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Awareness, Acceptance and Attitudes towards Open Access Publishing among Indian Research Community

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ABSTRACT
India is one of the largest country in the world with plenty of higher educational institutions, universities, research centres and research organisations imparting higher education to the students and also research activities. The country is spending thousands of crores of rupees annually for research activities these funds generated from the tax payers' money. So the tax payer funded research results should reach the public in order to get the maximum benefits of the tax payers'. The present study aims to understand the awareness, level of acceptance, and factors that influence the practice of open-access publishing (OAP) among Indian Research Community. The investigation employed the survey method for collected the data using web-based Google Forms questionnaire. The structure questionnaire were sent an emailed to the (18,463) targeted respondents. Finally we received 675 Indian researchers from various higher education and research organizations across India and this as considered study sample. Further applied suitable statistical analysis. The results of the study shows there were a total of 675 respondents participated by filling out the structured questionnaire prepared for the study. In that majorities of 72.15% were male, and 27.85% were female respondents. Regarding the educational qualifications of the respondents, a majority of 77.04% hold doctoral degrees. The most of the research community was either moderately aware or well aware of open-access concepts. The highest 612 (90.66%) of respondents agreeing that cost-free access is helpful. The 461 (68.29%) felt that open access journals are highly peer-reviewed, 514 (76.14%) opined open access articles can reach maximum readers without any barriers compared to closed access. Journal reputation, researcher popularity, impact factor, short turnaround times, and publication fees influences authors' decisions to publish in OAJ.

Keywords: Open-Access, Awareness and Acceptance, Research Community, India, Influential-Factors

Introduction:
The scholars and academicians play a vital role in society as the creators of scientific scholarly literature and developers of new applications that address societal needs (Valladares, 2021). Scholarly communication is the process of creating, discovering, publishing, and disseminating scholarly literature (Widén, 2010). Academic journals, conference proceedings, research monographs, dissertations, research project reports, and first-hand recollections are the most important channels for this scholarly literature (Das, 2015). Today, the ICT and Internet-enabled environment facilitates the global outreach of scholarly literature through various online academic and social media platforms, compared to the earlier print media era (Haleem et al., 2022). Open access publishing is a publishing model that allows the public to freely access scholarly articles, research papers, and other scientific works online. This means that anyone can read, download, copy, distribute, and use the published works without any restrictions or payment (*Budapest Open Access Initiative*, 2002), (*Bethesda Statement on Open Access Publishing*, 2003), and (*Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*, 2003). The main aim of open access publishing is to make scientific research more accessible to a wider audience, including researchers, students, policymakers, and the general public (Kankam et al., 2024). By removing financial and legal barriers, open access publishing can accelerate the dissemination of knowledge, promote collaboration, and improve the overall impact of research. Gold open access refers to the immediate, unrestricted availability of the final published version of an article, often with a fee paid by the author or the author's institution to cover the costs of publication (*Gold Open Access and Green Open Access*, 2022). Green open access, on the other hand, allows authors to deposit preprints or post-prints of their work in publicly accessible repositories, such as institutional repositories or subject-specific repositories, usually after a certain embargo period. Open access publishing has gained significant momentum over the past decade, with many funding agencies, governments, and universities mandating or encouraging researchers to publish their work under open access models (*Green or Gold Routes to OA | Open Science | Springer Nature*, 2024) .
There are several advantages to open access publishing. It enhances the visibility and impact of research by making it widely available to a global audience (Borgman, 2018). Opined open access can also enhance research collaboration and interdisciplinary exchange of ideas, as researchers can more easily access and build upon each other's work. Moreover, open access publishing can benefit the public by providing them with access to the latest scientific developments, which

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can contribute to societal progress and help with decision-making (Bailey, 2006). In recent years, there have been growing calls for a more open and collaborative approach to scientific research, often referred to as "open science." According to (Tracz & Lawrence, 2016) "open science involves the sharing of data, code, and other research materials, along with the use of open-source software and collaborative platforms." This shift towards openness and transparency in science has the potential to accelerate the pace of scientific progress, foster cross-disciplinary collaboration, and enhance the public's trust in science (Khan & Ahangar, 2017). Overall, the transition towards open access publishing and the broader adoption of Open Science principles are transforming the landscape of scholarly communication. These developments have the potential to drive innovation, enhance the impact of scientific research, and contribute to the advancement of knowledge for society by making research more accessible and collaborative (Maedche et al., 2024).

Need for the study

India, one of the world's largest countries, boasts a multitude of higher educational institutions, universities, research centers, and organizations that provide higher education and conduct research activities (Reddy et al., 2016) . Every year, the nation allocates thousands of crores of rupees to research activities (DEPARTMENT OF SCIENCE & TECHNOLOGY, 2023), (PIB Delhi, 2024) and (Anand, 2024), a sum that originates from public taxes. Therefore, we should make the taxpayer-funded research output accessible to the public to maximize its benefits. This will only be feasible if the research output is easily accessible to the public, free of charge, and devoid of any technical barriers. There is one way to do this: publish taxpayer-funded research output in Open Access journals or platforms in the form of scholarly literature. The investigator conducted a comprehensive literature survey on open access, open access publishing, and the research community's acceptance of open access publishing. The researchers found during the literature search process that the global research community, including India, has conducted only a few studies on open access and open access publishing. During the literature review, the investigator noted that the global research community understands, accepts, and practices the concept of open access and open access publishing. Currently, there is a need to conduct a study to understand the current state of the open access and open access publishing system in the nation, the degree of acceptance of open access within the scientific research community, and its influence on scholarly literature and the research community itself.

The study's objectives

1. To know the level of awareness of open access and its related concepts.
2. To understand the researcher community level of acceptance of open access (OA).
3. To know the researchers preference among the publishing models.
4. To analyze the factors influenced to publish their scholarly literature as open access.

The study's scope and limitations

The scope and limitation of this study confined to only research community working in the research institutions across India who had published scholarly articles in open access journals in Indian Academy of Science (IAS), Council of Scientific and Industrial Research–National Institute of Science Communication and Policy Research (CSIR–NIScPR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR) and Defence Research and Development Organisation (DRDO) journals for the period of ten years (2014-2023) from the journals indexed in Scopus citation database only.

Methodology

The investigator used a survey method to fulfill the stated objectives of the study. This survey focused on the research community's level of acceptance and awareness of open access (OA), as well as factors influencing publishing in an open access journal. We distributed the survey via a Google Form questionnaire to selected respondents. The study's target audience is the research community across India, specifically articles published in NIScPR, IAS, ICAR, ICMR, and DRDO-DESIDOC with Scopus-indexed journals from 2014 to 2023. We distributed the survey via email to all research communities, including 18,463 finalized emails from the aforementioned Scopus-indexed journals. We analyzed the data using Microsoft Excel and SPSS to determine frequencies, significance, etc.

Data analysis and interpretation

Table-1: Demographic characteristics of the respondents

Demographic characteristics		Responses (N=675)	
		Frequency	Percentage
Gender	Male	487	72.15
	Female	188	27.85
Age group	25-30 years	60	8.89
	31-35 years	91	13.48
	36-40 years	111	16.44

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	41-45 years	88	13.04
	46-50 years	119	17.63
	>51 years	206	30.52
Qualification	Graduates	93	13.78
	Pursuing Ph.D.	39	5.78
	Ph.D.	520	77.04
	PDF	23	3.41
Designation	Assistant Professor	149	22.07
	Associate Professor	94	13.93
	Professor	164	24.3
	Scientist	113	16.74
	LIS Professional	31	4.59
	Others	124	18.37

Data in table-1 shows the demographic information of the respondents. Of the 675 respondents, a majority of 72.15% male, and 27.85% were female respondents. The age-wise distribution reveals that 206 respondents above 51 years, 119 were between 46 to 50 years, and 11 were in the 36 to 40 years age group, indicating that the study was primarily answered by respondents from the older age groups and perhaps experienced group. According to the educational qualifications of the respondents, a majority of 77.04% hold doctoral degrees, while the remaining respondents included 13.78% graduates, 5.78% pursuing doctoral studies, and a least response of 3.41% pursuing post-doctoral studies. The designation-wise distribution of respondents shows those 164 professors, 149 assistant professors, and 94 associate professors, for a total of 60.3% respondents involved in the research and teaching profession. The remaining 124 respondents were other professionals but they were involved in research activities not teaching, 131 were Scientists conducting research and 31 were LIS Professionals.

Table-2: Open Access (OA) awareness

Description	**Responses (N=675)**			**Mean**	**SD**	**P-value**
	1=Average	**2=Good**	**3=Excellent**			
Open Access/ Open Access Initiatives [Awareness]	164 (24.29%)	316 (46.81%)	195 (28.88%)	2.27	0.691	<.001
Open Access Publishing	95 (14.07%)	306 (45.33%)	274 (40.59%)	2.05	0.728	<.001
Open Access Journals	107 (15.85%)	295 (43.70%)	273 (40.44%)	2.25	0.709	<.001
Open Access Books	225 (33.33%)	249 (36.88%)	201 (29.77%)	1.96	0.794	>.077
Open Access Publishing Modules	288 (42.66%)	236 (34.96%)	151 (22.37%)	1.80	0.781	<.001
Pre-prints/ Post-Prints	201 (29.77%)	291 (43.11%)	183 (27.11%)	1.87	0.772	<.001
Institutional Repositories	234 (34.66%)	250 (37.03%)	191 (28.29%)	1.94	0.746	<.001
Academic Social Networking Sites [ASNS]	231 (34.22%)	285 (42.22%)	159 (23.55%)	1.97	0.754	<.001
Article Processing Charge	193 (28.59%)	274 (40.59%)	208 (30.81%)	1.94	0.792	>.016
Copyright Laws	252 (37.33%)	261 (38.66%)	162 (24.00%)	1.89	0.753	<.001
Creative Common Licenses	210 (31.11%)	297 (44.00%)	168 (24.88%)	2.02	0.771	<.001

Data in the above table-2 shows the awareness level on the open access, OA initiatives and other OA related concepts. We used 3 points rating scale to analyze awareness level of the research community. The respondents are well aware of Open Access and OA Initiatives (Mean=2.27), and Open Access Journals (Mean=2.25) only. An average level of understanding of the concepts such as Open Access Publishing (Mean=2.05), Open Access Books (Mean=1.96), Open Access Publishing Model (Mean=1.8), Preprints/ Post-Prints (Mean=1.87), Institutional Repositories (Mean=1.94), Academic Social Networking Sites (Mean=1.97), Article Processing Charge (Mean=1.94), Copyright Laws (Mean=1.89), Creative Commons Licenses (Mean=2.02). The result clearly indicates that research community has an average level awareness on open access and OA related concepts. We used a non-parametric statistical (Chi-square) test to determine differentiation within the research community; the p-value <.001 shows there significant difference in awareness of open access concepts except open access books (p-value = 0.77) and article processing charge (p-value = 0.16). It indicates that there are significant differences among the research community. The (Sheikh, 2019) study found that despite being aware of scholarly open access, Pakistani faculty members (71.5%) had low awareness of open access-related resources and initiatives (Rodriguez, 2014), and (Rodriguez, 2014), study found similar results.

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Table-3: Level of acceptance of Open Access (OA)

OA Statements	Responses (N=675)			Test Statistics (X^2) p-value			
	Agree	Don't Agree	No Comment	Gender	Age	Qualification	Designation
Cost free access to article is very helpful to reach maximum readers	612 (90.66%)	38 (5.62%)	25 (3.70%)	>.011	>.020	>.113	>.038
Open access journals are peer reviewed	461 (68.29%)	104 (15.40%)	110 (16.29%)	>.085	>.005	>.024	<.000
Any user/ reader can read/ download/ copy/ distribute/ search/ link the full text of open access articles with no cost/ no Copyright restrictions	490 (72.59%)	124 (18.37%)	61 (9.03%)	>.081	>.064	>.222	>.014
Open Access publishing reaches the end user better than the subscription model	514 (76.14%)	84 (12.44%)	77 (11.40%)	<.001	>.092	>.109	>.048

The study mainly aims to assess the research community's level of acceptance of open access and we have consolidated their opinions on open access statements. The results presented in table-3, shows that the majority 90.7% (612) of the research community agreed that "Cost-free access to articles is very helpful in reaching maximum readers." Additionally, 514 (76.1%) of the respondents accepted that "Open Access publishing reaches the end-user better than the subscription model." Further a lowest of 12.44% disagreed and 11.40% of the respondents did not comment. Regarding the statement on open access (Any user/ reader can read/ download/ copy/ distribute/ search/ link the full text of Open Access articles with no cost/ no Copyright restrictions), 490 (72.6%) respondents agreed and 18.37% disagreed. The reasons for this may include journals requiring login, institutional authentication, broken links or DOI issues, and network problems, among others. When asked about peer review, a highest number 68.3% (461) of respondents felt that open access journals are peer-reviewed. However, 15.40% to 16.29% of respondents either disagreed or did not comment indicate that these respondents may not be fully aware of the peer-review process in journal publication life cycle.

Table-4: Peer-review services by the research community

Statements	Responses (N=675)	
	Yes	No
I provide peer review services for an open access journal(s)	438 (64.88%)	237 (35.11%)
I provide peer review services for a commercially-published journal(s)	473 (70.07%	202 (29.92%)

Peer-review process play vital role in assess the research papers quality as well as quality of the journal. In the table-4 shows that a significant majority (64.88%) of respondents provides peer-review services for open access journals. This suggests a strong engagement of the research community with open access publications. Even larger proportions (70.07%) of respondents provide peer review services for commercially-published journals. This suggests that commercially-published journals might still have a slight edge over open access journals in terms of attracting peer reviewers. The smaller range of 29.92% to 35.11% of respondents says they do not provide any kind of peer-review services to both model of publications. The chi-square test statistic used for find significant difference among research community in terms of providing peer-review services. The test value X2=143.701 with a p-value of less than .000 indicates that there is a highly significant difference in the proportion of respondents who provide peer review services those who do not for both open access and commercial journals.

Table-5: Providing editorial services by the research community

Statements	Responses (N=675)	
	Yes	No
I am an editor or on the editorial board member for an open access journal(s)	167 (24.74%)	508 (75.25%)
I am an editor or on the editorial board member for a commercially published journal(s)	175 (25.92%)	500 (74.07%)

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Any editing service focus on improving a research work in terms of content, clarity, grammar, spelling, punctuation, capitalization, and sentence structure and many more. Here is an effort to capture the data on the scientific community's participation in the editorial services to assess the acceptance and willingness in scholarly services irrespective of the publication being published be it a commercial journal or open access journals. The data in the table-5 present that a comparatively smaller portion of 24.74% respondents are serving as editors for open access journals and 25.92% respondents to the commercial journals compared to those who do not provide services to both journals from 74.07% to 75.25%. This table results indicates that Indian research community are not having any favourism towards commercial or open access journals in terms of rendering editorial services. The chi-square test statistic of X2= 123.981 with a p-value of less than <.000 indicates that there is a highly significant difference in the proportion of respondents who provide editorial services versus those who do not provide the editorial services for both modes of publications i.e. commercial and open access publications.

Table-6: Publication under the Open Access models

Open Access Models	No. of publications				
	1-5	**6-10**	**11-15**	**> 15**	**Total**
Green OA	221 (62.1%)	64 (18%)	23 (6.5%)	48 (13.5%)	**356 (100%)**
Gold OA	113 (66.1%)	19 (11.1%)	23 (13.5%)	16 (9.4%)	**171 (100%)**
Hybrid OA	101 (48.1%)	36 (17.1%)	22 (10.5%)	51 (24.3%)	**210 (100%)**
Diamond OA	38 (57.6%)	5 (7.6%)	8 (12.1%)	15 (22.7%)	**66 (100%)**

The data presented in the table-6 highlights the trend in Indian open access publishing. The results show that, green open access is the most prevalent model, accounting for over 50% of the total open access publications. Gold open access, hybrid open access, and diamond open access models account for the remaining 25%, 31%, and 10% of open access publications, respectively. Further, we can see from the table that majority of respondents have published 1-5 articles in the different open access models such as Green OA, Gold OA, Hybrid and Diamond OA. It is further observed from the responses that open access publishing is more common in the sciences, with the life sciences, physical sciences, clinical and medicinal sciences having a significantly higher proportion of open access publications compared to the arts, humanities, and social sciences. These findings suggest that Indian researchers are actively embracing open access publishing, with a preference for green open access channels. Overall, the data presented in this study highlights the need for continued efforts to promote and support open access publishing in India, particularly in number of article publications. Take initiatives to increase funding for open access, develop institutional open access policies, institutional repositories and raise awareness about the benefits of open access could help to further improve the open access landscape in the country.

Table-7: Publications preference among the research community

Type of journals	Responses (N=675)					($X^{2)}$ Designation
	Not preferred	**Less preferred**	**Moderately preferred**	**Preferred**	**Most preferred**	
Commercial journals/ closed access	137 (20.3%)	80 (11.9%)	167 (24.7%)	213 (31.6%)	78 (11.6%)	P=<.001
Commercial journal but Open Access	75 (11.1%)	74 (11.0%)	142 (21.0%)	267 (39.6%)	11 (17.3%)	P=<.001
Purely Open Access journals	72 (10.7%)	57 (8.4%)	118 (17.5%)	192 (28.4%)	236 (35.0%)	P=<.000

The results presented in table-7 indicates the publications preferences among the research community. The designation-wise publication preference by the researchers to publish in commercial journals. The Chi-square test was applied to know any difference in the preference of respondents to publish in commercial journals. The data analysis reveals that the preference of researchers to publish in commercial journals varies significantly by their designation (X2=46.970; P=<.001). Professors and Associate Professors show a higher preference for commercial journals compared to Assistant Professors and Scientists. LIS professionals have the lowest preference for publishing in commercial journals. The preference for hybrid journals indicates that, Professors have the highest preference for hybrid journals, with 62 respondents of them rating hybrid journals as "preferred" and 32 respondents rating them as "most preferred." Followed

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by 53 Scientists and 58 other designated professional "preferred" and 34 respondents "most preferred". The LIS professionals have the lowest preference for hybrid journals, with only 16 rating them as "preferred" and 7 as "most preferred." The chi-square test results suggest that the preference for hybrid journals is significantly associated with the respondents' designations (X2=45.707; P=<.001). Preferences towards open access journals (OAJ) among the respondents significantly different across various designations (X2=56.885; P=<.000). The almost 428 (63.4%) of the research community show a stronger preference for open access journals whereas low 118 (17.5%) number of show moderately, 57 (8.4%) less, 72 (10.7%) not preferred. These findings suggest that seniority and familiarity with the open access publishing model may play a role in the preference for publishing in the open access journals. The results also highlight the need for further education and awareness among junior researchers and scientists to promote the adoption of open access publishing. Overall, these findings provide valuable insights into the perceptions and preferences of researchers towards open access journals, which can inform strategies to enhance the visibility and adoption of open access publishing.

Table-8: Influential factors to publish in OAJ

Designation	Factors									
	The journal has reputation in my field		The journal is well read by researchers in my field		The journal has a high Impact Factor		The journal is known for short decision turnaround times		The journal does not charge to publish	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Assistant Professor	4.12	1.046	4.13	.888	3.91	.910	3.88	.958	3.89	1.269
Associate Professor	4.32	1.008	4.30	.993	4.21	.960	3.99	.874	4.18	1.005
Professor	3.95	1.038	3.98	.994	3.82	1.039	3.66	1.059	3.76	1.141
Scientist	3.97	.995	3.97	.940	3.91	1.048	3.73	1.009	3.50	1.390
LIS Professional	4.26	.575	4.19	.543	4.00	.775	3.84	.583	4.16	.735
Others	3.98	.958	4.05	.953	3.81	.985	3.56	1.205	3.77	1.230
Total	4.06	1.003	4.08	.941	3.92	.987	3.76	1.024	3.82	1.214
Test Statistics	**F=11.743; P=>.039**		**F=8.188; P=>.099**		**F=11.416; P=>.038**		**F=14.140; P=>.019**		**F=29.556; P=<.001**	

When we investigated to assess the influential factors for scholars publish in OAJ, the responses received are shown in the table-8, the results indicate that the reputation of the journal in their subject field with a Mean value of 4.06. The other factor influence the researcher to publish in OAJ is being that the journal is well-read by researchers in their subject field yields a Mean value of 4.08. The journal's impact factor (accounts for a Mean value of 3.92, and short decision turnaround times with a Mean of 3.75 and journal does not charge to publish (Mean=3.82) are important factors that influence authors to publish in open access journals (OAJs) across all designations.

The responses based on research community designations, we can see from the table that Associate Professors strongly agreed with mean 4 and above level among the factors, followed by LIS & Research Professional with mean 4 levels. A good number of Associate Professors and Scientist also accepted with mean score 3.5 and above levels. Entire the table presents the mean importance assigned by different faculty positions to various journal attributes that influence their decision to publish in open access journals.

The ANOVA results confirm that there are statistically significant differences in the importance placed on these factors across the different faculty positions (P=>.005). This suggests that the decision to publish in open access journals is influenced by the individual's academic positions and role, with more senior and research-focused positions prioritizing factors like journal reputation and impact over cost considerations.

Findings of the study

- Out of 675 respondents, 487 (72.14%) were male and 188 (27.86%) were female. The majority of respondents (77.05%) hold doctoral degrees, and 33.18% have more than 21 years of research experience in their respective fields.
- The level of awareness of OA concepts ranges from an average (mean = 1.80 to 2.27) on a 3-point rating scale, and it is found that significant deference at p-value = <.001 and except OAB and APC p-value is >.005 level.
- The study surveyed the research community's acceptance of open access, finding that 90% agreed that cost-free access to articles is helpful in reaching maximum readers. 77.14% agreed that open-access publishing reaches end users better than subscription models. However, 18.37% disagreed due to technical reasons. The highest number of respondents (461) felt open access journals were highly peer-reviewed, but similar numbers (15.40%) and (16.29%) disagreed or did not comment, suggesting respondents may not be fully aware of the peer-review process.

- The study reveals that a majority of respondents offer peer-review services to both OA and commercial journals. At the same time, Indian researchers have struggled to secure editors or editorial board members for both publications.
- The study found that the majority of 428 respondents favored open access (OA) journals, identifying the highest 356 green OA and 171 gold OA publications in comparison to other models.
- The study shows that factors like the journal's reputation, researcher popularity, impact factor, quick decision turnaround times, and lack of publication fees influence authors' decisions to publish in open access journals. Associate Professors, LIS, and research professionals strongly agree with these criteria.

Conclusion

The study on the awareness and acceptance of open-access publishing (OAP) among the Indian research community reveals a moderate level of understanding of open access concepts, with significant gaps in knowledge regarding various aspects of OAP. While a majority of researchers recognize the benefits of open access, such as wider readership and peer review, their actual participation in publishing through open access channels remains limited. The findings indicate that green open access is the most commonly utilized model, with a notable preference for purely open access journals among respondents. Factors influencing publication decisions include journal reputation, impact factor, and publication costs, highlighting the need for enhanced awareness and institutional support for open access initiatives. Overall, the study underscores the importance of promoting open access publishing in India to maximize the accessibility and impact of taxpayer-funded research outputs.

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