

The Adoption of Open Access Funds Among Canadian Academic Research Libraries, 2008-2012

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Abstract

As a result of changes in scholarly communication created by the open access movement, some academic libraries established open access (OA) publishing funds. OA funds are monies set aside at an institution to fund open access publishing of the results of scholarly research. OA funds are a recent innovation in the type of services offered by academic libraries. Adoption of an innovation can be examined in the light of established theories of innovation adoption among social systems. To examine academic libraries' responses to OA publishing charges, this article explores the adoption of OA funds among Canadian academic research libraries from 2008 to 2012 by analyzing results from a series of previously published surveys. The findings are then examined in light of Everett Rogers' Innovation Diffusion Theory (IDT) to consider the question of whether or not OA funds are becoming a standard service in Canadian academic research institutions. Adoption in Canada is briefly compared to that in the United States and United Kingdom. The paper concludes that, as of 2012, OA funds were becoming common but were not a standard service in Canadian academic research libraries and that libraries were actively participating in the development of OA funding models. Given the current Canadian context, the need of researchers for OA publishing support is likely to create pressure for continued adoption of OA funds among Canadian academic research institutions. However, assessment of existing OA funds is needed.

Keywords

open access funds; Canadian academic research libraries; Innovation Diffusion Theory

Introduction

Open access (OA) publications are, by definition, free of charge to the user; no subscription fee is paid to make use of open access content. Without the revenue from subscription fees, OA publishers cover their publication costs by one or more other means. Article processing charges (APCs) are one model of funding the publication of OA journals. In this case, a journal supports its publishing costs

by charging APCs to the authors whose articles they publish. APCs may be charged by journals whose entire contents are open access or by journals that publish individual articles as open access content in an otherwise subscription-based publication ("hybrid" journals). Not all open access journals charge such fees; in fact, most do not. As of January 2014, 67% of the open access journals listed by the Directory of Open Access Journals did not charge fees ("Directory").

Open access funds (OA funds), sometimes called "central funds," are defined by the Scholarly Publishing and Academic Resources Coalition (SPARC) as "a pool of money set aside by an institution to support publication models that enable free, immediate, online distribution of, and access to, scholarly research" ("Campus-based"). These funds are usually administered through the library but may be managed elsewhere within the institution—in the university's research office, for example. Institutionally sponsored OA funds are not the only, and not the primary, source of funding used by researchers to pay APCs. Though researchers use OA funds as one source of such funding, they more often use research grants, personal funds, and other institutional funding sources (Solomon and Björk 102-105).

OA funds cover OA publishing charges using different models, based on the various payment options offered by publishers. In one model, an "author fund," the institution uses the OA fund in response to individual, on-demand requests from researchers to pay OA publishing fees encountered when publishing their scholarly work in OA outlets, typically journals. Besides author funds, academic institutions may also provide OA publishing support to their researchers through sponsorship with a publisher. In this case, the institution pays a fee to a publisher to cover or subsidize APCs for its researchers who have manuscripts accepted by that publisher, for example BioMed Central ("BioMed Central"). The SCOAP³ (Sponsoring Consortium for Open Access Publishing in Particle Physics) project is a unique OA model. This project represents a model of OA publishing in which institutions contribute funds to SCOAP³, which pays the publishers of specified journals to become open access with no fee for authors ("SCOAP³").

Academic institutional OA funds began late in the first decade of the present century. Among Canadian academic institutions, OA funds were first adopted at the University of Calgary, starting in fiscal year 2008-2009, the sixth such fund in the world (Waller, "A Very Brief Look," 2). A number of surveys that touch on or particularly study OA funds were done from 2007 to 2012. These surveys provide a means to track the adoption of OA funds among academic institutions during this period, particularly in Canada. However, the studies only provide data on the numbers of adopting institutions over this period. A theoretical model is necessary to interpret what these numbers suggest about whether OA funds are becoming a standard service among academic research institutions.

A number of established theories can be used to study the adoption of new technology and other innovations by individuals or among groups. This paper uses Everett Rogers' Innovation Diffusion Theory (IDT), although other theories

exist. Venkatesh et al., for example, studied eight theories to develop a unified theory of technology acceptance by individuals: the Unified Theory of Acceptance and Use of Technology (UTAUT). Several theories focus specifically on the adoption of technology itself, such as technological devices or applications. However, while changes in technology created the circumstances for OA funds to exist, OA funds are not a form of technology. Some theories focus on the perceptions, motivations, or other specific details about individuals who choose, or do not choose, to adopt a given change. Theories focusing closely on individuals may include analysis of factors that are too specific for the current analysis, such as gender, age, and the individual's intentions and perceptions.

Innovation Diffusion Theory is a model of how innovations diffuse through a social system. Developed over decades of research and across cultures (Rogers 39-101), IDT has been applied to a broad range of topics, including information technology, agriculture, public health, public policy, and marketing. IDT discusses several elements of the process of innovation diffusion among members of a social system and how these elements relate to one another. Included in the various elements of IDT are factors such as: attributes of the innovation itself, characteristics and categories of adopters (for example, "early adopters"), and the decision process and types of communication channels effective at various stages of the process. Of particular interest to the present topic is IDT's theory regarding statistical representations related to innovation adoption, discussed in more detail below, which provides a framework to give meaning to the numbers found in the surveys.

This article uses Innovation Diffusion Theory as a framework within which to examine the establishment of OA funds among Canadian academic research libraries from 2008-2012 to consider whether OA funds are becoming a standard service in Canadian academic research libraries and in order to understand broadly how such libraries are responding to OA publishing charges. This study focuses on institutions in Canada, the country for which the most data was available. While this article focuses on Canadian institutions, the evolution of OA funds in other countries is not unrelated, as academic publishing is an international industry. However, the specific factors affecting the adoption of open access in general differ significantly from country to country. Mandates requiring open access publishing of research results have evolved differently in different countries. The availability of alternative sources for APC funding, such as those provided by bodies outside of academic institutions, also differs. These factors make comparisons between countries complex. In order to eliminate the complicating effect of such international comparisons, this study examines Canadian academic research institutions exclusively. However, after examining the adoption process among Canadian institutions, this article briefly considers the results in light of data regarding OA funds in the United States and United Kingdom.

Literature Review

The literature contains a number of surveys done in the 2007-2012 period that either primarily address or touch on OA funds. However, with the exception of Pinfield and Middleton noted below, most are individual surveys that have not been considered together to establish a trend. The starting point is a 2007 survey by Newman, Blecic and Armstrong, published as a SPEC Kit on scholarly communication. This survey is important, having been carried out near the time of the inception of OA funds. In 2009, Greyson et al. conducted an investigation of open access supports among members of the Canadian Association of Research Libraries (CARL), the Canadian counterpart to the Association of Research Libraries (ARL). This study specifically describes itself as establishing a “baseline assessment” for future comparisons of various institutional open access supports among libraries and research administrators at Canadian academic research institutions (14). Taylor et al., in 2010, surveyed Canadian libraries, university presses, and non-university scholarly presses regarding their support for, and activity related to, OA journal publishing. This study provided extensive, detailed, quantitative data on open access supports and identified not only supports currently undertaken but also areas of potential support. In a 2010-2011 survey of CARL libraries, Fernandez and Nariani conducted one of the few studies focused exclusively on open access funds. Similarly, Pinfield and Middleton surveyed UK higher education institutions in 2011, repeating a 2009 study of the number of institutions with OA funds (“central funds”), to identify any trend in the establishment of such funds or similar APC funding supports. Also in 2011, Solomon and Björk conducted an international survey of authors, examining funding sources for open access article processing fees. Its concise and informative results included distinction by such factors as broad disciplinary area, source of funding, and per capita GNP of the author’s country. In 2012, another SPEC Kit on scholarly communication services provided data to indicate the level of adoption of OA funds in ARL institutions at that time (Radom, Feltner-Reichert, and stringer-stanback). In 2012, Burpee and Fernandez conducted a qualitative survey of scholarly communications activity among CARL academic research libraries, interviewing one participant at each library. This study provides the most comprehensive coverage of CARL academic libraries. While most of these studies did not include comparison of results to establish or examine trends, the surveys collectively provide data that can be used to examine the establishment of OA funds, primarily among Canadian academic research libraries.

Limited application of innovation adoption theories to open access topics is found in the literature, and none to OA funds in particular. Two theories predominate in the literature: UTAUT and, more commonly, IDT. Hedlund used UTAUT to develop a survey to investigate attitudes to open access and institutional repositories among researchers from business disciplines. Dulle and Minishi-Majanja used UTAUT to study individual researchers’ use of open access publishing—as users and as authors—as well as to test UTAUT as a model to study factors influencing such individual use, concluding that the model was

useful. Using Christensen's theory of the "disruptive innovation," Lewis examined open access publishing, specifically the model of "gold OA" (journals whose entire contents are open access immediately from time of initial publication), concluding that gold OA will become the dominant mode of scholarly publishing between 2017 and 2020.

Several authors have used IDT to explore topics related to OA. Edminster used IDT in her study of the adoption of electronic theses and dissertations (ETDs) in the United States, considering the relative advantages of, and academe's social resistance to, ETDs compared to the traditional print equivalent (110-145). Jones, Andrews, and MacColl applied IDT to the development of advocacy strategy in support of institutional repositories (111-138). Xia examined the adoption rates of OA practices globally using IDT, examining the spread of these practices geographically, and discussing related cultural factors influencing adoption. Using IDT's theory of innovation adoption by organizations, and focusing mainly on institutional repositories, Pinfield et al. considered the effect on adoption of organizational factors characteristic of academic institutions, as well as disciplinary differences. As these studies indicate, OA scholarly publishing has been developing long enough that adoption theories can be applied to it. To date, IDT has been applied more often than UTAUT.

Methodology

To track the adoption of OA funds over time, data on the number of institutions with OA funds was gathered from published surveys covering the period of 2007-2012, using a close reading. The data regarding OA funds was extracted and subsequently analyzed. The data did not consistently distinguish support by model of OA funding, for example, sponsorship with a publisher versus author fund, so differentiation by funding model was not possible. The SCOAP³ project came into effect on January 1, 2014, outside of the period of this study, and was therefore not included. Most of the surveys were conducted using Canadian institutions; therefore, this study focused on tracking adoption of OA funds among Canadian academic research institutions. The results were interpreted in light of IDT's statistical models of innovation adoption within social systems, and trends and benchmarks were noted.

Of the two innovation adoption theories that predominate in the literature, UTAUT and IDT, IDT was the theoretical model chosen for this study due to its broad applicability to innovation adoptions of a variety of types and to the nature of the available data. UTAUT focuses on the adoption of technology itself and also focuses on the individual, examining specific factors, including an individual's age, gender, and perception of others' expectations. These factors were not assessed or discussed in the surveys. IDT provides a statistical model within which to interpret the quantitative data available from the surveys and the trend observed. It also provides a theory of behavioural patterns associated with innovation adoption in light of which the present state of OA funds among Canadian academic research institutions can be considered.

IDT poses five categories of adopters: innovators, early adopters, early majority, late majority, and laggards (recognizing that “laggard” is not to be taken in a negative sense). “Adopters” may refer to individuals or organizations. For convenience, the discussion below uses the word “individuals” although application to organizations is understood. The categories indicate the relative caution with which individuals or organizations adopt a given innovation. Statistically, when the number of adopters is plotted graphically over time to represent frequency distribution, the results create the normal or “bell” curve (Rogers 272-285). Rogers notes that these categories are a simplification, based on statistical concepts of standard deviation and mean, to create a “conceptual device” useful for discussing behaviour of the groupings of individuals. He points out that, in reality, such groupings are not as delineated (280).

According to IDT, in addition to the normal bell-shaped curve of the adopter categories, the adoption of an innovation typically exhibits a normally distributed S-shaped curve when plotted by cumulative number of adopters over time. The steepness of the curve’s slope varies depending on how quickly an adoption occurs within a population. Rogers also points out that, while normal, the S-curve is not inevitable as an innovation may at some point be discontinued by those who adopt it, without reaching the end of the S-curve (272-277). The bell curve, S-curve, and adopter categories, assuming full adoption, are illustrated particularly well by Hvassing in a marketing example reproduced in Figure 1.

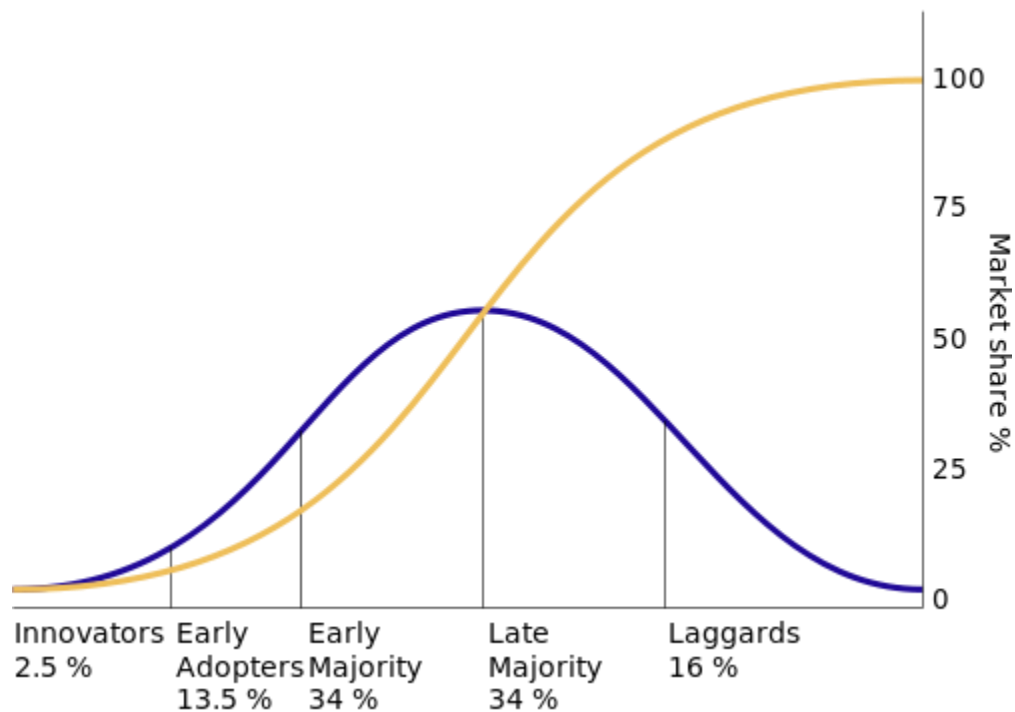


Figure 1. IDT bell curve, S-curve, and adopter categories. (Hvassing)

Innovation Diffusion Theory states that, at a certain point, adoption reaches a “critical mass,” which is “the point at which enough individuals in a system have adopted an innovation so that the innovation’s further rate of adoption becomes self-sustaining” (Rogers 343). Critical mass occurs at a point where 10-20% of the individuals in the system have adopted the innovation, after which the rate of adoption accelerates and the slope of the S-curve becomes steep. Adoption then continues through the system unless something occurs to discontinue it (274-75, 343-44).

Results

In the 2007 SPEC Kit on scholarly communication, OA funds are barely mentioned, coming up only twice in respondent comments (Newman, Blečić, and Armstrong 65, 67). This survey is primarily American in scope; it was distributed to ARL members that, while including Canadian institutions, are predominantly American. It cannot be used as a gauge of Canadian libraries in particular as they are not identified separately. However, what it does suggest, mainly by their absence, is that OA funds were not prominent at this time.

Similarly, in the 2009 survey by Greyson et al. regarding open access supports within Canadian universities whose libraries are members of CARL, no specific question was asked as to whether the respondent’s institution had established an OA fund although such funds were mentioned in librarian responses regarding future plans within the next two years (12). The absence of a specific question to determine the number of institutions with an OA fund implies that, at that time, such funds were still not a common expectation as a form of OA support. In fact, this survey specifically inquired as to whether respondents thought that helping to pay for OA publishing fees was within the library’s mandate and found that only 37% of librarians and 23% of research administrators believed that it was (10).

Uptake in the adoption of OA funds in Canada occurred between 2009 and 2010. In Taylor et al.’s 2010 survey of Canadian academic libraries, university presses, and non-university scholarly presses, support for paying authors’ article processing charges to reduce the price of journal subscriptions was not strong, with most respondents (20 of 33) indicating only weak support or no support for this approach. However, Taylor et al. noted that responses to this question may reflect respondents’ views toward hybrid journals in particular as this survey found that five respondents (four libraries plus one press) currently provided for this type of author support (37). It should be noted that six of the 33 survey respondents were university and scholarly presses; the remaining 27 were library members of the Canadian Research Knowledge Network (CRKN), a Canadian academic library consortium of 73 members at the time of the study (31-32). It is not indicated how many of the four libraries providing support for article processing charges were also CARL members, as were the respondents of the other Canadian studies. The one press providing funding support is not included in the analysis discussed here.

During 2010, Canadian academic research libraries continued to establish OA funds. Fernandez and Nariani surveyed CARL libraries in 2010-11, focusing on author funds specifically. Results indicated that 12 of 18 responding CARL libraries provided support to researchers for OA publishing fees. At least nine of these libraries did so for individual article fees, i.e., as author funds, not simply through sponsorships with publishers (6). In this study, the authors noted a possible response bias towards institutions with “some stake in open access” (14).

By 2012, Burpee and Fernandez’ qualitative study of all 29 academic libraries within CARL indicated that “more than half of CARL institutions have author funds or support memberships with BMC, PLoS and Hindawi” (8). Results of this survey did not indicate the number of institutions with author funds specifically, as compared to memberships only. However, because the survey included all 29 CARL libraries, the results can be considered accurate, with no possible sample bias.

Among Canadian academic institutions, the first OA fund was established in 2008-2009 (see Table 1). The number of such funds in Canadian academic libraries, though not necessarily CARL institutions, increased to at least four in 2010. At least 12 CARL institutions had such funds by the beginning of 2011, and over half of CARL institutions had OA funds by 2012.

Table 1

Summary of data on number of OA funds among Canadian academic libraries, 2008-2012

Year	Number of OA Funds	Note	Source
2008	At least 1	University of Calgary	Waller, “A Very Brief Look” 2.
2009	No data	Some respondents planning an OA fund	Greyson, et al. 12.
2010	At least 4	Survey of CRKN institutions	Taylor, et al. 37.
2011	At least 12	Survey of CARL institutions	Fernandez and Nariani 6.
2012	Over half of CARL institutions (i.e., at least 15)	Survey of CARL institutions	Burpee and Fernandez 8.

Discussion

Some limitations exist in the available survey data. The surveys indicated the number of adopting institutions but did not indicate which institutions had adopted. Therefore, it was not possible to identify whether any institutions adopted and then discontinued their OA funds during this period. Most of the Canadian studies were conducted on CARL libraries, but one survey, sent to 73 CRKN libraries, included academic libraries beyond CARL members (Taylor et al. 31). Data for the year 2011 was unavailable. In the case of the 2012 data, the

result was described verbally as “over half,” rather than being reported in numerical terms (Burpee and Fernandez 8). Given the small number of respondents in most of the surveys, as well as the limited number of CARL institutions, calculation of the percent of adopting institutions for each survey was not attempted as such low numbers make this calculation unreliable. Instead, the actual number of reported OA funds is used as a base from which to consider adoption rate. This method may under-report adoption for the years 2009-2010. Burpee and Fernandez’ 2012 survey was comprehensive for CARL academic research libraries: therefore its results of over 50% adoption are reliable for CARL. This 2012 study may under-report the number of adopting institutions as the survey discusses the libraries only and does not mention institutional OA funds administered outside of the library—a less common but possible alternative. Despite these limitations, the collected results are sufficient to demonstrate a clear trend that can be compared to the normal adoption curve described in IDT as it is the trend, rather than the precise numbers along the curve, that is important for this present study.

According to the results of the surveys, the trend of adoption of OA funds in Canadian research institutions during the period 2008-2011 closely approximates the S-curve as IDT would anticipate, that is, an initial gradual increase followed by a steep increase in number of adopters occurring somewhere over 10% adoption. By 2012, over half of CARL institutions had adopted OA funds. Numerically, the number of adopters of OA funds and the point along the S-curve indicate that adoption appears to have experienced a point of critical mass between 2010 and 2011. However, the rate of adoption then slowed significantly between 2011 and 2012, near the middle of the S-curve. The adoption pattern from 2008-2012 therefore suggests that, while OA funds were becoming common among Canadian academic research libraries by the end of this period, they could not be considered a standard service as of 2012.

When interpreting these results, it is important to recall that innovations do not always follow a complete normal S-curve; new circumstances or new innovations can emerge that interfere with adoption within the social system. In the case of scholarly communication, for example, funding models are still in developmental stages. Further research would be needed to ascertain the specific reasons why academic research libraries did or did not choose to establish OA funds. However, one potential explanation for the adoption pattern shown is that OA funds were being initiated and trialed by adopting libraries.

IDT indicates that individuals may trial an innovation themselves or may use the experience of others as a “vicarious trial.” Later adopters may use the experience of earlier adopters in such a way (Rogers 258). Although IDT finds that, when deciding whether to adopt an innovation, most individuals use subjective evaluation from peers rather than formal objective studies (18-19), in the current academic library environment calls for formal assessment are to be expected. Assessment of existing OA funds would be valuable not only to evaluate their success but also to inform the decisions of institutions that might use existing OA

funds as vicarious trials. A need for assessment of scholarly communication initiatives in general has already been noted, although more time may be needed before assessment can be undertaken as these initiatives are somewhat new (Burpee and Fernandez 13). Public sharing of the results of assessment of existing OA funds has been limited to date. Waller provides useful, general data on the use of University of Calgary's author fund ("A Brief Overview," "A Very Brief Look") but more assessment is needed, including qualitative assessment.

Funding agencies continue to implement mandated open access publishing of research results, often with an initial embargo period of several months. In Canada, such mandates from federal sources for science, social science, and humanities disciplines are anticipated in the near future, similar to those already in place for federal health sciences research funding. As more researchers are subject to OA mandates, authors will increasingly encounter the varied models of OA charges and will seek funding either from grants or elsewhere. Though granting agencies are willing to pay OA charges, for example, as the draft policy of the Canadian funding agencies indicates (Canada, NSERC), researchers at times seek OA funding sources other than grants (Solomon and Björk 102-105). Therefore, research institutions can expect increasing requests for OA funding support from their researchers in the coming years, particularly while the scholarly publishing industry establishes its practices in this still emerging area. In this environment, it is likely that pressure to create and resource institutional OA funds will increase, and that adoption of OA funds in academic research institutions, by some means, is likely to continue. Given that over half of Canadian academic research libraries had instituted OA funds by 2012, these libraries are demonstrating a willingness to participate actively as OA funding models develop.

The SCOAP³ project was implemented after the time period of this study. All of the CARL libraries participate in SCOAP³, contributing through CRKN. Because SCOAP³ contributions fit the SPARC definition of OA funds, it could be said that, as of 2014, all CARL libraries have OA funds. However, in terms of innovation adoption, it is a matter of institutional interpretation whether participation in SCOAP³ represents a deliberate institutional choice to set aside the associated monies as adoption of an OA fund or simply a participation in this specific, unique project; different institutions may describe their intention and participation differently on this point.

As mentioned at the beginning of this article, scholarly communication is an international matter, and not all countries have adopted OA funds as fully as Canada has. The 2012 SPEC Kit reporting on the organization of scholarly communication among ARL members indicated that 33% of responding institutions had an open access publishing fund (Radom, Feltner-Reichert, and stringer-stanback 40). This number suggests that OA publishing funds have passed the point of critical mass in the United States as well. In the United Kingdom, a 2011 study by Pinfield and Middleton found that only 13% of responding institutions had a similar fund, and the percentage had not changed

since 2009, suggesting that adoption in the UK had not reached critical mass as of 2011. It should be noted that this survey included respondents from several types of higher education institutions, not solely research institutions (109). The survey was conducted mid-year and indicated that respondents were considering various models of OA support, including OA funds and other financial resources such as grants or research funds (109-110)—discussions which seem to reflect the early stage of such initiatives. Nonetheless, a potentially stalled adoption rate over two years is notable. Subsequent research would be needed to identify if OA fund adoption in the UK has changed since 2011, which is still relatively early in the history of such funds, and what factors are influencing the course of adoption. Both the US and UK are larger countries than Canada, with greater influence on the publishing industry. While adoption of OA funds at Canadian research institutions appears to be well underway, the global nature of publishing and scholarly communication means that a trend for the library field as a whole cannot be predicted on the basis of relatively fast adoption in Canada.

Conclusion

Innovation Diffusion Theory provides a useful framework within which to examine the adoption of OA funds among Canadian academic research institutions during the period 2008-2012, the first five years after their inception. During this period, the trend of adoption closely approximates an S-curve and suggests critical mass was reached between 2010 and 2011; however, the rate of adoption appeared to slow in 2012 as adoption reached over 50%. One possible explanation for this pattern is that OA funds, still in relatively early stages of development, were being trialed. The adoption pattern suggests that OA funds could not be considered a standard service among Canadian academic research institutions as of 2012. However, libraries are demonstrating a willingness to participate actively in the development of models for OA publishing support. As existing OA funds can act as vicarious trials for institutions that have not yet established such funds, assessment of existing funds would be valuable to confirm their success, or not, and to inform the decisions of those yet to adopt. Particularly in light of expanding OA mandates from federal funding agencies regarding the results of publicly funded research, pressure from researchers in Canadian academic research institutions is likely to cause OA fund adoption to continue. Given the global nature of the scholarly publishing industry and the influence of particular national circumstances, the relatively high level of adoption of OA funds in Canada cannot be taken to indicate the state of OA funds internationally.

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