is continuously increasing; no institution can afford a subscription to every journal. The cost of journal subscriptions has increased 250 % faster than inflation over the last 35 years. Fewer institutions, especially in high-income nations, can afford subscriptions due to these escalating prices. Traditional publishing is associated with the 'pay-to-access' model. As a result, the economic model dependent on subscriptions is unsustainable. OA switches the revenue source from subscribers to the authors willing to pay APCs to make their research widely available. OA publishing is associated with a 'pay-to-publish' model, where many OA publishers or journals charge for publishing. OA models affected research funding and licensing, and IP rights have also become problematic where state funds are in play. Around 70 % of peer-reviewed OA journals do not charge APCs, according to data from DOAJ. Journals with subscriptions might switch to the OA model. Journals that make little profit or are incurring losses would find this shift appealing. This might enable them to continue to exist.

It is estimated that the average production cost for a single research article is between $3500 and $4000. Closed access publishers charge for access through subscriptions to recoup those expenses and make a profit. Since there is no need for printed copies of OA journals, the OA publishing model is a cost-saving method. Typesetting and copy editing are not required. Online journal hosting costs roughly $15 a year. The overall operational cost per article under the OA online-only paradigm ranges from $6.50 to $10.50[24].

OA publishing model is suitable for small businesses and entrepreneurs. Increasing research accessibility may boost local economies. Increases in the return on investment have been linked to OA. Collaboration is also made possible through it. Many publishers have shifted to a "pay-to-publish" model, although this may make it more difficult for individuals without funds to contribute. Early-career researchers working in sectors where obtaining research grants and publishing fees could be more challenging.

5.5.3 Societal Impact of OA

Access to scientific knowledge and information is essential for worldwide human equality. Some academics believe that everyone should have access to knowledge. Article 27 of the UNDHR (1948) states, "Everyone has the right to freely participate in the cultural life of the community, to enjoy the arts, and to share in scientific advancement and its benefits." Others contend that because taxes primarily support research, all citizens should have access to its findings. Citizen science is made feasible by OA. OA to scholarly publications has wider effects on other spheres of society than just academics. An OA article has a significantly higher chance of being read by readers outside of academia.

The difference between researchers in developed and developing nations is fuelled by subscription-based access. OA has the power to alleviate this inequality by ensuring that all people have access to scholarly work. Pay-to-publish models risk reducing support for OA in developing countries by keeping authors out of the publication system, even if removing paywalls can significantly benefit these countries. OA has the effect of making research more affordable for libraries to make available to their users. Therefore, OA provides real advantages for researchers, the economy, and society.

6. CONCLUSIONS

The prospect for OA in India appears good as policymakers are eager to promote the OA movement. Many OA journals are available in India, making it one of the major growing nations in the OA movement. The study found that many research papers are available free to read via OA journals and other platforms. A significant amount of OA research papers can be found in two reputed databases, namely, Scopus and WoS. DOAJ is indexed a substantial number of OA journals with OA literature. In the Indian context, data from Open DOAR and ROARMAP shows the availability of a large amount of OA literature.

Some major funding bodies in India have formulated OA policies and mandated authors to make research outcomes of publicly funded research OA. However, due to the lack of proper implementation and monitoring, these policies and mandates have no significant impact on OA availability to funded research in India. OA publishing has an important academic, economic and societal impact. OA articles are consistently cited more frequently and promptly than non-OA publications. Traditional publishing is associated with the 'pay-to-access' model, whereas OA publishing is associated with a 'pay-to-publish' model. However, around 70 % of peer-reviewed OA journals in DOAJ do not charge APCs. OA has the power to alleviate this by ensuring that all people of both developed and developing nations have access to scholarly work. The present study will aid policymakers in realising the difficulty associated with OA adoption, contributing to policy formulation and implementation nationwide.

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He performed the interpretation of study result.