The Current State of Open Access in Journals Sponsored by the China Association for Science and Technology[1]

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The open-access (OA) journals among the 1003 journals sponsored by the China Association for Science and Technology (CAST) were identified. Information about the following aspects of the journals were collected and analysed: when each journal was established, its publication cycle, its system model, its region, its discipline, the time between an issue's publication and the posting of the online version, the number of issues that have been made OA, and length of time that it has had an OA policy. On the basis of these results, problems associated with OA journals sponsored by CAST were found and relevant approaches that can promote OA publication in China were recommended.

Keywords: open access, journal, China Association for Science and Technology, online system model, regional distribution, discipline distribution, category distribution, time since adopting OA policy

INTRODUCTION

Open access (OA) refers to the free availability of research on the public Internet that permits any user 'to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their

work and the right to be properly acknowledged and cited.'[2] OA can be provided in two ways: green OA self-archiving, where the author self-archives his or her contribution at the time of its submission to a publication and makes it available via a venue independent of the journal, and gold OA publishing, where the author or author's institution pays a fee to the publisher at publication time that allows the contribution to thereafter be 'free' through the publication's point of access. The two forms of OA are not incompatible with each other.[3]

In China, the movement for OA journals began a little later than elsewhere, but it has undergone a high-speed development. To promote OA in China, the Chinese Academy of Sciences (CAS) launched its platform for OA Journals (CAS-OAJ) in October 2010.[4] CAS-OAJ facilitates navigation to Web pages of OA journals in China and retrieval of OA articles to promote scientific communication and improve influence of journals in China. As of 29 July 2011, CAS-OAJ included 172 journals printed in Chinese or English with complete or optional OA of selected articles.[5] In the Directory of Open Access Journals, 14 journals in China, 12 in Taiwan, and 11 in Hong Kong have been included. In addition, Sciencepaper Online featured 148 journals in natural science, 51 in engineering, 40 in medicine and health, 20 in agricultural science, and 44 in the humanities and social sciences in the catalogue, and this online presence is increasing.[6] Researchers in China, like Ren,[7] Wang et al.,[8] and Cheng et al.,[9] have conducted studies on OA in China. This has greatly contributed to our understanding of OA publication in China. However, no systematic and comprehensive research on OA journals sponsored by CAST has been conducted. CAST is the largest national non-governmental organization of scientific and technological workers in China.[10] CAST devotes itself to boosting the development of science and technology in China and enhancing the science literacy of the whole nation, encourages scientists and engineers of the country to participate in academic exchange and science popularization. As of the end of 2010, CAST was sponsoring 1003 journals, including 699 academic journals, 186 technical journals, 65 popular-science journals, 49 comprehensive journals, and 4 retrieval journals.[11]

In this study, we conducted a systematic analysis of the current situation of OA journals sponsored by CAST and also recommended relevant approaches that can promote OA publication in China.

METHODS

We searched the 1003 journals one by one from September 2010 to May 2011. We searched for each journal by entering its title in Google's search engine, and then we entered its home page to collect information about when the journal was established, its publication cycle, its model of OA, its region, its discipline, the time between an issue's publication and the posting of the online version, the number of issues that have been made OA, and length of time the journal has had an OA policy. We also referred to the *Scientific and Technical Journals Report* (2011) edited by CAST in 2011.

RESULTS

OA journals

At the end of 2010, 241 of the 1003 CAST journals were OA (24 per cent), while in 2007, 101 were (Table 1). In 2010, 70 of the 1003 CAST journals were English, and 30 of the 70 English journals were OA (42.9 per cent).

TABLE 1. OA journals sponsored by CAST

Year	CAST journals	OA journals (%)
2007	898	140 (15.6)
2010	1003	241 (24.0)

Online system model

Table 2 shows the online system models of OA journals. Most OA journals have adopted the single independent online model (i.e., the journal has its own independent domain). The percentage of OA CAST journals using this model increased by 9.9 percentage points between 2007 and 2010. Fewer OA journals have adopted the sponsor-supported online model (i.e., content is accessible on the main Web site of the journal's sponsoring institution), the subjects-information-network-supported online model (i.e., content is located on its own Web site that is supported by a subject information company), or the associated online model (i.e., two or more journals share one domain). The percentage of journals using the sponsor-supported online model decreased

most obviously—by 9.5 percentage points—between 2007 and 2010. This indicates that the single independent online model has become a trend for the OA journals.

TABLE 2. Online system models of OA journals sponsored by CAST

Model	Journals (%)	
	2007	2010
Single independent online	75 (53.6)	153 (63.5)
Sponsor-supported online	19 (13.6)	10 (4.1)
Subjects-information-network-supported online	23 (16.4)	42 (17.4)
Associated online	23 (16.4)	36 (14.9)

Regional distribution

Table 3 shows the regional distribution of journals sponsored by CAST. In 2010, the 241 OA journals were distributed in twenty-four provinces of China. Among them, 125 were from Beijing, 16 from Shanghai, 14 from Shanxi, 12 from Liaoning, 16 from Shanghai, and 6 from Anhui. Since 2007, the regional number OA journals increased by six (eighteen versus twenty-four). From 2007 to 2010, the number of OA journals increased in twenty provinces, did not change in eight provinces (Guangxi, Guizhou, Heibei, Heilongjiang, Jiangxi, Qinghai, Tianjin, Yunnan), and decreased in one province (Shandong). The number of OA journals increased most obviously in Beijing, Shanxi, and Shanghai by forty-eight, ten, and eight, respectively.

Discipline distribution

Table 4 shows the discipline distribution of OA journals sponsored by CAST. We can see that the top six disciplines are industrial technology (sixty-two journals), medicine (fifty-six), mathematical sciences and chemistry (twenty-four), biology (twenty-four), astronomy/earth sciences (twenty-four), and agriculture (eighteen). The four disciplines with the highest percentages of OA journals are biology (52.2 per cent), mathematical sciences and chemistry (42.9 per cent), astronomy/earth sciences (42.9 per cent), and agriculture (32.1 per cent).

TABLE 3. Regional distribution of journals sponsored by CAST, 2010

Regions	Journals (%)	OA journals (%)
Beijing	486 (48.5)	125 (51.9)
Shanghai	72 (7.2)	16 (6.6)
Shanxi	22 (2.2)	14 (5.8)
Liaoning	38 (3.8)	12 (5.0)
Hubei	45 (4.5)	8 (3.3)
Anhui	23 (2.3)	6 (2.5)
Chongqing	17 (1.7)	5 (2.1)
Guangdong	22 (2.2)	5 (2.1)
Hunan	17 (1.7)	5 (2.1)
Jilin	23 (2.3)	5 (2.1)
Jiangsu	44 (4.4)	5 (2.1)
Sichuan	21 (2.1)	5 (2.1)
Gansu	10 (1.0)	4 (1.7)
Shandong	20 (2.0)	4 (1.7)
Zhejiang	16 (1.6)	4 (1.7)
Fujian	11 (1.1)	3 (1.2)
Heilongjiang	24 (2.4)	3 (1.2)
Shanxi	15 (1.5)	3 (1.2)
Tianjin	35 (3.5)	3 (1.2)
Hainan	3 (0.3)	2 (0.8)
Henan	13 (1.3)	1 (0.4)
Neimenggu	7 (0.7)	1 (0.4)
Ningxia	1 (0.1)	1 (0.4)
Qinghai	2 (0.2)	1 (0.4)
Guangxi	1 (0.1)	0
Guizhou	3 (0.3)	0
Hebei	6 (0.6)	0
Jiangxi	3 (0.3)	0
Yunnan	3 (0.3)	0
Total	1003 (100)	241 (100)

Between the years 2007 to 2010, the number of OA journals in each discipline increased. The five disciplines with the greatest increases are medicine (increased by twenty-six journals), industrial technology (nineteen journals), agriculture (fourteen journals), astronomy/earth sciences (thirteen journals), and mathematical sciences and chemistry (twelve journals). Between the years 2007 to 2010, the percentage of OA journals in agriculture, environmental science, and astronomy/earth sciences increased most, by 23.9 per cent, 22.2 per cent, and 21.7 per cent, respectively.

TABLE 4. Discipline distribution of OA journals sponsored by CAST, 2010

Discipline	Journals (% of total)	OA journals (% of journals in discipline)	OA journals as % of CAST OA journals
Industrial technology	293 (29.2)	62 (21.2)	25.7
Medicine	343 (34.2)	56 (16.3)	23.2
Mathematical sciences and chemistry	84 (8.4)	36 (42.9)	14.9
Biology	46 (4.6)	24 (52.2)	10.0
Astronomy/earth sciences	56 (5.6)	24 (42.9)	10.0
Agriculture	56 (5.6)	18 (32.1)	7.5
Culture/science/education/Sports/others	34 (3.4)	6 (17.6)	2.5
Transportation	24 (2.4)	4 (16.7)	1.7
Natural science	34 (3.4)	4 (11.8)	1.7
Aeronautical science	11 (1.1)	3 (27.3)	1.2
Environmental science	9 (0.9)	2 (22.2)	0.8
Economics	13 (1.3)	2 (15.4)	0.8
Total	1003 (100)	241 (24.0)	100

Category distribution

Table 5 shows the category distribution of OA journals sponsored by CAST. We found that academic OA journals account for the largest portion, at 83.4 per cent. From 2007 to 2010, the number of OA journals increased from 140 to 241. Among the new 101 OA journals, 86 are academic journals, 7 are technical journals, 8 are comprehensive journals, and 3 are popular-science journals.

Time of online full-text delivery

Table 6 shows the possible intervals between publication of an issue and online full-text delivery in OA journals sponsored by CAST. In 2010, OA journals that offered electronic editions at the same time as print editions were the biggest group, at 37.2 per cent; meanwhile, OA journals that released electronic edition delayed by three or more issues accounted for 27.3 per cent. From 2007 to 2010, the percentage of OA journals that offered electronic editions before or at the same time as

TABLE 5. The category distribution of OA journals sponsored by CAST, 2010

Category	Journals (% of total)	OA journals (% of journals in category)	OA journals as % of total CAST OA journals
Academic	699 (69.7)	201 (28.8)	83.4
Technical	186 (18.5)	21 (11.3)	8.7
Comprehensive	65 (6.5)	9 (13.8)	3.7
Popular-science	49 (4.9)	10 (20.4)	4.1
Retrieval	4 (0.4)	0 (0.0)	0.0
Total	1003 (100)	241 (24.0)	100

TABLE 6. Time of online full-text delivery of OA journals sponsored by CAST

	Journals (%)	
	2007*	2010
Preceded print edition	4 (2.9)	13 (5.4)
In parallel with print edition	44 (32.4)	90 (37.3)
Delayed by 1 issue	42 (30.9)	55 (22.8)
Delayed by 2 issues	10 (7.4)	17 (7.1)
Delayed by 3 or more issues	36 (26.4)	66 (27.4)
Delayed by 1–12 months	76 (55.9)	111 (46.1)
Delayed by more than 13 months	12 (8.8)	27 (11.2)

* The total number of OA journals in 2007 was 140, but 4 journals were excluded because of incomplete information.

print editions increased by 7.3 percentage points. The percentage of OA journals whose electronic editions were delayed by three or more issues or by thirteen more months increased by 0.8 and 2.4 percentage points, respectively. The percentage of OA journals whose electronic editions were delayed by one to twelve months decreased by 9.8 percentage points.

Volumes published in OA form

Table 7 groups the OA journals sponsored by CAST according to how many volumes have been published. From 2007 to 2010, the number of OA volumes published by OA journals increased significantly; the percentage of OA journals that have published fewer than fifty volumes in OA form decreased from 60.6 per cent to 41.0 per cent; the number of OA journals that have published more than one hundred volumes in OA form increased from 30 to 78.

TABLE 7. Volumes published in OA form by journals sponsored by CAST

Volumes	Journals (%)	
	2007*	2010
Less than 25 volumes	50 (36.5)	63 (26.1)
26–50 volumes	33 (24.1)	36 (14.9)
51–100 volumes	25 (18.2)	65 (27.0)
More than 100 volumes	29 (21.2)	77 (32)

* The total number of OA journals in 2007 was 140, but 3 journals were excluded because of incomplete information.

Time since adopting OA policy

Table 8 groups the CAST OA journals by how long they have had OA policies. We can see that nearly half of the journals became OA in the past three years; 7.9 per cent of journals started OA less than one year ago and 24.7 per cent of journals started OA more than five years ago.

TABLE 8. Time since adopting OA policy of journals sponsored by CAST, 2010

Time	Journals* (%)
Less than 1 year	7 (7.9)
1–3 years	40 (44.9)
3–5 years	20 (22.5)
More than 5 years	22 (24.7)

* The total number of OA journals in 2010 was 241, but only 89 journals had complete information about the time to start OA.

DISCUSSION

Compared with traditional forms of journals, with their high cost, time-consuming browsing, controlled use, and other disadvantages, OA journals play a more positive role in scientific research communication and in the exchange and distribution of scientific information.[12] For example, OA gives authors a worldwide audience larger than that of any subscription-based journal; OA allows readers free access to literature they need for their research; and OA solves the pricing crisis for libraries.[13]

In the past few years, the OA movement has made great strides in developed countries, but it started a little late in China. We can see that at the end of 2010 only 241 — or 24 per cent — of the 1003 CAST journals were available online, and in 2007 there were even fewer, only 101 journals (15.65 per cent). From a regional perspective, nearly half (51.9 per cent) of OA journals sponsored by CAST were based in Beijing, followed by Shanghai (only 6.6%), which reveals significant regional differences in online journal availability. This difference indicates that the development of OA journals is positively associated with economic development and that a higher level of economic strength enables the expansion of OA journals. OA journals in the industrial technology (sixty-two journals), medicine (fifty-six), mathematical sciences and chemistry (thirty-six), biology (twenty-four), astronomy/earth sciences (twenty-four), and agriculture (eighteen) were clearly at the forefront, compared with journals in other fields. Nearly half of the journals began their OA policy in the past three years, and 7.9 per cent of the journals started OA less than one year ago. A total of ninety-nine OA journals have only published less than fifty volumes. This implies that the availability of OA journals and archive storage in China is far behind those of other developed countries.

Chinese science and technology journals should learn from the successful endeavours of developed countries in order to promote OA in China. First, the Chinese government should give more support to OA by, for example, establishing policies ensuring OA of repository materials, changing management mechanisms and registration systems, and resetting academic assessment systems in universities and research institutions.[14] Second, publishers should focus more closely on the transformation of their businesses by introducing new concepts and functionalities that are compatible with OA journals as a further means of supporting OA.[15] Third, Chinese OA journals should promote full-text availability, both by increasing the number of articles in full-text form and decreasing the delay before their availability.

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NOTES

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