DLINE JOURNALS

Journal of Science & Technology Metrics

ISSN: 2582 – 6956

JSTM 2024;5(3)

https://doi.org/10.6025/jstm/2024/5/3/71-76

Open Access Publications: A Scientometric Analysis

Keshava, Hemavathi. B. N
Department of Library & Information Science
Tumkur University, Tumakuru India
keshtut@gmail.com

Chandrashekhara. N
Department of Library & Information Science
Tumkur University, Tumakuru. India
chandrasci998@gmail.com

Received: 10 May 2024
Revised: 5 July 2024
Accepted: 21 July 2024

ABSTRACT

The paper examines the development trend of open-access publications released from 2014 to 2023. Data was obtained from the Scopus database using the keyword "Open Access." The collected articles were organized chronologically and transferred to a spreadsheet for analysis in line with the study's objectives. The findings indicated 581,535 publications, with the highest number of publications (87,558) in 2022 and the lowest of 32,075 publications in 2014. The average relative growth rate of open-access publications showed an exponential pattern. The dataset fits well with the polynomial model (r2 =.9698), linear model (r2 =.9567), exponential model (r2 =.9645), and logarithmic model (r2 =.7912).

Keywords: Open Access Publication, Relative Growth Rate, Scientometrics, Growth Pattern

1. Introduction

"Open access to literature refers to the free distribution of works on the internet for users to read, download, copy, distribute, print, search, link to complete texts, crawl for indexing, pass as data to software, or utilise for legal purposes". It does so without restrictions on technology, finances or regulations except for those about internet access (Pandian et al.,2008). Further, Nalimov & Mulchenko (1969) introduced Scientometrics into science studies to describe the notions of structure, growth, interdependence, and production (Correia et al., 2018). Scientometrics allows for measuring and analysing science, technology, and innovation. De Solla Price (2000) defines scientometrics as using mathematical and statistical methodologies found in scientific publications.

2. Need

A scientometric analysis of "open access publication 2014 to 2023" is vital to comprehensively understand the evolution, impact, and trends within the specified time frame. Such a study would yield invaluable intuition on the growth of open-access publications.

3. Objectives

a) Knowing the distributions of publications by year enables one to know the growth pattern and trend and understand the underlying dynamics of domains over a while,

b) Comparing and calculating the relative growth rate of publications will lead to conceptualise the uniformity or skewness in the growth distribution,

c) Determining the publication doubling timewill help to know the extent of the growth of a domain in a longer window and

d) Testing the applicability of growth models helps the potential of available models and assess their suitability.

4. Scope and Methodology

The analysis followsresearch production as measured by Scopus from 2014 to 2023. The database's data was retrieved using the term "Open Access." A total of 581535 results were discovered, processed and examined to accomplish the intended objectives.

5. Data Analysis and Discussion

This analysis focuses on the growth of open-access publications from 2014 to 2023. The data includes annual publication counts, cumulative publication counts, relative growth rate (RGR), and doubling time (Dt). Additionally, the effectiveness of various growth models (exponential, polynomial, linear, and logarithmic) is assessed using R2 values.

According to thedata presented in Table 1, the quantity (number) of publications has consistently increased every year. The highest number of annual publications was in 2022, with 87,558 publications. The study has evidenced notable jumps in the quantity (number) of publications between 2018–2019 and 2020–2021. The cumulative number of publications reached 581,535 by 2023. Each year contributes a growing share to the cumulative total, indicating consistent growth. The cumulative percentage of publications demonstrates the increasing importance of open access over time.

5.1. Relative Growth Rate (RGR):

The relative growth rate describes the increase in articles in open-access research results from 2014–2023. The growth of publications was evaluated using two parameters: relative growth rate (RGR) and doubling time (Dt) (Mahapatra, 1985).

Relative Growth Rate (RGR) = Ln(P2)-Ln(P1)/(T2-T1); Where,

RGR = growth rate across the interval's specified time.

P1 = loge (the natural log of the initial number of contributions)

P2 = loge (the natural log of the final number of contributions)

T1 is the unit of starting time.

T2 is the unit of completion time.

Doubling time (Dt) = 0.693/RGR

SN	Year	No. of publications	% of Publications	Cumulative No. of Publications	% of Cumulative Publications
1	2014	32075	5.52	32075	5.52
2	2015	36786	6.33	68861	11.84
3	2016	40742	7.01	109603	18.85
4	2017	40998	7.05	150601	25.90
5	2018	47381	8.15	197982	34.04
6	2019	60921	10.48	258903	44.52
7	2020	68333	11.75	327236	56.27
8	2021	79299	13.64	406535	69.91
9	2022	87558	15.06	494093	84.96
10	2023	87442	15.04	581535	100.00
	Total	**581535**	**100.00**		

Table 1. Annual and Cumulative Publications (2014-2023)

The following table presents a mathematical representation of publications' mean relative growth rate over a given period.

The RGR increased from 0.63 in 2015 to 1.89 in 2023, indicating an accelerating growth rate of publications. The mean RGR during the last decade is 2.30, reflecting a general trend of increasing publication rates. *Dt* decreased from 1.11 in 2015 to 0.37 in 2023, indicating a faster rate of doubling publications. The mean *Dt* is around 0.55, showing that the time required for the number of publications to double has consistently decreased.

The exponential model has a high R^2 value of 0.9645, indicating a strong fit. This suggests that the growth of publications closely follows an exponential pattern. The polynomial model has the highest R^2 value of 0.9698, making it the best fit among the models. This implies that polynomial growth accurately represents the trend in open-access publications. The linear model is also generouswith the R^2 value of 0.9567, though not as accurately as the exponential or polynomial models. The logarithmic model has the lowest R^2 value of 0.7912, indicating it is the least accurate in describing the growth trend.

Tables collectively illustrate a significant and accelerating growth trend in open-access publications from 2014 to 2023. The increasing number of publications each year, rising relative growth rates, and decreasing doubling times highlight this expansion. The polynomial growth model, with the highest R^2value, most accurately describes this trend. Libraries can use these insights to enhance their collections, infrastructure, and services to support the open-access movement.

SN	Year	No. of Publications	% of Publications	Log (p)1	Log (p)2	RGR(p)	Mean RGR	Dt(p)	Mean Dt(p)
1	2014	32075	5.52		10.38	-		-	
2	2015	36786	6.33	10.51	11.14	0.63		1.11	
3	2016	40742	7.01	10.62	11.60	0.99		0.70	
4	2017	40998	7.05	10.62	11.92	1.30		0.53	
5	2018	47381	8.15	10.77	12.20	1.43	2.30	0.48	0.55
6	2019	60921	10.48	11.02	12.46	1.45		0.48	
7	2020	68333	11.75	11.13	12.70	1.57		0.44	
8	2021	79299	13.64	11.28	12.92	1.63		0.42	
9	2022	87558	15.06	11.38	13.11	1.73		0.40	
10	2023	87442	15.04	11.38	13.27	1.89		0.37	

Table 2. Relative Growth Rate (RGR) and Doubling Time (Dt)

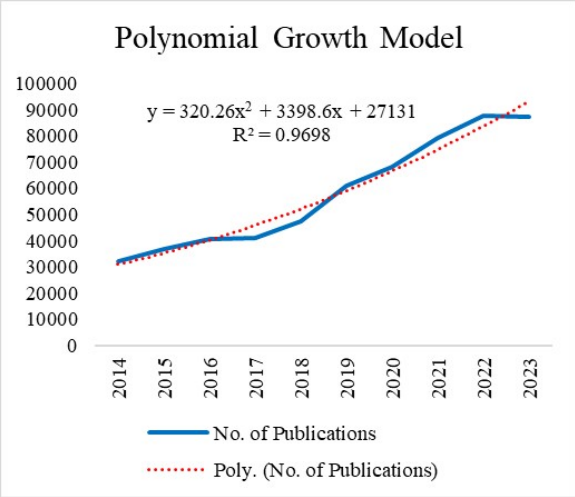
SN	Growth models	R^2
a	Exponential	0.9645
b	Polynomial	0.9698
c	Linear	0.9567
d	Logarithmic	0.7912

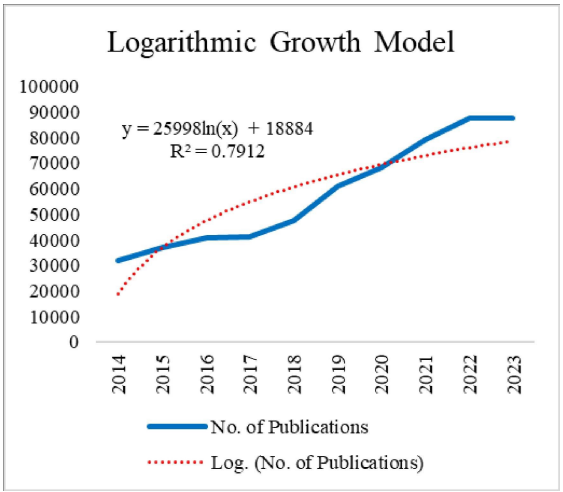
Table 3. Level of Application of Growth Models

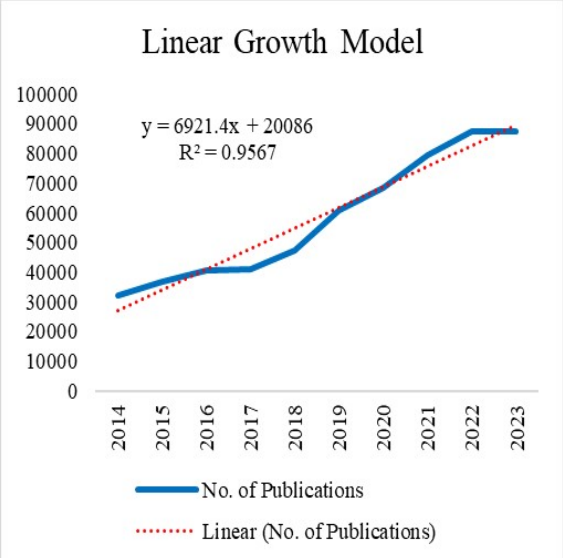
The exponential model has a high R^2 value of 0.9645, indicating a strong fit. This suggests that the growth of publications closely follows an exponential pattern. The polynomial model has the highest R^2 value of 0.9698, making it the best fit among the models. This implies that polynomial growth accurately represents the trend in open-access publications. The linear model is also generouswith the R^2 value of 0.9567, though not as accurately as the exponential or polynomial models. The logarithmic model has the lowest R^2 value of 0.7912, indicating it is the least accurate in describing the growth trend.

The tables collectively illustrate a significant and accelerating growth trend in open-access publications from 2014 to 2023. The increasing number of publications each year, rising relative growth rates, and decreasing doubling times highlight this expansion. The polynomial growth model, with the highest R^2 value, most accurately describes this trend. Libraries can

use these insights to enhance their collections, infrastructure, and services to support the open-access movement.







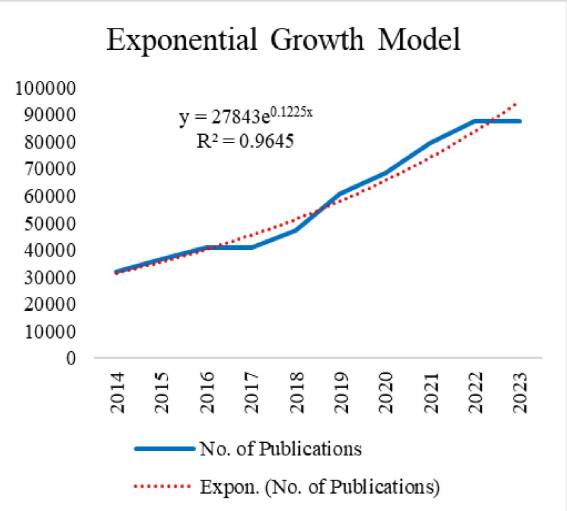


Table 3. Level of Application of Growth Models

6. Future

Based on the scientometric analysis of open-access publications from 2014 to 2023, libraries can implement several strategies to enhance their services and support the growing trend in open-access publishing. Libraries can create guides, tutorials, FAQs, and other information products with open-access scholarly publishing platforms, providing a single point of access to diverse open-access publishing platforms, conducting workshops and seminars to create awareness and educate researchers, students, and faculty about the benefits of open-access publishing, highlighting the growing trend and its impact on research dissemination. Developing an institutional repository with faculty publications is also a good approach to providing valuable resources to library users.

5. Conclusion

The analysis of open-access publications from 2014 to 2023 reveals a significant and accelerating growth trend characterized by an increase in the number of publications, rising relative growth rates, and decreasing doubling times. This robust expansion underscores the growing importance and acceptance of open-access models in the scholarly community.For libraries, this trend presents both opportunities and challenges. By expanding their open-access collections, enhancing digital infrastructure, and promoting open-access awareness, libraries can better serve their patrons and support the broader research community. Implementing advanced metadata practices, fostering community engagement, and leveraging emerging technologies will further enhance the discoverability and utility of open-access resources. Proactively adapting to these trends will ensure that libraries remain vital hubs of knowledge and research, facilitating substantial access to scholarly content and fostering an inclusive and collaborative academic environment. By adopting the strategies outlined, libraries can continue to play an immense role in the dissemination and democratisation of knowledge in the digital age.

References

[1] Ahmadi, A. (2018). Contribution of Indian scientists in Plos One: A scientometric analysis. COLLNET *J. of Scientometrics and Information Management,* 12 (2) 183–196.

[2] Correia, A., Paredes, H., Fonseca, B. (2018). Scientometric analysis of scientific publications in CSCW. *Scientometrics,* 114 (1) 31–89.

[3] Derek, D. S. (2000). A study of learning and retention with a web-based IR interface *Journal of. Librarianship and Information Science,* 37 (1*) 7-16.*

[4] Mahapatra, M. (1985). On the validity of the theory of exponential growth of scientific literature. *In:* Proceedings of the 15th IASLIC conference, Bangalore (Vol. 6170).

[5] Nalimov, V. V., Mulchenko, B. M. (1969). Scientometrics. Studies of science as a process of information. Science, Moscow.

[6] Pandian, R., Rajasekar, V., Dhanakar, M. A., Nithyanandam, K. (2008). Open Access Journals: A Study.