Current Status and Future Impact of Mega Open Access Journals: An Analysis

Authors: Chen Xiujuan, Chen Xuefei, Guo Jinjing, 彭媛媛, Huang Jinxia

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Abstract

Against the backdrop of open access publishing, this study selects ten representative mega open access journals as research subjects, with data sourced from journal official websites, JCR, and Scopus. The current development status of these ten mega OA journals is analyzed across five dimensions: impact factor, publication volume, article processing charges, acceptance rate, and publication speed. Based on this analysis, the potential positive impacts and challenges that mega OA journals may generate in the future are discussed, aiming to provide reference and guidance for policy-making in the publishing community and for authors' publication decisions.

Full Text

Preamble

Analysis on the Development Status and Long-Term Influence of Open Access Mega-Journals

Xiujuan Chen[1,3)]†, Xuefei Chen[2], Jinjing Guo , Yuanyuan Peng[2,3)], Jinxia Huang[2]

[1)] Chengdu Library and Information Center, Chinese Academy of Sciences, Chengdu 610041, China
[2)] National Science Library, Chinese Academy of Sciences, Beijing 100190, China
[3)] University of Chinese Academy of Sciences, Beijing 100049, China
) Institute of Medical Information, Chinese Academy of Medical Sciences, Beijing 100005, China

Abstract

In the context of open publishing, this study examines ten representative open access mega-journals as case studies, drawing data from official journal websites,

Journal Citation Reports (JCR), and Scopus. We analyze the development status of these ten open access mega-journals across five dimensions: impact factor, article volumes, article processing charges (APCs), acceptance rates, and publishing speed. Based on this analysis, we discuss both the potential positive impacts and emerging challenges of mega-journals, aiming to provide valuable references for policy-making in the publishing industry and for authors seeking publication venues.

Keywords: Open Access Mega-Journal; Open Publishing; Scientific Publishing Model

Academic journals originated in the 17th century and established a fixed publishing model by the mid-20th century, characterized by standardized peer review processes, regular volumes and issues, fixed article formats, and institutional subscription-based access. With the advent of the internet, academic publishing shifted from print to online formats, laying the foundation and providing a platform for open access (OA) journal development. As national OA initiatives progressed and OA policies were formulated, major publishers created fully OA journals, and traditional commercial publishers began offering hybrid OA options, leading to continuous expansion in both the volume and influence of OA journals. As of January 5, 2017, the Directory of Open Access Journals (DOAJ) had indexed 9,463 quality-controlled academic OA journals from 128 countries, of which 6,645 journals offered full-text retrieval, collectively publishing 2,405,613 articles. In addition to leveraging online dissemination, OA journals inherited the peer review standardization, fixed article counts per volume, and commercial publishing characteristics of traditional journals. Around 2000, the commercial model for OA journals shifted as some publishers moved from post-publication subscriptions to pre-publication author payments (article processing charges, APCs), which became the primary revenue source for OA publishers.

In December 2006, OA publisher PLOS launched a new type of OA journal, PLOS ONE, whose most distinctive feature was its peer review policy. Rather than adopting traditional peer review criteria (assessing whether articles fit the journal' s editorial scope or evaluating novelty and significance), PLOS ONE based acceptance decisions solely on technical soundness—whether the methodology was robust and the experimental design rigorous. Additionally, compared to traditional OA journals, it featured a broader disciplinary scope and larger publication volume [1]. This open publishing model quickly proved successful: PLOS ONE published 174 articles in 2006, 23,464 in 2012 (accounting for 2.5% of all PubMed-indexed content that year, making it the world' s largest journal) [2], and 22,004 articles in 2016. As a pioneer and exemplar of this new publishing model, PLOS ONE later became known as a mega-journal.

Building on PLOS ONE' s success, many publishers began exploring this model, gradually launching similar journals from 2011 onward, such as Scientific Reports (Nature), Open Biology (Royal Society), and SpringerPlus (Springer). Although no formal definition of mega-journals yet exists, the *STM Report: An*

Overview of Scientific and Scholarly Journal Publishing—Celebrating 350 Years of Journal Publishing (4th edition) by the International Association of Scientific, Technical and Medical Publishers (STM) introduced the concept, listing 35 open access mega-journals [3].

The emergence of mega-journals has sparked considerable debate in the academic community, with scholars conducting various discussions and studies. For instance, in May 2015, Bo-Christer Björk examined publication rate changes in several mega-journals from 2010-2015 [4]; in May 2015, Mike Taylor supplemented Björk' s findings [5]; in October 2016, Stephen Pinfield discussed the future development of mega-journals [6]; in November 2015, Bo-Christer Björk and Paul Catani compared peer review processes between traditional journals and mega-journals [7]; and in November 2016, Simon Wakeling et al. quantitatively analyzed article output, author characteristics, subject areas, and topic distribution across seven mega-journals. However, no systematic study has yet examined the development status of mega-journals themselves or the potential impacts of this new publishing model. To comprehensively understand mega-journal development, this study investigates mega-journals and selects ten representative titles for analysis across five dimensions—impact factor, article volume, APCs, acceptance rates, and publishing speed—followed by a discussion of potential positive impacts and challenges, thereby providing references for future OA journal development model exploration, policy-making, and author publication decisions.

1.1 Research Objects

Although PLOS ONE pioneered the mega-journal publishing model, no clear definition of mega-journals currently exists, with scholars holding varying perspectives, making it difficult to determine which journals belong to this category. Bo-Christer Björk synthesized characteristics of mega-journals listed on Wikipedia [8], Binfield [9], and Frank [10] to propose a comprehensive set of evaluation criteria, which we have slightly adjusted for our study (Table 1). The criteria comprise primary and secondary standards, and our selected mega-journals must meet all primary standards and most secondary standards. We first compiled a list of potential mega-journals through extensive literature review and publisher website browsing, then applied the evaluation criteria from Table 1 to select ten typical mega-journals (Table 2), which span multiple disciplines including physics, biology, medicine, genetics, and social sciences. Since PLOS ONE launched in 2006, other journals began adopting this new publishing model from 2011 onward.

1.2 Data Collection and Analysis

Our analyzed data primarily derive from the official websites of the ten mega-journals. Impact factor data were collected from Journal Citation Reports (JCR) for 2011-2015 (2011 marking the year PLOS ONE' s competitors emerged, while 2015 represents the latest available data in JCR at the time). Annual article

volumes were sourced from Scopus (2011-2016), as Scopus covers broader disciplinary areas and indexes more journals than Web of Science, and our statistics confirmed it includes more mega-journals. We used Excel for descriptive statistical analysis and visualization. The data collection cutoff date was January 13, 2017.

2 Development Status of Mega-Journals

Using ten typical mega-journals as representatives, we present data analysis results across five dimensions—impact factor, annual article volume, APCs, acceptance rates, and publishing speed—to reflect the overall development status of mega-journals.

2.1 Generally Low Impact Factors Among Mega-Journals

Analyzing journal impact factors reveals the current academic quality and influence of mega-journals. Table 3 and Figure 1 [Figure 1: see original paper] illustrate impact factor changes from 2001 to 2015 for nine mega-journals (SAGE Open is not indexed in JCR). As shown, the nine journals' impact factors range between 1 and 6, with an average of 2.543 in 2015. Figure 1 demonstrates that PLOS ONE' s impact factor has consistently declined since 2001, while BMJ Open has steadily increased. Scientific Reports, AIP Advances, and G3 initially rose but began declining in recent years. Biology Open, FEBS Open Bio, and IEEE Access were more recently indexed in JCR, with only two years of data available. Overall, these data suggest a declining trend in academic quality and influence for several mega-journals. (Note: "0" in the table/figure indicates no impact factor for that year.)

2.2 Significant Divergence in Annual Publication Volume

Table 4 and Figure 2 [Figure 2: see original paper] display annual article volume changes from 2011 to 2016. Overall, total annual output across mega-journals has continued to rise. As Figure 2 shows, PLOS ONE' s publication volume far exceeds other journals, dominating overall trends, but its output has declined annually in recent years. In 2016, PLOS ONE published approximately 22,004 articles, a decrease of 7,773 (26%) from 2015, representing the lowest volume since 2012 and a 32% drop from its 2014 peak, indicating a gradual loss of market share. Apart from PLOS ONE, only Scientific Reports shows a visible trend line, with its article volume increasing annually since launch, reaching 20,841 articles in 2016—nearly double the 10,897 published in 2015—and showing potential to overtake PLOS ONE as the world's largest open access journal. The remaining journals have relatively similar and modest volumes, with their trend lines barely visible in the figure. Overall, successful mega-journal development remains concentrated among a few titles, with uncertain future prospects. (Note: "0" in the table/figure indicates no articles published.)

2.3 APCs Slightly Higher Than Regular OA Journals

Mega-journals follow the OA model of converting subscription fees to APCs. Based on journal website surveys, Figure 3 [Figure 3: see original paper] summarizes APCs for non-member institutions, ranging from $395 to $2,200, with an average of $1,537.5. In 2014, Björk et al. estimated the average APC for non-member authors in fully OA journals indexed in Scopus at $1,418 [11], indicating that mega-journal APCs are slightly higher than the OA journal average. Some mega-journals offer discounted rates for member institutions; for example, corresponding authors from IEEE member institutions receive a 5% discount on IEEE Access APCs, while IEEE society members receive a 15% discount. Similarly, G3 charges member institutions $1,815 compared to the standard $2,145 APC. (Note: The figure shows APCs for regular authors only, excluding member institutions, with APCs denominated in US dollars.)

2.4 Higher Overall Acceptance Rates Than Traditional Journals

Based on journal website information, PLOS ONE, BMJ Open, PeerJ, and Biology Open report average acceptance rates above 50%. In 2013, Sugimoto et al. studied correlations between journal acceptance rates and other metrics, finding average acceptance rates of 30-45% across approximately 5,000 journals in five disciplines, with OA journals in the same fields ranging from 37-57%, while top-tier journals had acceptance rates below 20% [12]. According to Nature, its acceptance rate is only 7% [13]. Overall, mega-journals demonstrate higher acceptance rates than traditional peer-reviewed journals.

- PLOS ONE: 69% (http://www.plosone.org/static/information)
- BMJ Open: 55% (http://bmjopen.bmj.com/site/about/)
- PeerJ: 58% (https://peerj.com/blog/post/115284878470/what-are-my-chances-of-being-accepted-at-peerj/)
- Biology Open: 51% (http://bio.biologists.org/site/about/about bio.xhtml)

2.5 Rapid Review and Short Publication Cycles

Several mega-journals provide publication timeline information through their websites, press releases, and conference presentations. BMJ Open reports that in 2015, authors received their first editorial decision in an average of 55 days [14]. PeerJ requires an average of 27 days for authors to receive editorial feedback [15], and for accepted manuscripts, an average of 22 days from acceptance to final publication [16]. G3 also promotes rapid publication, with approximately 30 days from submission to first decision and about 56 days from submission to acceptance [17]. FEBS Open Bio reports that in 2015, authors received first decisions in an average of 25 days, with accepted papers published online within 7 days and final versions freely accessible within 20 days [18]. On average, IEEE Access authors receive acceptance or rejection notifications in approximately 4 weeks (28 days), with papers published within 4-6 weeks (28-42 days)

[19]. Beyond official publisher data, researchers have investigated mega-journal publication speeds; for instance, Björk' s statistical analysis indicates that mega-journals require an average of 3-5 months from submission to final publication [4]. Based on these data, mega-journals feature relatively rapid review processes and short publication cycles.

3 Future Impact Analysis of Mega-Journals

As a new form of OA journal publishing, mega-journals have a relatively brief history, and our analysis reveals distinctive characteristics of their publishing model. Current scholarly opinions on their future development fall into two categories. Supporters, such as Claire Creaser, argue that mega-journals are reversing future trends in scholarly publishing [20]; Richard Wellen believes they represent a breakthrough innovation in publishing [21]; and Jean Claude Guédon contends they will become the best system for future scholarly communication [22]. Critics, conversely, include John Hawley, who denounces all mega-journals as "dumping grounds for low-quality content," and Declan Butler, who describes PLOS ONE as a "cash cow"profiting from mass publication [23]; Stephen Pinfield criticizes mega-journals for abandoning traditional content filtering mechanisms [6]. Overall, the future trajectory of mega-journals remains highly uncertain, potentially bringing both positive impacts and new challenges, which we analyze below in conjunction with their characteristics and current development status.

3.1.1 Innovating Scientific Publishing Models

Mega-journals may drive breakthrough innovations in the scholarly publishing ecosystem. First, they break down interdisciplinary boundaries: whereas traditional journals typically confine their scope to specific disciplines, mega-journals' broad disciplinary coverage facilitates connections and cross-pollination among different scholarly communities. Second, they streamline review processes and systems: traditional journals maintain diverse review criteria, requiring publishers to manage numerous journal-specific systems, whereas mega-journals' simpler review standards enable publishers to create streamlined, integrated management systems. Third, they enhance transparency and openness in publication: after undergoing basic peer review, papers enter the public domain for evaluation by the scientific community, where every author can comment on papers and assess their value through peer commentary.

3.1.2 Transforming Scholarly Communication

Mega-journals' distinctive quality control methods have fundamentally transformed scholarly communication. Traditional journals primarily rely on reviewers and editors to evaluate novelty and significance. Mega-journals employ a two-stage quality control process: first, pre-publication peer review assesses "technical soundness" rather than novelty or significance; second, post-publication community evaluation uses usage, citation, and commentary data (Altmetrics)

to determine importance and novelty. This approach enables the scientific community to participate in research evaluation and promotes article-level assessment rather than relying on traditional journal-level metrics such as impact factor. Furthermore, under this evaluation mechanism, the scientific community assesses papers based on their intrinsic quality rather than journal reputation, fostering healthy development of the entire scholarly publishing system.

3.1.3 Accelerating Scientific Publication Speed

Solomon D J's survey of 2,128 authors publishing in four mega-journals identified review/publication speed as one of the most relevant factors influencing their journal choice [24]. A significant impact of mega-journals is their enhancement of speed and efficiency across the scholarly publishing ecosystem. Traditional scholarly publishing requires weeks or months of peer review assessing frontier issues, novelty, and research significance. If requirements are unmet, authors must resubmit to other journals, undergoing similarly lengthy review processes, with articles potentially requiring multiple rounds of review over months or even years before publication. This filtering mechanism may involve redundant reviews of the same article by different experts and editors, wasting substantial time, while authors expend considerable time, energy, and resources during prolonged waiting periods. By contrast, articles submitted to mega-journals that pass "technical soundness" review are rapidly published and enter the public domain, saving time for both reviewers and authors and accelerating the pace of scientific discovery.

3.2.1 Declining Academic Quality of Journal Articles

Mega-journals' unique quality control methods constitute their most controversial feature. While innovating publishing models, transforming scholarly communication, and accelerating publication speed, they may also lead to declining academic quality and influence. Some scholars argue that pre-publication review based solely on "technical soundness"—without considering novelty, significance, or community interest—represents a subjective evaluation mechanism, and that papers passing through such filtering may not represent "good science."Additionally, some mega-journal publishers may prioritize generating revenue through high publication volumes while neglecting quality control. PLOS ONE, the exemplar of mega-journals, has experienced a continuous decline in impact factor, from 4.351 in 2009 to 3.057 in 2015 (Figure 4 [Figure 4: see original paper]). Solomon D J' s survey also identified journal quality (impact factor) as another relevant factor influencing authors' publication choices [24], and Scholarly Kitchen blogger Phil Davis predicts, based on PLOS ONE' s trajectory, that authors will return to traditional discipline-based journals [25].

3.2.2 Emergence of Fraudulent Mega-Journals

OA publishing now accounts for half of scholarly publishing, and this substantial market has attracted both traditional publishers and new OA publishers,

but also created opportunities for malicious actors to create fraudulent journals to extract APCs from authors. Fraudulent journals fall into two categories: predatory journals that create low-quality publications and flood the market with articles, and hijacked journals that create fake websites impersonating legitimate journals [26]. Since mega-journals maintain the OA model of charging APCs and feature high publication volumes, some publishers have exploited these characteristics to create fraudulent mega-journals that publish articles of any quality to generate massive APC profits. For instance, University of Colorado librarian Jeffrey Beall detailed five predatory mega-journals 模仿 PLOS ONE' s publishing model—British Journal of Science, International Journal of Current Research, International Journal of Science and Advanced Technology (IJSAT), International Journal of Sciences (IJSciences), and World Journal of Science and Technology—to help authors identify them [27].

3.2.3 Publishers Profiting from APCs

Traditional (OA) journal publishers primarily rely on subscription fees or author-paid APCs, with rejection rates far exceeding acceptance rates. Following PLOS ONE' s success, many publishers launched mega-journals because they recognized the substantial economic benefits this model could generate. By earning APCs through high acceptance rates and publication volumes, publishers can offset financial losses from their more selective journals. For example, Nature Publishing Group' s mega-journal Scientific Reports published 20,841 articles in 2016 at an APC of $1,675 (compared to $1,418 for regular OA journals), generating annual revenue of $34,908,675. Moreover, Scientific Reports can leverage Nature' s prestige for long-term development. This symbiotic relationship, where mega-journals' finances and reputation complement traditional journals, suggests that mega-journals may simply be tools for publishers to profit from APCs, and using high prestige to mask their limitations may ultimately prove harmful to their future development.

4 Conclusion

This study examines the new open publishing model of mega-journals, analyzing the development status of ten representative titles and systematically discussing this model' s potential positive impacts on future scholarly publishing models, communication methods, and publication speed, while also examining associated challenges such as declining academic quality, emergence of fraudulent mega-journals, and publishers profiting from APCs. Our findings provide references for future mega-journal research and related practical work.

However, this study focuses on providing a comprehensive overview rather than in-depth analysis of key factors such as mega-journals' unique quality control methods. Additionally, data on regular OA and subscription journals were drawn from existing studies rather than primary research. Many questions require future collaborative investigation, including comparisons between mega-journals and traditional OA journals, academic community perceptions of mega-

journals, reviewer perspectives on mega-journal quality control, author motivations for publishing in mega-journals, and prospects for future mega-journal development.

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Note: Figure translations are in progress. See original paper for figures.