*Publications* **2015**, *3*, 190-210; doi:10.3390/publications3030190

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*publications*

**ISSN 2304-6775**

www.mdpi.com/journal/publications

*Article*

# Barriers to Open Access Publishing: Views from the Library Literature

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Academic Editor: Remedios Melero

*Received: 30 May 2015 / Accepted: 02 September 2015 / Published: 3 September 2015*

**Abstract:** The library and information science (LIS) community has an active role in supporting access to information and, therefore, is an important stakeholder in the open access conversation. One major discussion involves the barriers that have hindered the complete transition to open access in scientific publications. Building upon a longitudinal study by Bo-Christer Björk that looked at barriers to the open access publishing of scholarly articles, this study evaluates the discussion of those barriers in the LIS literature over the ten year period 2004–2014, and compares this to Björk's conclusions about gold open access publishing. Content analysis and bibliometrics are used to confirm the growth of the discussion of open access in the past ten years and gain insight into the most prevalent issues hindering the development of open access.

**Keywords:** open access; information science; libraries; scholarly publishing; barriers

## 1. Introduction

The discussion around open access publishing—the free and unrestricted online availability of scholarly literature—has been persistent for over two decades (e.g., Harnad [1]). According to the Budapest Open Access Initiative [2], open access publishing should pose no barrier to a reader other than having access to the Internet. However, while many scholarly journals have embraced open access and the number of open access articles published has grown, there is still much deliberation around the barriers to open access [3].

Libraries and information professionals have always been involved in supporting access to information and knowledge and they play a vital and active role in the success of the open access movement [4,5]. One way to gain an understanding of the discourse around open access is to study the views of the library and information science (LIS) community. The comprehensive role of the LIS professional in open access (*i.e.*, as creator, advocate, consumer, educator, developer) makes them a unique and comprehensive model to measure the overall climate of open access.

In a 2004 study, Bo-Christer Björk [6] explored the barriers that have hindered the complete transition to open access in scientific publications. He then revisited the analysis ten years later to assess the shift over time [7]. He identified six main types of barriers: legal framework, IT-infrastructure, business models, indexing services and standards, academic reward system, and marketing and critical mass. Björk used anecdotes and secondary sources to illustrate open access conditions in 2003 and leveraged data from published studies to report the update.

Borrowing Björk's [6] six types of barriers to open access, this study will evaluate the discussion of barriers in the LIS literature over the ten year period 2004–2014 and compare this to Björk's conclusions. As a proxy for the LIS community dialogue of open access, the research set will examine journals articles from an established LIS database that are indexed with the subject term "open access". This study will first describe characteristics of the research sample such as, publishing models and author traits. Using bibliometrics will enable the detection of trends by measuring changes over time [8,9].

The second phase of this study will specifically investigate the subject of open access barriers within this dataset. Content analysis, a research method that has been used to understand a document's content and make inferences from the data about its context, can be used to gain insight into the development of the six barriers within the literature [10]. This can provide knowledge about the focus of a discipline over a period of time, as it indicates subject trends and major issues that occupy the discourse [11]. Previous LIS research has typically questioned what topics were being discussed within the literature to identify emerging patterns [12,13]. This study, however, will employ directed content analysis, which is a deductive method based on prior research to support or extend an existing theory [14]. This type of content analysis will utilize Björk's [6] existing barrier types as the initial coding categories and employ a coder's interpretations (software algorithms) of the meaning of the content set by identifying words and phrases in the abstracts that define the categories [15]. Björk's [7] conclusion states that the majority of the barriers are lower today than ten years ago. This study builds upon Björk's research to analyze the LIS literature and answer the following research questions: How can the attention to barriers to gold open access be explored using LIS literature; How does this discussion compare to Björk's results; How has the focus on these barriers to open access among the authors of the LIS community changed over time?

## 2. Previous Research

There have been many articles studying the development of open access in the LIS journal literature. The majority use descriptive statistics or bibliometrics to examine publishing characteristics of LIS-related journal publications by analyzing entire journal title contents. Way [16] and Singh, Shah, and Gul [17] report on the availability and growth of open access journals among all of the LIS identified journals from Ulrichsweb: Global Serials Directory (Ulrichs). Many more studies analyze only open-access

LIS-related journals by aggregating appropriate titles from periodical directories, e.g., Directory of Open Access Journals (DOAJ), based on the LIS subject classification [3,18–22]. They describe data such as, the publication's language, distribution, indexing coverage, country of origin, publishing models and licensing, and authorship patterns. Singh and Chikate [23] limit their open access-LIS study to a particular geographic region (Asia) and Yuan and Hua [24] use similar methodology to only research scholarly impact of LIS open access journals demonstrating examples of more narrowly focused open access-LIS studies.

Another method has been to use bibliometrics to examine open access development by drawing random samples of articles from bibliographic databases over time. There are two papers that describe using this method to study the issue of "open access" within LIS literature, not geographically limited. Liu and Wan [25] were the first to survey publication trends of scholarly journal articles on open access in the LIS literature from 2000 to 2005. This study used open access related search terms to extract articles from databases, such as Library and Information Science Abstracts (LISA) and Social Sciences Citation Index, as well as from bibliography lists. The authors analyzed the content by journal type, article type, author type, country type, and content category. Grandbois and Beheshti [26] searched the LISA database for the term "open access" in the title of articles from 2003 to 2011. This study additionally limited their search to English language and peer reviewed journals and reported on availability of the articles, characteristics of the articles and authors, publication trends, and correlations between these attributes.

## 3. Data and Methods

In this study, EBSCO's Library and Information Science Source (LISS) was used to retrieve data from 1994–2014. To get a thorough view of open access within the LIS community, the data (literature or articles) needed to be collected across a wide breadth of journal titles. LISS was selected because it is a comprehensive bibliographic database in the field of LIS that indexes more than 1,700 publications, including Library, Information Science and Technology Abstracts and H.W. Wilson's Library Literature and Information Science Index, a long time a key resource in LIS [27,28]. Previous studies that examined open access in the LIS literature also used subject databases to collect data, but they extracted articles from smaller databases, such as LISA or broader indexes, such as Social Sciences Citation Index [16,25,26,29].

To investigate the express issue of open access, the search term "open access" was used to retrieve all relevant literature by limiting the term to only search the subject field (SU) in the LISS database. Rather than searching by thesaurus term, SU was chosen because according to EBSCO [30], SU is one of the search fields that is common to every database and LISS is actually a combination previously existing databases. In addition, not all SU terms are listed in the database's thesaurus authority file [31]. To illustrate, there are only two open access related terms available in the thesaurus: "Open access publishing" and "Open access publishing—Finance". By more broadly searching in the subject field, the results were not limited and included SU terms, such as, "Open access publishing—Evaluation" and "Open access publishing—Research".

There is much variation in results across other search field options in this database (see Figure 1). Grandbois and Beheshti [26] chose to search for the term "open access" in the article title in the LISA database. However, subject indexing can add search precision to results by providing control for

synonyms, homographs, and related terms [32]. Using this strategy assumes an accurate retrieval of papers on the subject of open access, eliminating articles that use the term "open access" in a different context. For example, the following article has "open access" in the title and abstract but does not discuss open access publishing:

Article Title: ***Open access*** for ill and carers[1]

Abstract: The article reports on a 2013 decision which the British journal publisher, Wiley, made to join a multi-partner program that allows patients and their families free access to ***open access*** articles on medical conditions and their treatment.

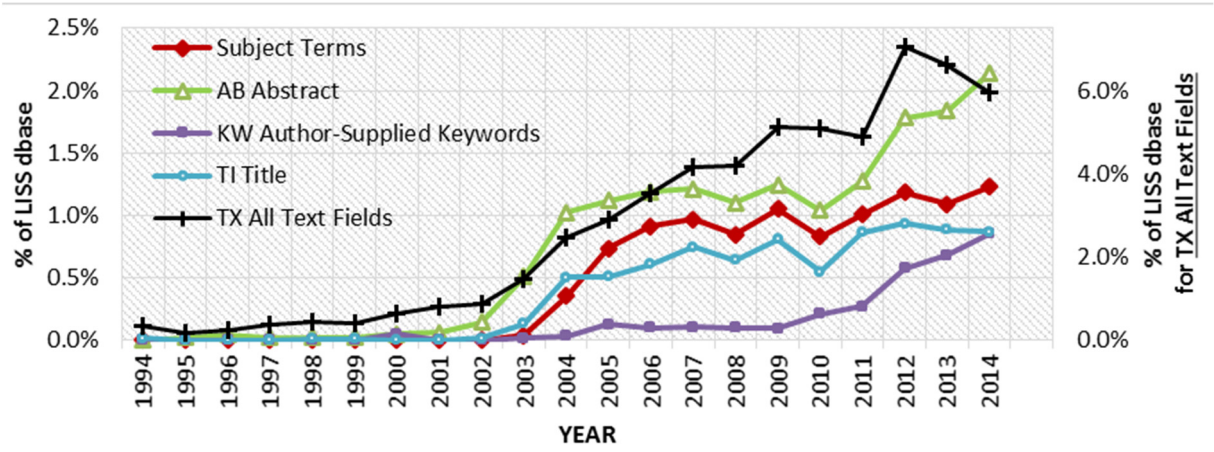


**Figure 1.** Appearance of search term "open access" across different search fields as a percent of the Library and Information Science Source (LISS) database. Limited to journal articles only.

However, it is important to note that there are inherent problems with the subject indexing process which can result in missed indexing [33]. Using subject indexing to generate the sample data does not represent an absolutely complete corpus of open access publishing related papers. For example, the article, "Publication fees for open access journals: Different disciplines-different methods"[2] does not have "open access" as a subject term, but the article examines the percentage of articles in DOAJ that charge authors to publish.

The searches in LISS also limited publication type to academic journal. Per the LISS database coverage list from EBSCO, academic journals represent 50% of the database title coverage and of those, 50% are listed as peer-review. Unlike previous studies, searches were not restricted to peer-review only nor was language limited to English only [26].

To do longitudinal text analysis, abstracts of the entire search results were exported into Excel for each of the years: 2004, 2006, 2008, 2010, 2012, 2014 and were downloaded using the LISS interface record manager tool. Although the LISS database contains full text records, not all records in the result set included the full text and represented only half of the available search results. In addition to establishing a large enough sample size, it is generally accepted that the abstract of a journal article states

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1 Jardim, C.; Pakenham, K.I. Open access for ill and carers. *CILIP Update* **2013**, *12*, 6.

2 Kozak, M.; Hartley, J. Publication fees for open access journals: Different disciplines-different methods. *J. Am. Soc. Inf. Sci. Technol.* **2013**, *64*, 2591–2594.

important ideas found in the body of the article and are an accepted surrogate for the content of a research paper [34]. Table 1 illustrates the distribution of abstract counts used in the content analysis.

**Table 1.** Sequential distribution of abstract counts in the content analysis dataset.

| YEAR | # Abstract |
|---|---|
| 2004 | 33 |
| 2006 | 108 |
| 2008 | 122 |
| 2010 | 120 |
| 2012 | 172 |
| 2014 | 154 |
| Total | 709 |

This study began in 2004 because the appearance of the term "open access" as a subject term did not occur until 2003, which only generated three articles. After removing duplicates and non-English abstracts, 709 cases (abstracts or records) were imported into QDA Miner software and subsequently evaluated in the built-in WordStat Content Analysis program. Applying the extraction tool, 1019 two to five word phrases with a minimum frequency of three and a significant list of keywords with frequency greater than twenty (Appendix 1) were generated. Using Keywords-in-Context[3] as a guide, phrases were selected to characterize each of Björk's barrier types to create a code dictionary (Appendix 2). Text classification was run on the entire dataset to tag each abstract with the corresponding code. Records were examined to ensure the context of the code was correct and manually code additional records using single keyword searches. Number and percentage of cases for each barrier type were calculated.

For a temporal comparison of article characteristics, full citations for the entire search results were exported into Excel for each of the years: 2004, 2009, and 2014. To compare publishing models, open access or subscription publisher information was added using Ulrichs. As this information was collected in 2015, discrepancies could exist with earlier data (2004 or 2009) if a title shifted from subscription to open access since it would be recorded as open access. The extent of this was not investigated.

To assess author characteristics, author affiliation information was collected directly from individual articles. To maximize the data set, but maintain a uniform sampling size, 37, 35, and 36 records from 2004, 2009, and 2014 were examined respectively as 37 was the total number of records in 2004. Geographic location of the author was identified and author's professional position or affiliation was categorized into sectors. Authors affiliated with a library or who maintained an information science position were tagged as LIS Community. Academic (non-LIS) included professors, administrative, and researchers working in any other discipline (e.g., engineering, computer science). Any author associated with a publisher or society was labelled Publisher/Society and those identified as students were also categorized. Excel software was used to describe the data.

[3] A tool to utilize the surrounding words to understand the underlying meaning of the identified keyword.

## 4. Results

### *4.1. Bibliometric Analysis*

Figure 2 shows the difference in publishing models for the representative sample of articles in the LIS literature discussing open access. While there appears to be a slight increase (9%) in publishing in open access journals over the past ten years, this is still a very small percentage (25%) of the articles examining open access as a topic overall. Indeed, over the last five years, there has been virtually no increase in "open access" articles being published in open access journals. These results compliment Grandbois and Beheshti's [26] analysis of 203 "open access" articles from 2003–2011 in which they reported 25% were published in open access journals.

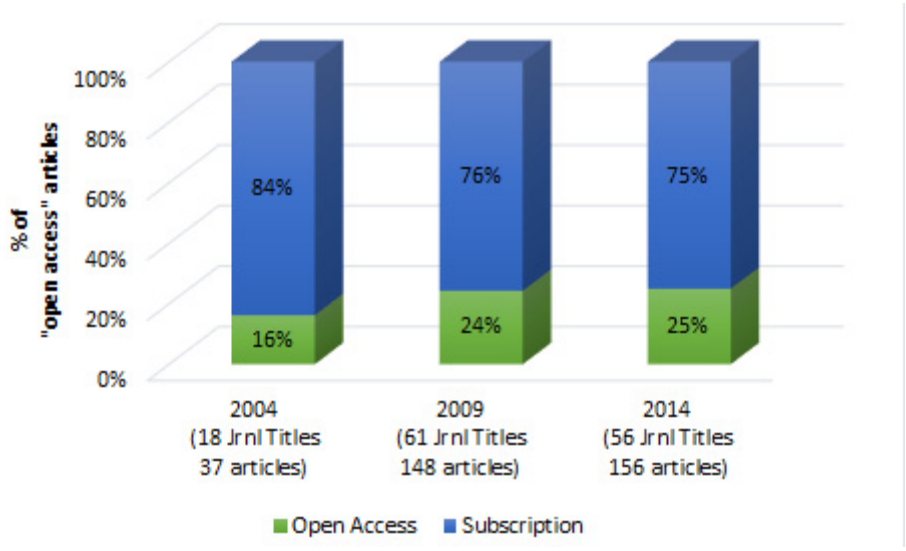


**Figure 2.** Percentage of journal articles with subject term "open access" by publishing model.

The geographic distribution of authors discussing open access can be seen in Figure 3. In 2004, 98% of the authors of articles in LISS with the subject term "open access" were from North America and Europe. North American authors (56%) only had a slight advantage over European authors (42%). Over the next five and ten years, these two regions still comprised the majority of authors, but the overall percentage dropped to 73% and 74% respectively. The remaining approximately 25% of authors represented thirteen countries in 2009 and nine countries in 2014. While the authors are predominantly from North America and Europe, there is an interesting positive trend of Indian authors (Figure 4). This correlates to an overall increase in open access initiatives and publishing channels in India [35]. For example, over the period 2007–2011, the number of Indian open access journals increased by nearly 180% while the total number of all open access journals only increased by 58% [36,37]. However, Singh *et al.* [17] demonstrate that Indian journals in 2014 only comprise 5% of all LIS journals.

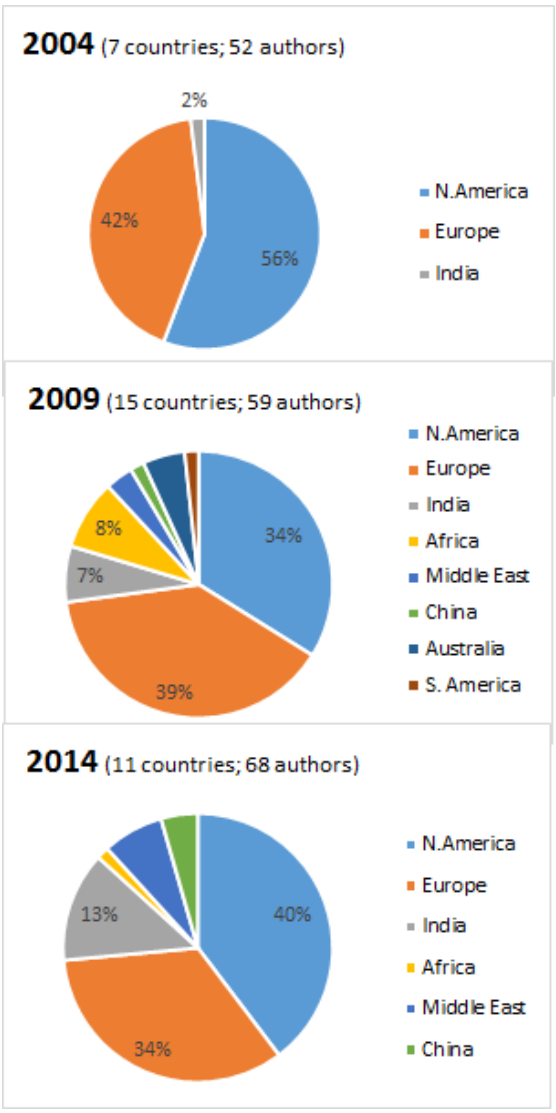


**Figure 3.** Geographic distribution of authors of journal articles with subject term "open access".

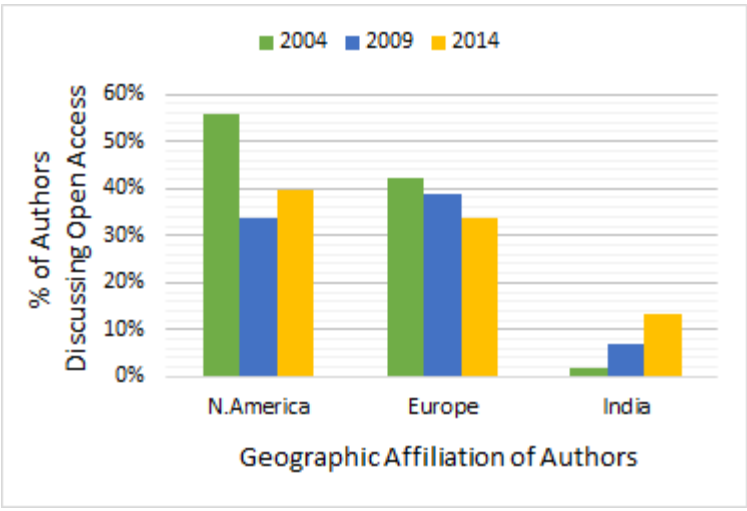


**Figure 4.** Growth trend of top three geographic regions of authors of journal articles with subject term "open access".

Figure 5 presents a view of the author's affiliation sector among the open access literature across the three years. The majority of author's discussing open access are from the LIS community and the percentage of authors from the LIS community has not changed over the past five years. At the same time, there appears to be a decrease in the number of non-LIS academic authors publishing about open access in the LIS literature. Although Liu and Wan [25] used slightly different parameters to classify their author types, for 2004 they reported similar percentages for LIS community (37%) and Academics (31%). The results in Figure 5 show 23% for publisher/society affiliation which is higher than Liu and Wan's [25] 16% for publishing professionals, but their study did not include author's affiliated with societies in this category.

Is it also important to note that the goal of the bibliometrics analysis was to describe the overall characteristics of the data, the process of which was quite labor intensive. The reported data only represents analysis of a subset of the total dataset, however the results did corroborate with previous studies.

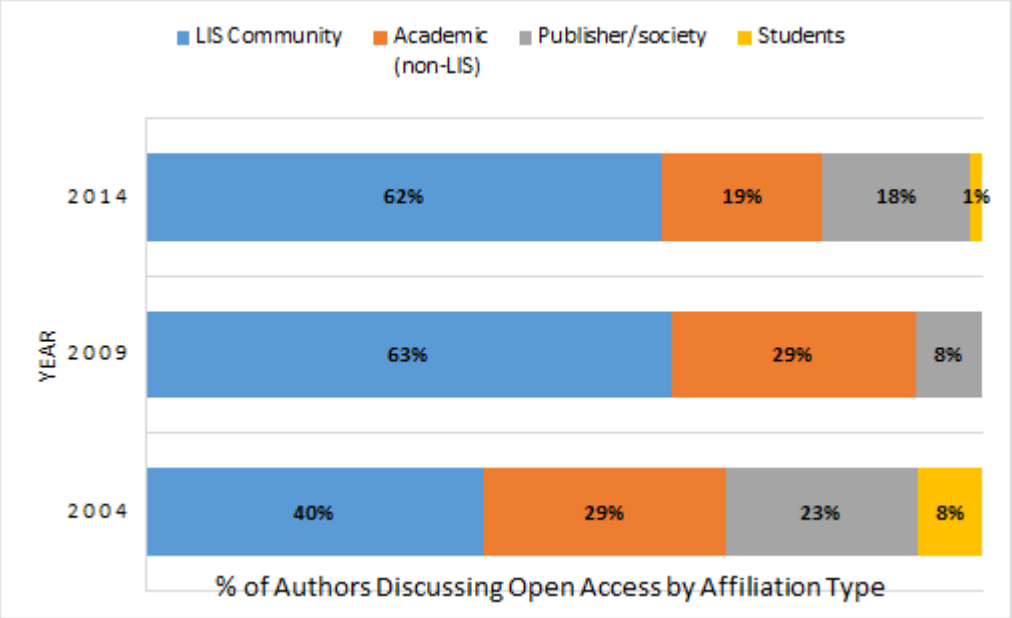


**Figure 5.** Percentage of journal articles with subject term "open access" by author affiliation type.

### *4.2. Content Analysis*

Out of 709 article abstracts with subject term "open access," 72% were classified with "barrier" codes. Figure 6 shows the percentage of abstracts coded for each barrier type over all the years combined (2004–2014). Almost 30% of all articles were classified as business models, which is more than two times greater than all other barrier types. Marketing and critical mass, IT infrastructure, and legal framework each classified only 8% of the abstracts.

The percent change in the number of abstracts classified by each barrier type over the entire ten year period can be seen in Figure 7. There is a decrease in the percentage of abstracts per barrier type, except for the increase in legal framework. However, by dividing the ten year period into two year intervals and visualizing the percentage of abstracts for each barrier type illustrates much variability among the abstract classification over the time frame (Figure 8).

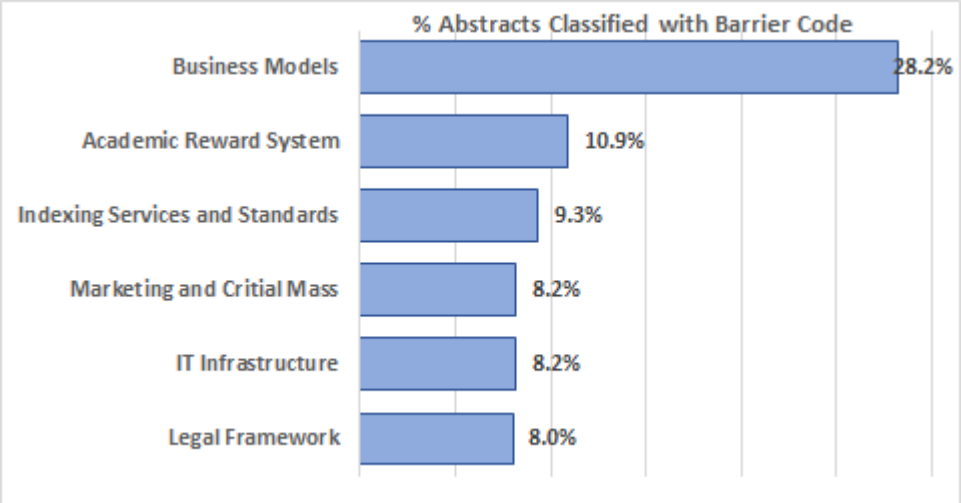


**Figure 6.** Percentage of "open access" abstracts coded for each barrier type over all the years combined (2004–2014) ($n$ = 709).

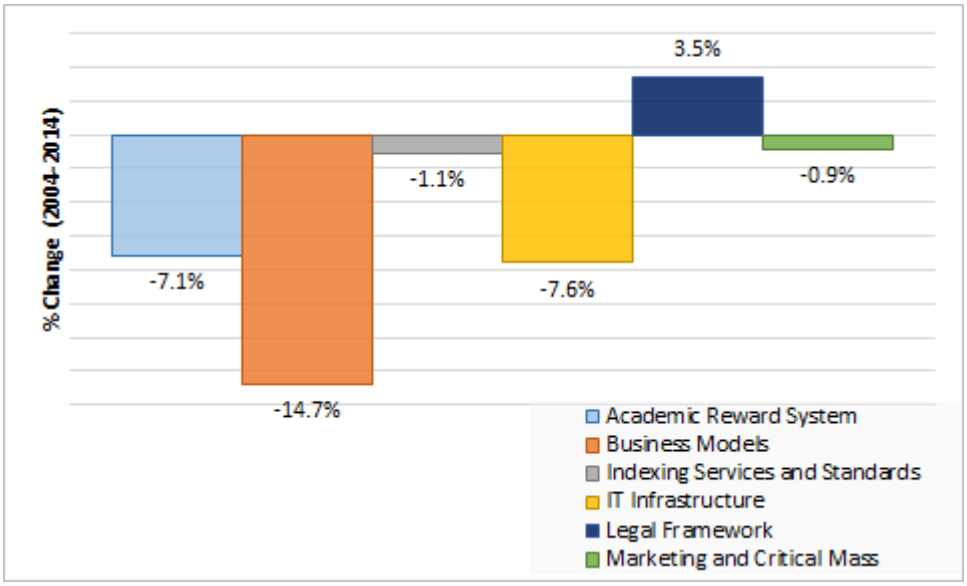


**Figure 7.** Percentage change for each barrier type over the ten year period, 2004–2014.

## 5. Discussion

Björk's [7] discussion of barriers to open access details how each barrier can impact open access publishing parsed into broad publishing channels—journals that make content freely available (gold open access) and authors, or third parties, making their content available by depositing into repositories (green open access). Within this division, he also subjectively ranks how much the barrier impedes the development of open access over time based on anecdotal evidence and other research. This content analysis, however, is only considered through Björk's lens of journal publishing channels or gold open access. The bibliometric data collected in this study is used to describe the data sample and also gauge how the LIS community compares to some of Björk's barriers dialog. To begin, the majority of authors in this this study, those discussing "open access," are LIS professionals either affiliated with a library or

maintain an information science position (see Figure 5). Their geographic affiliation is predominantly North American and European (see Figure 3).

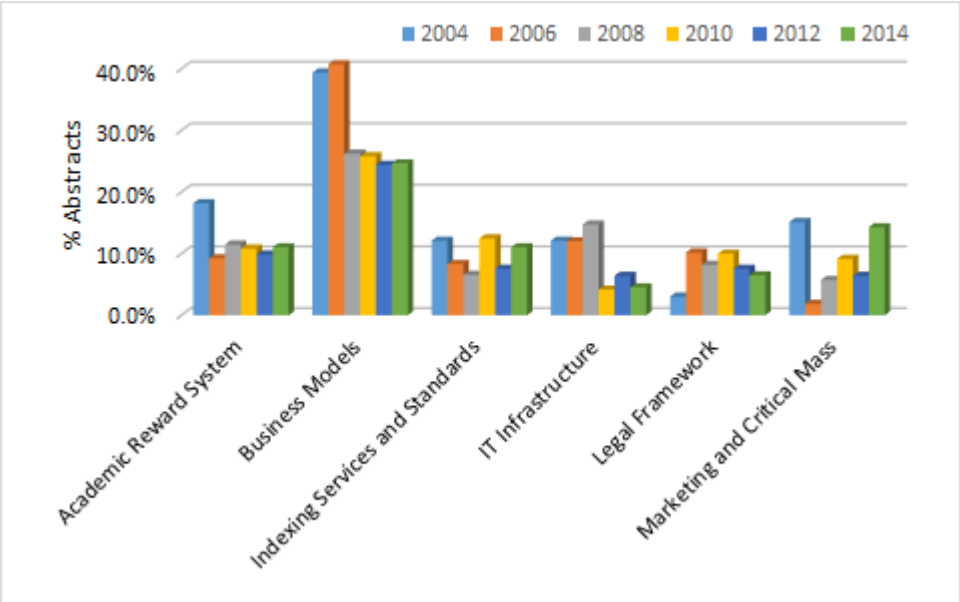


**Figure 8.** Percentage of "open access" abstracts for time period 2004–2014 by two year intervals for each barrier type.

In addition to describing the data, this study uses text mining to specifically explore the barrier types within the LIS literature. This analysis of the LIS literature assesses the appearance over time of the topics that depict the barrier within the discussion of open access; it does not evaluate the impact of that barrier on open access. In other words, a negative percentage value in an individual barrier from Figure 7 does not imply that topic is no longer a barrier to open access initiatives. Instead, it does indicate a decrease in the percentage of articles being published that contained subject matter related to the barrier type. This, however, could infer that the interest of the LIS community in that topic decreased.

Björk's [6] study also included his interpretation of importance for each barrier by ranking how much a barrier might disrupt the rapid transition to open access. A mashup of the two datasets can be seen in Figure 9, where the bars represent the occurrence of a barrier as a topic in the LIS literature (LIS interest) and the stars denote Björk's ranking system (three=high). This comparison shows similarities, for example in in 2004[4] the academic reward system, business models, and marketing are assigned the highest rank by Björk and concurrently show the highest percentage of articles (interest) for that year. It certainly stands to reason that if a topic is considered disruptive to an existing system, the professionals in the field would be discussing the topic. And following that reasoning, a barrier that no longer imposes constraints to open access would be less prevalent in the literature.

The discussion around IT infrastructure illustrates this supposition. By 2004, the technology for electronic publishing of scholarly literature was established and the subsequent development of new technologies only facilitated further publishing opportunities and initiatives [38]. Björk's [7] assessment that IT infrastructure is no longer a barrier to gold open access is similar to the decline in the percentage

[4] Note: Björk's 2013 data is aligned with 2014 data

of IT-infrastructure related articles. While IT and infrastructure are still important to open access, there is little controversy around the need, which is generally an impetus for the intensification of a topic in the literature. The articles that do appear in 2014 report on specific software and technology integration by organizations, not necessarily dynamic debates.

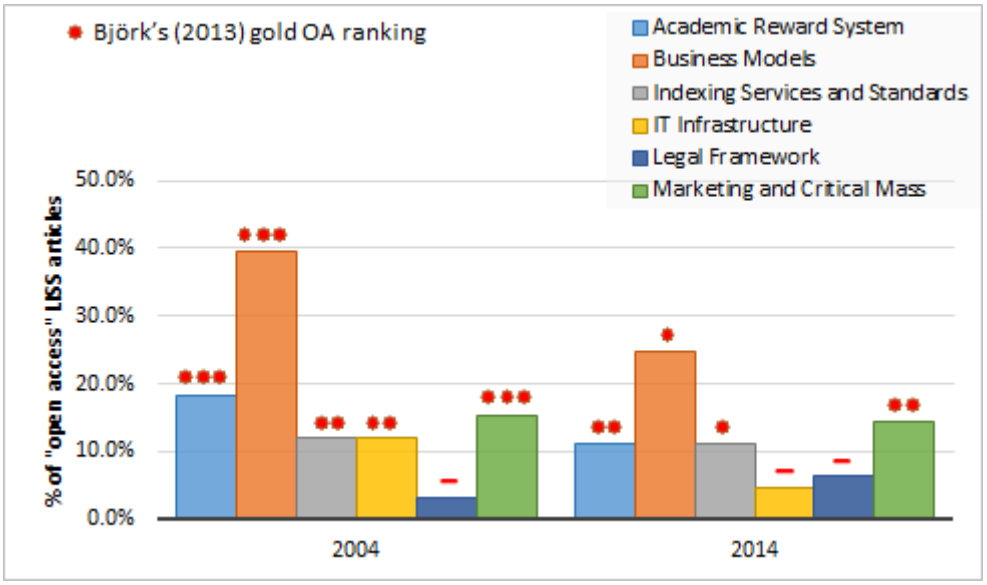


**Figure 9.** A mashup of Björk's [7] ranking system for gold open access (open access journals) with content analysis data. Note: Björk's data is aligned per his article publication dates.

This interesting parallel continues as the decrease in the topics surrounding the barriers (Figure 7) corresponds with Björk's [7] conclusion that the barriers have indeed decreased in the past ten years. One disparity is that while there is an increase in the discussion of legal framework, Björk [7] argues that it had no change to the impact of open access over ten years (Figure 9).

Björk [6] assigns no rank to legal framework stating that the copyright agreements for open access journals do not hinder the development of open access; ten years later he does not alter the assessment. The content analysis data likewise indicates that legal framework issues are not prevalent in the literature in 2004 and although there is an increase in the percentage of literature published in 2014, it is still low compared to the other topics. Björk [7] pointed to the rising popularity of the Creative Commons licenses to further support his conclusion. While copyright exists to protect the rights of an owner of an original work by imposing restrictions on re-use, Creative Commons licenses "maximizes digital creativity, sharing, and innovation" by enabling a license holder to grant specific permission terms for using, modifying, and repurposing their work [39] (para 10). By facilitating sharing and re-use in and open access environment, Creative Commons' licenses would certainly reduce the legal framework barrier to open access and accordingly, there has been massive uptake. In 2009, the estimate number of works with a Creative Commons licenses was 350 million [40]. However, this is a legal tool, not a law, and it is not always clear how to apply the licenses to specific situations and some argue it can be manipulated to clash with open access goals [41,42]. Therefore, as the LIS community endeavors to understand the issues, it follows that there would be an increase in the extent of articles about legal framework topics in the literature.

Björk's [6,7] description of the academic reward system as another barrier to open access points to the academic tenure system as a driver. He explains that the perception of open access journals lacking quality and citation impact effect an author's decision on where to publish for career promotion. He states that the situation is improving, for example open access journals now have traditional impact factors [7]. Recent studies have confirmed that there is no difference in the scientific impact of open access vs non-open access journals and that an open access article is more likely to be used and cited than one behind subscription paywalls [43,44]. In addition, surveys are showing that researchers do not believe publishing in open access journals would be considered a disadvantage by tenure and promotion committees [45]. Yet, in 2014, only 25% of all the LIS articles about open access were published in open access journals (Figure 2). Although this represents an overall increase over the ten years, it is still a small percentage considering the content of these articles includes some discourse regarding the unrestricted online access to scholarly information. It is reasonable assumption that as the prestige of open access journals increases, the academic reward system barrier would decrease. However, it is quite possible that author behavior is lagging behind attitude and the barrier is still present. Figure 2 clearly shows there has been little increase in the percentage of these articles being published in open access journals in the past five years.

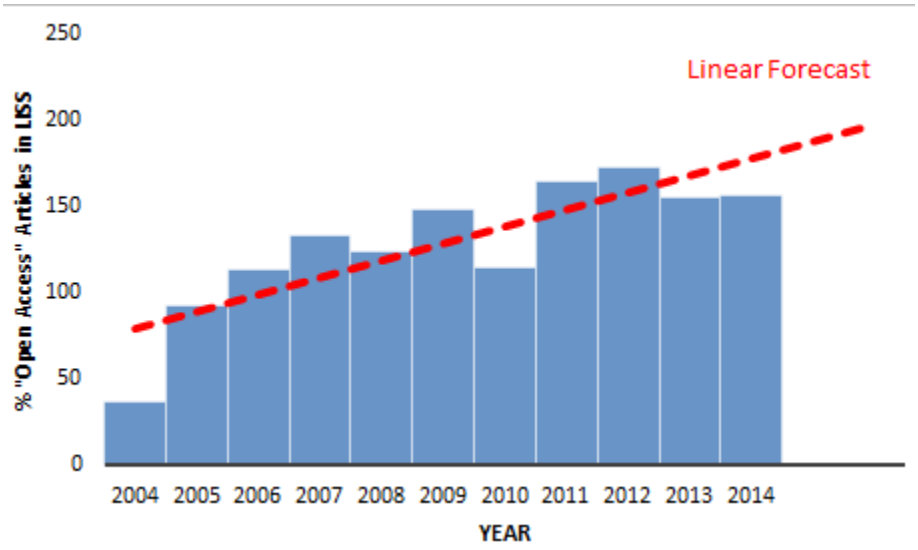


**Figure 10.** Growth and predictive growth of articles in LISS database with subject field (SU) "open access".

Björk [6] discussed that marketing and branding are critical to the viability of scholarly journals as they are dependent upon getting authors to submit their best papers to remain in the market. He used the longitudinal growth of open access journals and articles to support his claim that the marketing and critical mass barrier to open access has decreased as more and more open access articles are published [7]. Singh *et al.* [17] reported that the growth of LIS journals in DOAJ increased from 3% in 2004 to 23% in 2014. Figure 10 demonstrates the growth of LIS articles specifically discussing open access. The volume of articles that contained the subject term "open access" tripled from 0.4% in 2004 to 1.2% in 2014 and the trend is to continue. This represents an increased discussion of "open access" by the LIS community via increased amount of articles about open access published. This does support Björk's

view, however, this is still a very low percentage of the total output from the LIS community. At the same time, the content discussion of open access journal marketing and critical mass did show a decrease, albeit very slight. As more published articles about open access continue to grow, the discussion about the volume of open access journals continues.

Business models is another barrier type that Björk [7]explains has decreased and although the content analysis data corresponds, mechanisms to keep an open access journal operating still remains an important topic in the LIS literature. Many open access business models have emerged and are becoming accepted by publishers, such as, author publishing charges [46]. However, until the situation stabilizes, the continued discussion and interest of the LIS community—as seen as a high percentage of articles about business models in 2014—is reasonable.

Björk [6] describes the extent to which a journal is indexed in commercial indexing services as the indexing services and standards barrier to open access. These services assist the visibility and access to journals and often lend prestige to a title [47]. Per Björk [7], after ten years the increase in open access journals appearing in newly developed indexes (e.g., DOAJ, Scopus) supports his claim that this barrier has decreased. The content analysis data shows only a slight decrease, however, implying that the topic has not decreased among the LIS community. In fact, while the availability of open access articles in commercial indexing services is still low, research is showing that the influence of the literature is increasing [48]. Instead of the discussion decreasing, it has shifted from quantifying the open access journals in commercial services to new ways of discovering open access content and new methods of measuring journal impact.

## 6. Final Remarks

This study adds to the dialog of barriers to gold open access by exploring the voice of the LIS community and illustrating changes in interest over time. As LIS professionals are major stakeholders in all things open access, this can represent the most prevalent views in that scholarship. The bibliometric data confirmed that this was an appropriate sample set and additionally verified the growth of the discussion of open access in the past ten years and beyond. This study additionally complemented Björk's results that the majority of the barriers to gold open access are lower today than ten years ago. Analyzing the dataset specifically for the factors that impede open access showed a correlation between what previous studies have quantified and what is considered a prevalent topic in the LIS literature, thus an important issue to open access.

Although it would result in a smaller sample size, further research might consider analyzing full text instead of article abstracts. The articles selected for this analysis were collected from multiple sources and this had an effect on the consistency of the sample. Some journals contained very structured abstracts while others only provided a single sentence or did not state the purpose and/or conclusion of the study. Other investigations have also shown that when using text mining methods, abstracts have different structural and content characteristics from article bodies even when the abstracts are similarly structured [49,50].

This study produced more data that can be further investigated to increase the understanding of the LIS dialogue around open access. While this project specifically compared 2004 to 2014 to represent the change over the ten years, the two year incremental data (Figure 8) shows much variation within the

time frame. Additional research into this temporal change could further shed light on what factors (e.g., political, cultural) are enmeshed in the prevalent barriers to open access as well as illuminate emerging conversations to identify new obstacles impeding an open access transition. Recognizing and studying the vital role of LIS in the open access discussion (*i.e.*, strategies and best practices) is critical to the continued growth and development of this scholarly communication.

**Acknowledgments**

The author would like to thank Dr. Carol Tenopir for her endless support and guidance and the opportunity to participate in Team Science at the School of Information Science, University of Tennessee-Knoxville.

**Conflicts of Interest**

The author declares no conflict of interest.

## Appendix

**Table A1.** List of keywords with frequency >20. Includes the number of cases (abstracts) in which each keyword appears.

| Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACCESS | 1566 | 639 | WORK | 88 | 70 | INITIATIVE | 54 | 44 | SOCIETY | 41 | 31 | PROBLEMS | 31 | 25 |
| OPEN | 1476 | 635 | INCLUDING | 87 | 83 | BENEFITS | 52 | 43 | HUMANITIES | 40 | 30 | PRODUCTION | 31 | 20 |
| RESEARCH | 627 | 297 | PEER | 87 | 66 | ISSUE | 52 | 42 | PRINT | 40 | 35 | SUPPLY | 31 | 13 |
| JOURNALS | 588 | 241 | WORLD | 87 | 70 | SEARCH | 52 | 31 | SIGNIFICANT | 40 | 36 | AWARENESS | 30 | 25 |
| OA | 511 | 149 | BUSINESS | 85 | 55 | SERVICE | 52 | 31 | VISIBILITY | 40 | 30 | CENT | 30 | 10 |
| PUBLISHING | 487 | 270 | FREE | 85 | 68 | COMMERCIAL | 51 | 41 | DISCIPLINES | 39 | 30 | COMMUNICATIONS | 30 | 19 |
| ARTICLE | 429 | 345 | DESIGN | 84 | 82 | STATUS | 51 | 32 | RECENT | 39 | 36 | DISSERTATIONS | 30 | 16 |
| INFORMATION | 413 | 252 | COMMUNITY | 83 | 69 | CHALLENGES | 50 | 43 | LAW | 38 | 24 | EDITORS | 30 | 23 |
| SCHOLARLY | 341 | 213 | PROVIDE | 83 | 72 | COSTS | 50 | 40 | SOFTWARE | 38 | 28 | LIBRARIAN | 30 | 21 |
| REPOSITORIES | 289 | 123 | SURVEY | 83 | 45 | FUNDED | 50 | 43 | TYPES | 38 | 27 | MEMBERS | 30 | 25 |
| JOURNAL | 265 | 159 | ARCHIVING | 81 | 45 | OFFERS | 50 | 48 | ACTIVITIES | 37 | 31 | PROGRAM | 30 | 17 |
| PAPER | 265 | 159 | RELATED | 81 | 69 | INDIA | 49 | 24 | AVAILABILITY | 37 | 27 | READERS | 30 | 27 |
| LIBRARY | 250 | 168 | INCLUDE | 80 | 73 | LEVEL | 49 | 42 | FOCUS | 37 | 34 | SCHOLAR | 30 | 20 |
| LIBRARIES | 237 | 154 | PROJECT | 77 | 46 | MAJOR | 49 | 44 | INTRODUCTION | 37 | 36 | ADVANTAGE | 29 | 14 |
| ARTICLES | 229 | 112 | SUPPORT | 77 | 63 | SYSTEMS | 49 | 39 | MAIN | 37 | 35 | CENTRAL | 29 | 25 |
| ACADEMIC | 226 | 137 | CURRENT | 76 | 65 | GROUP | 48 | 38 | OPPORTUNITIES | 37 | 34 | CITED | 29 | 19 |
| SCIENTIFIC | 222 | 120 | FUTURE | 76 | 66 | HEALTH | 48 | 30 | PRACTICES | 37 | 29 | CONSIDERED | 29 | 26 |
| STUDY | 212 | 132 | PRESENTED | 76 | 74 | DIRECTORY | 47 | 35 | BOOK | 36 | 25 | CONTEXT | 29 | 27 |
| UNIVERSITY | 209 | 135 | PRESENTS | 76 | 75 | FIELD | 47 | 39 | FREELY | 36 | 31 | EXAMINED | 29 | 29 |
| DIGITAL | 201 | 121 | UNIVERSITIES | 76 | 55 | FOCUSES | 47 | 47 | LEGAL | 36 | 23 | IMPORTANCE | 29 | 27 |
| INSTITUTIONAL | 187 | 113 | MAKE | 74 | 62 | FULL | 47 | 35 | PROVIDING | 36 | 36 | MEANS | 29 | 28 |
| PUBLISHERS | 184 | 120 | METHODOLOGY | 74 | 70 | GENERAL | 47 | 40 | SCIENTISTS | 36 | 25 | PARTICIPANTS | 29 | 13 |

**Table A1.** *Cont.*

| Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATA | 180 | 89 | TOPICS | 74 | 70 | HIGH | 47 | 42 | DOCUMENTS | 35 | 20 | TERMS | 29 | 22 |
| AUTHORS | 178 | 120 | ANALYSIS | 73 | 50 | COST | 46 | 35 | FACTOR | 35 | 21 | ARCHIVE | 28 | 21 |
| SCIENCE | 168 | 110 | CITATIONS | 73 | 30 | MATERIALS | 46 | 29 | PART | 35 | 32 | CHANGE | 28 | 22 |
| RESEARCHERS | 162 | 96 | SOCIAL | 73 | 53 | MEDICAL | 46 | 31 | PROJECTS | 35 | 30 | COLLECTED | 28 | 23 |
| MODEL | 159 | 93 | SYSTEM | 73 | 59 | SHARING | 46 | 37 | RESOURCE | 35 | 32 | COMPARED | 28 | 21 |
| IMPACT | 158 | 102 | REPORTS | 71 | 69 | THESES | 46 | 21 | RIGHTS | 35 | 28 | GOVERNMENT | 28 | 19 |
| REPOSITORY | 151 | 84 | INITIATIVES | 70 | 53 | YEARS | 46 | 40 | SPECIFIC | 35 | 26 | METHODS | 28 | 27 |
| PUBLICATION | 149 | 99 | TECHNOLOGY | 70 | 57 | ARCHIVES | 45 | 37 | ACCESSIBLE | 34 | 28 | TITLES | 28 | 15 |
| COMMUNICATION | 146 | 108 | PAPERS | 69 | 36 | BOOKS | 45 | 34 | EXISTING | 34 | 31 | TRENDS | 28 | 22 |
| LIBRARIANS | 140 | 91 | MANAGEMENT | 68 | 51 | DESCRIBES | 45 | 44 | GROWING | 34 | 32 | ACCESSIBILITY | 27 | 20 |
| BASED | 139 | 115 | FUNDING | 67 | 47 | DOAJ | 45 | 26 | IDENTIFIED | 34 | 26 | BARRIERS | 27 | 24 |
| DISCUSSES | 138 | 129 | SCHOLARS | 67 | 47 | EDUCATION | 45 | 37 | INCLUDED | 34 | 24 | CREATION | 27 | 20 |
| LITERATURE | 138 | 80 | DISCUSSED | 66 | 62 | INCREASE | 45 | 37 | PRESERVATION | 34 | 24 | GREY | 27 | 8 |
| WEB | 137 | 84 | INTERNET | 66 | 58 | METADATA | 45 | 24 | PROVIDED | 34 | 33 | LACK | 27 | 24 |
| AUTHOR | 134 | 93 | ORIGINALITY | 66 | 66 | STUDENTS | 45 | 32 | STATE | 34 | 29 | NETWORK | 27 | 24 |
| PUBLISHED | 132 | 99 | POLICY | 66 | 48 | ENVIRONMENT | 44 | 40 | WAYS | 34 | 32 | PHYSICS | 27 | 21 |
| ELECTRONIC | 131 | 95 | ROLE | 66 | 54 | POLICIES | 44 | 35 | CASE | 33 | 32 | SELECTED | 27 | 23 |
| KNOWLEDGE | 127 | 84 | USERS | 66 | 49 | SUBSCRIPTION | 44 | 38 | COUNTRY | 33 | 24 | SET | 27 | 22 |
| ONLINE | 127 | 84 | COUNTRIES | 65 | 39 | DATABASES | 43 | 21 | FORM | 33 | 30 | SOURCES | 27 | 20 |
| CONTENT | 126 | 80 | QUALITY | 65 | 50 | FACTORS | 43 | 29 | HELD | 33 | 30 | USAGE | 27 | 18 |
| FINDINGS | 125 | 105 | COPYRIGHT | 62 | 45 | GLOBAL | 43 | 34 | INFRASTRUCTURE | 33 | 26 | USER | 27 | 22 |
| PUBLIC | 119 | 81 | NATIONAL | 60 | 46 | HIGHER | 43 | 36 | LIS | 33 | 14 | YEAR | 27 | 21 |
| FACULTY | 118 | 46 | TRADITIONAL | 60 | 48 | KEY | 43 | 40 | OUTPUT | 33 | 25 | ADOPTION | 26 | 20 |
| ISSUES | 117 | 89 | PUBLISHER | 59 | 46 | TECHNICAL | 43 | 36 | RATE | 33 | 23 | DIFFERENCES | 26 | 21 |

**Table A1.** *Cont.*

| Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES | Keyword | FREQ | NO. CASES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| APPROACH | 115 | 97 | PROCESS | 58 | 50 | TOOLS | 43 | 35 | AREAS | 32 | 26 | INFLUENCE | 26 | 21 |
| PURPOSE | 111 | 76 | GOOGLE | 57 | 31 | DISCUSSION | 42 | 35 | COLLECTIONS | 32 | 22 | MATERIAL | 26 | 21 |
| INSTITUTIONS | 108 | 76 | IMPLICATIONS | 57 | 44 | DISSEMINATION | 42 | 37 | EXAMINES | 32 | 30 | PROFESSIONAL | 26 | 19 |
| DEVELOPMENT | 107 | 91 | IMPORTANT | 57 | 52 | REPORT | 42 | 34 | GROWTH | 32 | 30 | REGARD | 26 | 19 |
| MOVEMENT | 106 | 80 | PUBLISH | 57 | 45 | SCHOLARSHIP | 42 | 35 | INCREASING | 32 | 29 | SAMPLE | 26 | 17 |
| PUBLICATIONS | 104 | 79 | SUBJECT | 57 | 41 | UK | 42 | 34 | MAKING | 32 | 28 | AMERICAN | 25 | 18 |
| RESOURCES | 103 | 75 | DEVELOPING | 56 | 38 | AIMS | 41 | 38 | PRESS | 32 | 21 | GOLD | 25 | 16 |
| RESULTS | 100 | 82 | INTERNATIONAL | 56 | 47 | COLLECTION | 41 | 26 | STUDIES | 32 | 32 | CHINA | 24 | 12 |
| REVIEW | 100 | 70 | IR | 56 | 18 | DATABASE | 41 | 27 | TEXT | 32 | 25 | AGE | 23 | 13 |
| SERVICES | 98 | 66 | SOURCE | 56 | 40 | DOCUMENT | 41 | 21 | DEVELOP | 31 | 28 | INDIAN | 23 | 9 |
| CITATION | 97 | 37 | POTENTIAL | 55 | 52 | EUROPEAN | 41 | 29 | DEVELOPMENTS | 31 | 22 | RESPONDENTS | 23 | 12 |
| MODELS | 94 | 71 | TIME | 55 | 46 | INSTITUTION | 41 | 32 | ECONOMIC | 31 | 25 | SKILLS | 23 | 10 |
| SCIENCES | 89 | 62 | CONFERENCE | 54 | 45 | PRESENT | 41 | 38 | EDUCATIONAL | 31 | 21 | IRS | 22 | 11 |
| NUMBER | 88 | 64 | DEVELOPED | 54 | 44 | REVIEWED | 41 | 39 | INCREASED | 31 | 29 | ETDS | 21 | 7 |

**Table A2.** WordStat extracted phrases selected to create code dictionary.

| | |
|---|---|
| **ACADEMIC_REWARD_SYSTEM** | |
| ALTERNATIVES_TO_THE_IMPACT_FACTOR | INCREASED_IMPACT |
| CHOICE_OF_A_JOURNAL | JOURNAL_CITATION |
| CITATION_IMPACT | METRICS_FOR |
| CITATION_IMPACTS | METRICS_IN |
| CITATION_INDICATORS | PRESTIGE |
| DECIDING_WHERE_TO_PUBLISH | PUBLISHING_IN_OPEN_ACCESS_JOURNALS |
| FACTORS_THAT_MOTIVATE | RANKED_JOURNALS |
| GREATER_RESEARCH_IMPACT | RESEARCH_IMPACT |
| IMPACT_ADVANTAGE | SCIENTIFIC_PUBLISHING_AND_PEER_REVIEW |
| IMPACT_FACTOR | JOURNAL_CITATION |
| CHOICE_OF_A_JOURNAL | TENURE_AND_PROMOTION |
| IMPACT_FACTORS | |
| **BUSINESS_MODELS** | |
| ALTERNATIVE_MODELS | MODEL_OF_OPEN_ACCESS |
| APCS | MODELS_FOR_SCIENTIFIC |
| ARTICLE_PROCESSING_CHARGES | OA_BUSINESS |
| AUTHOR_CHARGES | OA_MARKET |
| AUTHOR_PAYS | OA_MODEL |
| BIG_DEAL | OA_MODELS |
| BIG_DEALS | OA_MOVEMENT |
| BUSINESS_MODEL | OPEN_ACCESS_MODEL |
| BUSINESS_MODELS | PAYS_MODEL |
| COSTS_OF_PUBLISHING | PUBLICATION_CHARGES |
| ECONOMIC_REALITIES | PUBLICATION_FEES |
| FINANCIAL_SUSTAINABILITY_OF | PUBLICATION_MODEL |
| FREE_OF_CHARGE | PUBLISHING_BUSINESS |
| FUNDING_AGENCIES | PUBLISHING_FEES |
| FUNDING_AGENCY | PUBLISHING_MODEL |
| GOLD_OA | PUBLISHING_MODELS |
| GOLD_OPEN_ACCESS | RESEARCH_AND_LIBRARY_FUNDING |
| GREEN_OA | RESEARCH_FUNDING |
| GREEN_ROAD | SIDED_MARKETS |
| HYBRID_JOURNALS | SUBSCRIPTION_COSTS |
| HYBRID_OPEN_ACCESS | SUBSCRIPTION_MODEL |
| JOURNAL_SUBSCRIPTIONS | SUSTAINABILITY_OF_OPEN_ACCESS |
| LIBRARY_BUDGETS | TRADITIONAL_SUBSCRIPTION |
| **INDEXING_SERVICES_AND_STANDARDS** | |
| CITATION_ADVANTAGE | INDEXING_SERVICES |
| DISCOVERABILITY_OF | QUALITY_ASSURANCE |
| FINDABILITY | SEARCH_ENGINE |
| GOOGLE_SCHOLAR | SEARCH_ENGINES |

**Table A2.** *Cont.*

| | |
|---|---|
| **IT_INFRASTRUCTURE** | |
| ACCESS_TO_ELECTRONIC | INFORMATION_TECHNOLOGY |
| COMMUNICATION_TECHNOLOGY | OPEN_JOURNAL_SYSTEMS |
| EMERGING_TECHNOLOGIES | OPEN_SOURCE_SOFTWARE |
| INFORMATION_SYSTEM | PUBLISHING_INITIATIVES |
| INFORMATION_SYSTEMS | SOURCE_TECHNOLOGY |
| INFORMATION_TECHNOLOGIES | TECHNOLOGICAL_INNOVATIONS |
| **LEGAL_FRAMEWORK** | |
| AUTHOR_RIGHTS | COPYRIGHT_LAWS |
| COPYRIGHT_CONCERNS | COPYRIGHT_POLICIES |
| COPYRIGHT_ISSUES | CREATIVE_COMMONS |
| COPYRIGHT_LAW | INTELLECTUAL_PROPERTY_RIGHTS |
| **MARKETING_AND_CRITICAL_MASS** | |
| GROWTH_OF_OPEN_ACCESS | |
| MARKETING | |
| OPEN_ACCESS_INITIATIVE | |

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