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Benefits and Outcomes of Library Collections on Scholarly Reading in Finland

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Abstract: Results of an online survey distributed to faculty, PhD students, and researchers throughout Finland in 2016 show that library resources, journal articles, and books are important parts of scholars' research and work life. The survey was disseminated through FinELib to heads of libraries, who were then asked to distribute it to their academic staff, researchers, and PhD students. The purpose of this study was to examine the value of readings obtained from library collections. To help answer this question, participants were asked about the amount and value of their reading and where they obtained readings, which allowed comparison of how the value of the library collection differs from other sources. The study found that researchers use many ways to identify and obtain articles, and the library collection is identified as one important source. Scholars use the library's collection mostly to obtain articles for research and those articles help to inspire new ideas. Overall, this study demonstrates the importance of access to scholarly publications for scholars, from the library and elsewhere, such as open access sites and research sharing platforms.

Keywords: scholarly journals, reading, library collections, access to information resources

Introduction

Libraries have long measured their value by numbers—the size of their collections, the numbers of visitors to their buildings, those who participate in instructional sessions, and how often library e-materials are downloaded. These numbers demonstrate value to a certain degree: i. e. showing implied value by assuming that the act of downloading an article or visiting a building or taking a library instruction course demonstrate use and benefits, enabling comparison over time or with other populations, or demonstrating what services or collections are most popular. Measuring the results or outcomes from these activities, however, can provide a more nuanced view of the value by looking at the benefits to stakeholders by participating in the activities enabled by the library.

In the context of collections, it is more difficult to measure outcomes or benefits of reading rather than measure the implied value provided by downloads or circulation statistics. Measuring outcomes can show what happens after seeking, finding, and downloading information resources and how reading contributes to academic work. Capturing outcomes goes beyond mere popularity to dig deeper into long-lasting impacts or benefits to readers. One reading may have a profound impact on a researcher's work, while others may only satisfy curiosity. Examining the range of outcomes provides a complete picture of the impact of reading.

This study looks at scholarly work-related reading patterns and outcomes of that reading among faculty members, PhD students, and other researchers throughout the country of Finland. It was patterned after reading studies conducted over the last four decades, first in the United States and then in several other countries (Tenopir and King 2000; Wilson and Tenopir 2008; Tenopir et al. 2009, 2010a, 2010b; Tenopir, Volentine, and King 2012; Tenopir et al. 2015). A comprehensive look at reading in Finland has not been conducted before, as previous studies only looked at reading of e-journal articles and did not examine reading in print or scholarly readings from other types of resources such as books. Although the current study looked at readings and outcomes of reading from all sources, this article takes a closer look at print and electronic article and book readings that came from the library and departmental collections to show how library article and book collections contribute to the scholarly work of research, teaching, and service, while also compares the characteristics of those readings with readings from other sources. Other articles based on the data collected for this study will focus on more general reading patterns of scholarly articles, books, and other materials from a wide range of sources.

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The overarching research question that this paper addresses is what is the unique value of readings obtained from library collections? In order to understand this question, several specific research questions are addressed in this paper:

1. What are the characteristics (age, rank, job responsibilities, and subject discipline) of researchers who utilize library-related collections?
2. In what ways do scholarly article and book readings contribute to the work of researchers?
3. What is the value, in terms of outcomes or benefits to readers, of readings from library collections?
4. How does the contribution and value/benefits of readings from library collections differ from readings obtained from other sources?

Although this study took place in a single country (Finland) the methods used and the questionnaire have been tested many times in other countries, and the methods have wider applicability. The survey instrument is included here for adaption and use by others.

Literature Review

The economist Fritz Machlup (1979) provided a philosophical foundation for our methodology in his distinction between accessing information and understanding or gaining knowledge from the content. We use the term reading and use to describe what Machlup considered knowledge gained from content.

Machlup also recommended the concept of "benefits" rather than "value" to go beyond information seeking or access to explore the benefits of the consumption and understanding of information to the user. He defined how measuring value (or benefits) in the information context is both the same and different from other ways to look at value. He described two types of value of information: (1) purchase or exchange value, that is, what one is willing to pay for information in money and/or time, and (2) use value, that is, the favorable consequences derived from reading and using the information (Machlup 1979, 1962). In the library collection context, purchase or exchange value to the reader is almost always based on exchange value or time spent reading. The library bears the direct cost in monetary terms for access to content.

This is not the first study to look at value (or benefits) from reading (or understanding) scholarly information. Beginning in 1977, King and then Tenopir and King used a variation of the critical incident technique to examine scholarly journal article reading patterns and place the resulting data into the context of exchange and outcomes value (Tenopir and King 2000, 2004; Tenopir et al. 2015). These studies showed that academics read articles for many purposes and the reported value and outcomes of article reading vary significantly by purpose. For instance, the most common principal purpose for scholarly reading has long been research and writing and these readings were rated as more valuable to purpose.

The role of the library in providing access to scholarly journal articles has fluctuated over the years, with a drastically increased role starting in the mid-1990s as library electronic journals collections replaced printed personal subscriptions as the main source of article readings. In the dawn of the 2010s, however, open access and alternative sources of e-articles began to decrease the library monopoly on e-access. Still, in studies in Australia, Finland, and the U.S. from 2007–2010, the library was the main provider of e-article readings, accounting for between 50 and 67 % of readings by faculty members at several universities in these countries (Wilson and Tenopir 2008; Tenopir, Mays, and Wu 2011; Tenopir, Volentine, and King 2012).

Although e-books have been a growing part of library collections for nearly two decades, and, in spite of both the dramatic switch to ejournals and a robust consumer market for leisure book reading, library users have been slower to adopt library e-books than many expected. Librarians are advised that more outreach and education about their e-book collections are needed (Ashcroft 2011). When specifically asked, most scholars in an academic research library say that scholarly e-book collections have value to their work, in spite of relatively low rates of use (Chrzastowski 2011).

E-book use from the library is increasing over time as collections grow, although inconsistently among different users (Ahmad and Brogan 2012; Ahmad, Brogan, and Johnstone 2014). Several recent studies of the attitudes of faculty and students towards e-books in the academic setting show a lower than expected uptake, with opinions varying based on such factors as academic status (undergraduate students versus graduate students versus faculty), type of book (textbook versus reference book versus monograph), and subject discipline (Shin 2011; Corlett-Rivera and Hackman 2014; Carroll et al. 2016). According to a recent questionnaire conducted by FinElib (Mikkonen and Peltonen 2016), availability of e-books was not experienced as optimal, as simultaneous user rights were too restricted. Downloading the required reading

programs had proved technically challenging, while problems had been encountered in downloading e-books and in their browsing and navigation functionalities. The experienced usability problems and lower than expected uptake also seem to reflect more fundamental differences in how books and articles are read and used (Aaltonen et al. 2011; Walters 2013).

The academic library community has demonstrated growing concern with assessing library value with several high-profile initiatives over the last decade. These initiatives provide comprehensive reviews of the literature on library assessment. Rather than repeat all of the literature, we refer readers to these projects.

The LibValue project, sponsored by the Institute of Museum and Library Services (IMLS), created a bibliography of library assessment literature as it examined a variety of types of value provided by academic library collections and services and a variety of ways to measure the value. LibValue tested many types of value, including exchange, outcomes, social value, economic value, environmental value, contingent valuation, and return on investment and many types of collections (articles, books, and digital special collections) and services (library instruction, facilities). The project's research website may be found at http://libvalue.cci.utk.edu/. In addition, the Association of Research Libraries, as part of the LibValue team, hosts a separate website to house the project's research instruments or toolkit at http://www.libvalue.org/home.

The Association of Research Libraries (ARL) had long been interested in assessing the value of all types of library collections and services. ARL maintains an active listserv for assessment librarians to share ideas and research results and sponsors an assessment conference every other year (contact arl-assess@arl.org for further information).

In 2010, the Association of College & Research Libraries (ACRL) commissioned a comprehensive literature analysis on the topic of library assessment. This report describes methods to assess the value of library instruction, collections, and services to students and faculty (Oakleaf 2010). Oakleaf's work describes strategies for determining academic library value in these multiple areas (Oakleaf 2010, 2011).

Methodology and Limitations

The study reported here is a nationwide survey of academics and scholars throughout the country of Finland. FinELib, the Finnish national consortium based in the Finnish National Library, distributed the link to an online questionnaire to heads of libraries throughout Finland in the autumn of 2016. The librarians, in turn, were asked to distribute the invitation to participate to their academic staff, researchers, and PhD students. Some librarians sent the invitation directly to all in their institutions and others put the invitation on their library website, while others chose not to distribute the invitation. In addition, the researchers sent out an estimated 1,000 invitations directly to academics. There are an estimated 10,000 academics (EUI 2018) throughout Finland with an additional ~ 15,000 postgraduate students (OSF 2018), although we do not know how many of these actually received the invitation to participate in our study and hence cannot calculate a response rate. In total, we received 528 responses; however, to be compliant with the University of Tennessee IRB approval for research involving human subjects, respondents were allowed to skip any question or exit the survey at any time. Therefore, some questions have fewer than 528 responses and all analysis was done on the number of respondents to any one question, rather than on the total number of respondents to the questionnaire. For this specific study, the overall total is n = 455 because many respondents exited the questionnaire before answering many of the questions analyzed here.

The questionnaire was built in Qualtrics and housed on the University of Tennessee survey, with analysis done with SPSS. The questionnaire was available in both Finnish and English, with 88 % of the respondents choosing to respond to the Finnish version. The Finnish co-authors on this paper translated the Finnish results into English for analysis.

The survey instrument is based on previous surveys conducted by Tenopir and King over the years, with some modifications made to reflect place or time. For example, a question was added to determine whether the last article reading was in English, Finnish, or Swedish (or another language). In order to examine readings in addition to article readings, questions were asked about a wide variety of other types of readings for work, including social media (Tenopir, Christian, and Late 2017).

To enable analysis of the value and outcomes of readings, we asked four types of questions: (1) demographics (age, rank, job responsibilities, and subject discipline); (2) recollection questions about how many articles and other types of materials were read in the last month; (3) critical incident questions that focus on the most recent article reading and then the most recent other type of reading; and (4) open-ended questions on

how reading habits have changed and what changes in publications would be desirable in the future.

Critical incident questions allow a focus on outcomes by providing an in-depth look at characteristics of readings and how they vary by purpose of reading. The critical incident of last reading provides a second stage sample of *readings* in addition to the first stage sample of *readers*. Readers read articles for many reasons and the value or benefit of each reading to the reader will vary, sometimes depending on the purpose and sometimes depending on the quality or usefulness of a particular reading. Therefore, it is necessary to examine the characteristics and value of this second stage of readings to get the nuanced view of value.

Note that reading does not mean reading every word of a document, nor even reading carefully. In the questionnaire, reading of articles was defined as "going beyond the table of contents, title, and abstract to the body of the article" and reading for books "may include just reading a portion of the book such as skimming or reading a chapter." For article readings, readers were asked how thoroughly they read the last article, ranging from "I read all of it with great care" to "I skimmed it just to get the idea."

Analysis

Sources of Readings and Publication Types

This study examines in depth those questions relevant to the role of the library in providing access to readings and the benefits and value associated with those readings, specifically focusing on readings from journal articles and books. Article readings and book readings that were said to come from a library or department collection (most often paid by the library) were compared with article and book readings that did not come from the library (or that the reader did not recognize as coming from the library or departmental collections). Article readings from 222 respondents, or 49.1 % of the total of 454, were said to come from the library or departmental subscriptions (hereinafter referred to as library readings). The 50.9 % of article readings that did not come from the library or departmental subscriptions included readings from the web, shared by colleagues, personal subscriptions, etc. as shown in Figure 1. Of course, some of these readings may come from a library without the reader realizing the fact. For example, included in "other" readings, 5.5 % of the total

Source of Journal Article Readings n=452

- Personal subscription
- From the library/department collection
- Institutional/subject repository
- From another person
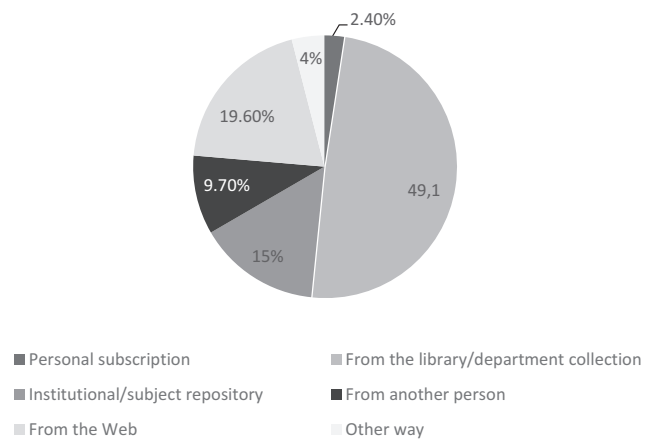- From the Web
- Other way

Figure 1: Source of journal article readings.

readings came from research social networking sites and readings from the web may include full texts that were accessible due to authentication and a link resolver acting on a Google Scholar search.

Journal articles are not, of course, the only source of scholarly readings. Scholars read from books or book chapters, conference proceedings or research reports, newspaper articles, and other types of resources, including blogs. Therefore, we also asked respondents to focus on other types of reading. Asking each respondent a full range of questions about each type of resource would have made the questionnaire much too long, resulting in the decision to just focus on whatever type of material was read most recently. This decision means that the numbers for other types vary considerably, from a low of 17 for "other" and 27 for blogs to a high of 94 for books or book chapters. Figure 2 shows the variety of places scholars use to obtain books or book chapters. The library is the most frequently used source to obtain book readings (43.6 % of book readings); however, colleagues or personal purchase are also important sources for books.

In this article, we focus only on articles and books/ book chapters, because they are the traditional resources offered in library collections and still the most likely to be obtained from the library. Thus, while every respondent was asked the critical incident questions about articles, only those who had read a book or book chapter recently were asked about book readings. Therefore, unlike article readings which reflect the entire population equally, book readings are more skewed to those disciplines or individuals who read more books (e. g. humanities scholars). Of other types of readings, books or book chapters accounted for about a fourth of a reported 392 readings of

Source of Different Publication Types (%)
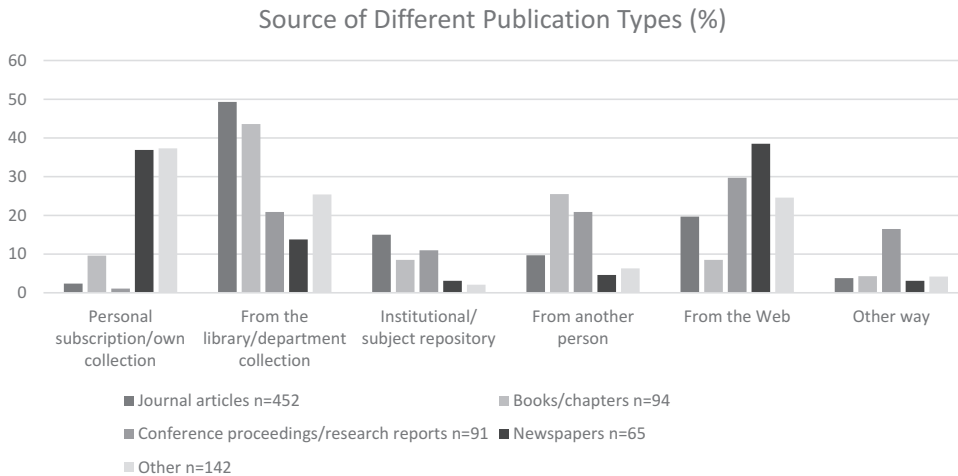
Figure 2: Source of different publication types.

various types of resources. Since the total number of book/book chapter readings is much lower than the total number of article readings, the results may be less robust. If a library wants to specifically focus on the value of its print or e-book collections, a survey focusing only on those readings may be in order.

Overall Characteristics of Article and Book Readings

Before examining the value of readings that come from the library, it is helpful to provide an overall picture of the reported readings. Overall, 86.3 % (n = 392) of the article readings reported were from electronic sources. This percentage was even higher in readings from the library – of the 222 articles that were identified as coming from the library, 90.5 % were from e-resources. Readers of articles have almost made the shift from paper journals to e-sources, but not yet completely. Library purchasing and nationwide journal licensing preferences for e- over print both drive and respond to this trend.

However, not all articles obtained from e-sources are read on the screen, and there is no difference in preference for final form of reading from articles obtained from library or other sources. Printing out an e-article still occurs in over forty percent of the readings and, when combined with the small percent that were from print journals, reading on paper is done for just under half of all readings (45.7 %, n = 205). Reading on screen, most often a desktop or laptop, is now more common, but just slightly so. Readings on a handheld device (mobile phone, tablet, or other e-reader) account for just a small

percent of article readings (even in a country with near universal cell phone coverage) (See Tables 1 and 2).

Although a growing number of books from both the library and elsewhere are available in electronic format, the nearly complete digital transformation that has happened for article access has not yet happened for books. Less than half (43.6 %) of book readings were from e-books. There is no significant difference in form between books obtained from the library collections and elsewhere. Furthermore, over half of the final format of book readings were printed books (56.4 %, n = 53) with an additional 18.1 % e-books downloaded and printed on paper to read (Tables 1 and 2). In total, then, approximately three-quarters of book readings were print books (74.5 %), the highest for any type of scholarly reading.

Over three-quarters of the article readings (78 %) were first-time readings, with the remainder being re-readings (22 %). Readings from the library are slightly more likely to be re-readings (25.3 % re-readings from the library, as compared to 18.7 % re-readings from other sources). Only a quarter of readings from books (26.6 %, n = 25) are re-readings from the same book, with no significant differences between readings from the library or other sources.

Exchange Value of Articles and Books

Scholars demonstrate the value of articles to their work by the time they spend reading. Although the standard deviation is high, scholars report they spend, on average, over 42 minutes per article reading, with just a slight difference between time spent per reading from library-provided articles and others (Table 3). Extrapolating from

Table 1: Final reading format of journal articles and scholarly books/book chapters, % (n) ("In what format was the publication when you read it?").

	Print	Downloaded and printed on paper	Previously downloaded/ saved and read on computer screen	Online computer screen (desktop or laptop)	On a mobile phone, e-reader, or tablet screen
Journal articles (n = 455)	5.3 (24)	40.4 (184)	18.7 (85)	33.0 (150)	2.6 (12)
Scholarly books (n = 94)	56.4 (53)	18.1 (17)	7.4 (7)	17.0 (16)	1.1 (1)

Table 2: Final reading format of article and book readings by the source of the publication, % (n).

		Printed[1]	Electronic[2]
Journal articles	From the library	43.2 (96)	56.8 (126)
(n = 449)	Other source	48.0 (110)	52.0 (120)
Scholarly books	From the library	73.2 (30)	26.8 (11)
(n = 94)	Other source	75.7 (40)	24.5 (13)

[1]Print articles in print journals, downloaded and printed on paper, [2]previously downloaded/saved and read on computer screen, online computer screen (desktop or laptop), on a mobile phone, e-reader, or tablet screen.

the self-reported estimated average in Finland of 20 article readings per month and an average of 42.29 minutes per article reading, scholars spend on average 830 minutes or 14 hours per month reading scholarly articles. This is a demonstration of exchange value. If library readings constitute an estimated 49.1 % of the overall readings and the average time per library article reading is 43.19 minutes, scholars spend on average an estimated 1,056 minutes or 17.6 hours per month reading articles that come from the library.

There is a significant difference between the number of read articles during the last month between those who obtained their last article from the library and from another source (t-test –3,380, sig.,001). Those who obtained their last journal article reading from the library read, on average, 24.46 articles in the last month, while those who obtained their last article reading through other means read only 15.39 articles.

Exchange value of books can be calculated in the same way as articles, but not surprisingly, the mean number of minutes reported for book readings is considerably longer than that for articles and readers read from many fewer books each month. On average, respondents report five readings per month from books, with an overall mean time spent per reading of 81.26 minutes, resulting in an average total of 420 minutes or 7 hours spent

Table 3: Time spent reading journal articles per month.

		Time spent on reading (n = 441)			Number of readings/month n = 451)			Hours spent on reading/month
		Mean	Range	SD	Mean	Range	SD	*
Journal articles	From the library	43.19	2–300	45.4	24.46	1–250	36.1	17.6
	Other source	41.45	0–360	41.1	15.39	0–120	17.4	10.63
	Total	42.29	0–360	43.2	19.83	0–250	28.5	13.98

Number of average readings average time spent on reading/60.

Table 4: Time spent reading scholarly books/book chapters per month.

		Time spent on reading during last month (n = 89)			Number of readings/month (n = 75)			Hours spent on reading/month
		Mean	Range	SD	Mean	Range	SD	*
Scholarly books/	From the library	59.72	4–300	61.3	6.79	0–40	8.6	6.76
book chapters	Other source	98.06	0–800	155.3	3.90	0–20	3.8	6.37
	Total	81.26	0–800	124.2	5.17	0–40	6.5	7.0

Number of average readings average time spend on one book or chapter reading during the last month/60.

reading from books for work-related purposes (Table 4). In the case of book readings, the time spent per reading from other sources is significantly higher than the reported time spent per library-provided book. With an average of 43.6% readings from books from the library each month, times an average estimated time per reading of 59.72 minutes, the exchange value of library book reading is on average 135 minutes or 2.2 hours per month. Readings from books that come from personal collections, colleagues, or a free advance copy are reported to take much longer than readings from departmental copies (which are included with library readings). Caution should be made when interpreting these results, as the standard deviation for book readings is quite high and the number of respondents who answered this question is relatively low.

Exchange value is somewhat problematic, because one of the fundamental laws of library science is to "save the time of the reader" (Ranganathan 1931). Libraries save the reader time in finding and obtaining high quality articles, presumably to allow more time for actually reading or other high value endeavors. E-collections may also save readers more time in that they do not need to visit the physical library in order to use the library's collections. This is dramatically illustrated by the relatively small percent of article readings that are done in the physical library, even when obtained from the library collection (Table 5).

Table 5: Where articles and books are read, % (n) ("Where were you when you read this publication?").

		Office/lab	Home	Library	Traveling/ commuting	All elsewhere
Journal articles (n = 450)	From the library	71.0 (157)	18.6 (41)	1.4 (3)	6.3 (14)	2.7 (6)
	Other source	60.7 (139)	26.6 (61)	0.4 (1)	10.0 (23)	2.2 (5)
Scholarly books/ book chapters (n = 93)	From the library	70.7 (29)	26.8 (11)	0 (0)	0 (0)	2.4 (1)
	Other source	50.9 (27)	24.5 (13)	0 (0)	15.1 (8)	9.4 (5)

Even though nearly half of book readings come from the library collection, no readings are reported to occur in the physical library. However, library book readings are significantly more likely to be read in the office or laboratory

than from home.[1] Approximately a quarter of readings of books from sources other than the library occur elsewhere, often while traveling.

Use/Outcomes Value of Articles and Books

Scholars read articles for many different reasons and the purpose of reading may influence the relative value of that reading. Research, including writing articles, proposals, and grant applications, is the most common reason for reading articles, collectively accounting for over three-quarters of readings in this study (68.1%) (see Table 6). Like article readings, book readings are most likely to be for the purposes of research and writing (61.3%, n = 57); library-provided books more likely to be for these purposes and less likely to be for personal pleasure. But scholarly readings are also done for a wide variety of reasons, including current awareness, teaching, making presentations, etc. Readings obtained from the library are most likely to be for the purposes of research and writing.

Table 6: Principal purpose for article and book/book chapter readings.

		Research and writing	Teaching	Current awareness	Other
Journal articles* (n = 451)	From the library	77.8 (172)	7.7 (17)	6.3 (14)	8.1 (18)
	Other source	60.0 (138)	10.0 (23)	16.1 (37)	13.9 (32)
Scholarly books (n = 93)	From the library	70.7 (29)	4.9 (2)	14.6 (6)	9.8 (4)
	Other source	53.8 (28)	9.6 (5)	17.3 (9)	19.2 (10)

*Difference is statistically significant chi^2 0.000.

Overall, library article readings average an importance-to-purpose score of M = 3.6 on a five-point scale (where 1 = not at all important and 5 = absolutely essential), compared to 3.3 for readings from other sources.[2] Article readings for research and writing are deemed to be of higher value to purpose (M = 3.7) and library readings most often are for this purpose. Library journal collections, therefore, make an important contribution to high importance readings supporting the research work of their scholars. Like article readings, book readings are

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1 chi^2 0.010.

2 Difference is statistically significant t = −3.072, df = 449, sig. 0.002.

rated similarly important overall to the purpose, but readings from the library and from other sources are not significantly different (library readings rated as a mean of 3.6 on a five-point scale and readings from elsewhere rated as 3.4.)

Since simple Lickert scale scores are insufficient in understanding use or outcomes value, because they fail to describe how the readings might be applied in work, we asked respondents to select from a variety of possible outcomes to describe "in what ways did the reading of the article (or later, book) affect your work?" The most frequently selected outcome for articles was "inspired new ideas". Articles, whatever their source, result in many positive outcomes (see Table 7). There are some significant differences between article readings from the library or obtained through other sources. Article readings from elsewhere are significantly more likely to "inspire new ideas" (chi^2 0.033) and readings from the library are more likely to help "me justify my work or make critical comments" (chi^2 0.000). Article readings from the library are also more likely to be cited now or in the future (chi^2 0.001).

Book readings have slightly different outcomes than article readings, with "helped justify my work," "improved the results," and "changed the focus" all selected more often than "inspired new ideas." The role of books in the scholar's work life is clearly somewhat different than the role of articles. Books may be considered the cornerstones where the development of a particular line of research is presented in an in-depth manner, and compared to articles, books may be considered as providing a fuller overview of accumulated findings or current research on a particular topic. As books are more often read for in-depth argumentation and for providing philosophical grounds for choosing a particular focus or theoretical approach, book readings are also more often re-readings

than articles readings (one fourth of book readings were re-readings). Books from the library are more likely to be cited than books from other sources (26.8 % of library books are cited compared to 17.3 % of books from other sources (chi^2 0.025)).

Who is More Likely to Read from the Library? (Demographic Differences)

Demographic questions provide insights into what type of reader is more likely to read resources obtained from the library. The following list shows where there are significant differences in the amount of article or book reading from the library versus other resources based on these reader characteristics: age, rank/position, work responsibilities, and type of research. Due to the much smaller number of book readings, most of the significant differences are found within article readings:

- Scholars in the age group of 31–40 are significantly more likely to obtain article readings from the library (**chi^2 0.000). Probably due to the small number of responses, the difference between age and where they obtain books is not statistically significant, although scholars over age 50 appear to read more books from sources other than the library (69 % from other sources).
- PhD-students read significantly more journal articles from the library (two-thirds of their readings) (chi^2 0.001) when compared to professors (47.4 %), lecturers (32.6 %), post-docs (55.6 %), and others (38.9 %).
- Scholars who spend more than half of their time on research activities (designated here as "research intensive") obtain a significantly higher percent of (chi^2 0.021) their journal articles readings from the library

Table 7: Outcomes from reading articles and books, % (n).

	Journal articles (n = 452)		Scholarly books (n = 94)	
	From the library	Other source	From the library	Other source
Inspired new ideas *	57.7 (128)	67.4 (155)	56.1 (23)	56.6 (30)
Helped to justify my work **	55.9 (124)	37.8 (87)	43.9 (18)	37.7 (20)
Improved the results	26.6 (59)	23.5 (54)	29.3 (12)	28.3 (15)
Changed the focus	20.7 (46)	17.8 (41)	24.4 (10)	18.9 (10)
Saved time and other resources	12.2 (27)	10.9 (25)	12.2 (5)	3.8 (2)
Resolved technical problems	9.0 (20)	7.8 (18)	7.3 (3)	11.3 (6)
Resulted in faster completion	9.0 (20)	7.0 (16)	14.6 (6)	3.8 (2)
Made me question my work	5.0 (11)	3.5 (8)	7.3 (3)	5.7 (3)
Resulted in collaboration	3.6 (8)	3.5 (8)	4.9 (2)	3.8 (2)
Wasted my time	1.4 (3)	1.3 (3)	2.4 (1)	3.8 (2)

** chi^2 0.000, *chi^2 0.033.

(52.4 %) when compared to "teaching intensive" scholars (39.6 % of their article readings come from the library).

– Scholars who say that they engage primarily in basic research are significantly (chi^2 0.046) more likely to obtain article readings from the library (54.5 %) than scholars who engage primarily in applied research (44.9 % of readings are from the library.)

Conclusions and Discussion

Although our article focuses on the differences between identified library-provided reading and those obtained by other means, we acknowledge that this analysis may underestimate the important of library-*connected* readings. That is, the library's contribution is not limited to those readings that respondents can absolutely identify as coming from a library or departmental collection. For instance, readings from institutional repositories (included here with subject repositories) and "the web" are often as a result of library efforts. Libraries expend much effort in building and making discoverable repositories that include articles and other materials authored by their communities and patrons. Library link resolvers and authentication protocols seamlessly link searches from web search engines such as Google or Google Scholar to full texts of articles held by a library subscription, so that to the affiliated user it may appear that they were able to view the text from the web without the library's involvement.

By measuring outcomes and benefits of article and book readings, we can provide a more nuanced view of value and show how access to scholarly publications help researchers, teachers, and doctoral students do their work. When comparing library-provided readings to those from other sources, this type of analysis also demonstrates how provision of high-quality information contributes to work and to the unique value contribution of library collections.

The methods described here, including the critical incident technique, can be used to measure the exchange and use value of any library-provided collection or service – not just article or book collections. Our main goal was to examine scholars' behavior after obtaining the reading and how the interaction with the library's collections or services impacted the scholars' work. The results are, of course, self-reported and represented the perceptions or views of the respondents. However, the exact numbers are less important than the overall trends and comparisons.

Scholarly article and book readings contribute to the work of researchers in several ways. Readings obtained from the library are most likely to be for the purpose of research and writing. This trend is consistent with past studies (Tenopir and King 2004; Tenopir et al. 2015). Scholars agreed that, overall, readings inspired new ideas and readings from the library were more likely to help justify their work or make critical comments.

The study found several values, in terms of outcomes or benefits to readers, of readings from the library collection. Library articles readings ranked higher on an importance of purpose scale with a mean of 3.6 compared to a mean of 3.3 for reading from other sources. Books from the library are more likely to be cited than books from other sources. Article readings are considered to be of higher value for research and writing purposes and scholars who spend more time on research activities obtain significantly more articles from the library, indicating that library journal collections are important to scholars' research work.

Furthermore, the contribution and value/benefits of reading from the library collections differ from readings obtained from other sources. Scholars who obtained their last journal article reading from the library read more articles in the last month than articles obtained from other sources (24.26 versus 15.39).

Such human-centered measurement is, however, labor intensive on the part of the assessment librarian and the users. Therefore, these techniques are not something that a library would employ every year or even every other year with the same population. As part of an overall assessment strategy measuring outcomes and benefits to users, these techniques provide a more complete view of overall and lasting value of library resources. Such an assessment strategy should include periodic measures of outcomes from reading and benefits to users, combined with ongoing implied value techniques such as visits, class attendance, and downloads in addition to the library's contributions to the university's mission, and the benefits of access and services to users.

Although this study looks at researchers in just one country, we believe results are more widely generalizable as researchers in Finnish universities come from all over the world and are widely fluent in multiple languages. However, there are some unique characteristics of Finnish access that need to be acknowledged. The negotiation of e-journal site licenses for Finnish libraries is undertaken by the nationwide FinELib consortium, equivalent to a large regional consortium in larger countries; therefore, in Finnish universities and research institutes there is widespread access to e-journals from all major

scholarly publishers and a growing collection of e-books. The decision was made at a national level over a decade ago to focus journal purchasing on electronic resources; more recently e-books were favored over print books. Individual libraries, however, can and do make individual purchases of print materials.

Finally, a cautionary note. The broader context of access is changing and these changes need to be taken into account in any study of reading behaviors and the library contribution. In an age of increasing ways to access published information, including gold open access obtained through publishers' websites, green open access through repositories or authors' web sites, or sharing through research sharing platforms, libraries cannot base their main value on collections anymore. Readers have a growing number of sources to access and obtain the information resources that they need. The library does not have a monopoly on scholarly information in our increasingly e-connected world. Libraries must concentrate on measuring other outlets of value. For example, by enabling the reading of high-quality materials through portals, finding aids, training, and unique collections, providing a variety of research data management services, educating users about open science policies, and offering direct services to help scholars work more efficiently and effectively, we can provide a more complete picture of library value in the future.

Appendix A

Proposed Survey of Scholarly Reading (Finland)
Section 1: Demographics
1. Which of the following best describes your academic discipline?
   - Life sciences
   - Physical sciences
   - Medical sciences
   - Computer science
   - Mathematics
   - Engineering
   - Social sciences
   - Business
   - Psychology
   - Education
   - Humanities
   - Fine Arts
   - Law
   - Other (please specify): _____
2. What is your specific discipline?
   _____

3. I currently work at:
   - University
   - University of applied sciences
   - State research institute
   - Other research institute
   - Other (please specify): _____
4. What is your academic status?
   - Director/manager of an institute
   - Professor
   - Assistant Professor
   - Project manager/program coordinator
   - Postdoctoral researcher
   - PhD candidate
   - Research assistant
   - Lecturer/university lecturer
   - Teacher/university teacher
   - Other (please specify): _____
5. What is your age?
   _____
6. What percentage of your work time do you spend doing the following? (The total should equal 100 %. If the answer is zero, please enter "0" instead of leaving a blank.)
   % Teaching _____
   % Research and Writing _____
   % Specialist work (chargeable services/research assignments) _____
   % Administration and service (academic/societal)
   _____
   % Consulting/advising _____
   % Other _____
7. The focus of my research is on:
   - Basic/"academic" research
   - Applied/practice-oriented research
   - Development/constructive research work
   - Other (please specify): _____
8. In the past two years, how many of the following have you published? (If the answer is zero, please enter "0" instead of leaving a blank.)
   National peer-reviewed scientific articles _____
   _____
   International peer-reviewed scientific articles _____
   _____
   National non-refereed scientific articles _____
   _____
   International non-refereed scientific articles _____
   _____
   Chapters in scholarly books _____
   Scholarly books _____
   Conference proceedings _____

Publications intended for the general public ____
_____

Publications intended for professional communities
_____

Public artistic and design activities _____
Theses _____
Patents and innovation announcements _____
_____

Audiovisual material, ICT software _____
_____

Other _____

9. In the past two years, have you received any awards or special recognition for your research or other profession-related contributions?
   – Yes
   – No

Section 2: Reading Practices

10. How important do you consider reading the following types of publications for your work?
    Scale: Absolutely essential, Very important, Important, Somewhat important, Not at all important, I don't know
    – Scholarly journals
    – Scholarly article compilations
    – Scholarly books
    – Conference proceedings
    – Research reports
    – Professional magazines/websites
    – Newspapers/news sites
    – Social media (e. g. blogs, Facebook, Twitter)
    – Other Internet resources
    – Textbooks/handbooks
    – Popular science books
    – Fiction

11. From which of the following scholarly fields do you read literature for your work?
    Scale: often, sometimes, never
    – Life sciences
    – Physical sciences
    – Medical sciences
    – Computer sciences
    – Mathematics
    – Engineering
    – Social sciences
    – Business
    – Psychology
    – Education
    – Humanities
    – Fine arts

    – Law
    – Other (please specify): _____

Section 3: Scholarly Article Reading (print and online)

12. In the past month (30 days), approximately how many **scholarly articles** have you read? Articles can include those found in journal issues, websites, or separate copies such as preprints, reprints, and other electronic or paper copies. Reading is defined as going beyond the table of contents, title, and abstract to the body of the article. If none, please enter "0" instead of leaving a blank.)
    Number of articles read (including skimmed) in the past month:
    _____ **(If "0" skip to Q32)**.
    The following questions in this section refer to the SCHOLARLY ARTICLE YOU READ MOST RECENTLY, even if you had previously read this article. Note that while this last reading may not be typical, it will help us establish the range of patterns in reading behavior.

13. What year was the last article you read published/ posted?

    _____
    – Within the last year
    – Within the last 2–5 years
    – Within the last 6–10 years
    – Within the last 11–15 years
    – More than 15 years ago

14. In what language was the article written?
    – Finnish
    – English
    – Swedish
    – Other (please specify): _____

15. How thoroughly did you read this article?
    – I read all of it with great care
    – I read parts of it with great care
    – I paid attention to the main points
    – I read only specific sections (e. g. figures, conclusions)
    – I skimmed it just to get the idea

16. Had you previously read this article, i. e. is this a re-reading?
    – Yes
    – No

17. How long (in minutes) did you spend reading this last article at this reading?
    In minutes: _____

18. How did you become aware of the last article you read?

- Found while browsing in a publication or website (without a specific objective in mind) **(skip to Q19)**
- Found while I (or someone on my behalf) was searching (e. g. by subject or author's name) **(skip to Q20)**
- Cited in another publication **(skip to Q21)**
- Another person (e. g. a colleague) told me about it **(skip to Q21)**
- Do not know/Do not remember **(skip to Q21)**
- Other (please specify): _____ _____ **(skip to Q21)**

19. Found while browsing: **(after answering, skip to Q21)**
    - Personal print subscription
    - Personal online subscription
    - Library print subscription
    - Library online subscription
    - School, department etc. print subscription
    - School, department etc. online subscription
    - Website
    - Open access journals
    - Research social networks (e. g. ResearchGate, Academia.edu)
    - Other (please specify): _____

20. Found while I (or someone on my behalf) was searching:
    - Web search engine (e. g. Google or Google Scholar)
    - Electronic indexing/abstracting service (e. g. Academic Search Premier, Web of Science)
    - Print index or abstract
    - Online journal collection (e. g. JSTOR)
    - Online current awareness service (e. g. Current Contents)
    - Preprint/e-print service (e. g. arXiv.org)
    - Open access journals
    - Research social networks (e. g. ResearchGate, Academia.edu)
    - Other (please specify): _____

21. After you became aware of this article, from where did you obtain it?
    - Personal subscription
    - Library subscription
    - School, department etc. subscription
    - Institutional or subject repository
    - Free web or open access journal
    - Preprint copy
    - Copy of the article from a colleague, author etc.
    - Interlibrary loan/document delivery service
    - An author's website
    - Other website

- Research social networking sites (e. g. ResearchGate, Academia.edu)
- Other (please specify): _____

22. This source was:
    - Print
    - Electronic

23. In what format was the article when you read it?
    - Print article in a print journal
    - Downloaded and printed on paper
    - Previously downloaded/saved and read on computer screen
    - Online computer screen (desktop or laptop)
    - On a mobile phone, e-reader, or tablet screen
    - Other (please specify): _____

24. Where were you when you read this article?
    - Office or lab
    - Library
    - Home
    - Traveling or commuting
    - Elsewhere (please specify): _____

25. For what principal purpose was this article read? (Choose only the most relevant answer)
    - Research
    - Teaching
    - Administration
    - Current awareness/keeping up
    - Writing proposals, reports, articles etc.
    - Writing funding/grant opportunities
    - Consulting, advising others
    - Internal or external presentations (e. g. lecture or conference paper)
    - Continuing education for self
    - Check or verify facts
    - Interest/pleasure/inspiration
    - Other (please specify): _____

26. For what other purposes did you read this article? (Choose all that apply)
    - Research
    - Teaching
    - Administration
    - Current awareness/keeping up
    - Writing proposals, reports, articles etc.
    - Writing funding/grant opportunities
    - Consulting, advising others
    - Internal or external presentations (e. g. lecture or conference paper)
    - Continuing education for self
    - Check or verify facts
    - Interest/pleasure/inspiration
    - Other (please specify): _____

27. How important is the article to your work?
    - Not at all important
    - Somewhat important
    - Important
    - Very important
    - Absolutely essential
28. In what ways did the reading of the article affect your work? (Choose all that apply)
    - It improved the result
    - It narrowed/broadened/changed the focus
    - It inspired new thinking/ideas
    - It resulted in collaboration/joint research
    - It wasted my time
    - It resulted in faster completion
    - It resolved technical problems
    - It made me question my work
    - It helped to justify my work or make critical comments
    - It saved time or other resources
    - Other (please specify): _____
29. Did you cite this article or do you plan to cite it in a paper or report?
    - No
    - Maybe
    - Already did
    - Will in the future
30. Did you share the article or ideas raised by the article in social media?
    - Yes, I shared the article
    - Yes, I shared the ideas raised by the article
    - No
    - No, but I will in the future

Section 4: Other Publication Reading (print and online)

31. In the past month (30 days) approximately how many **other publications** (non-article readings) did you read for work/research? Include books, conference proceedings, government documents, technical reports, magazines, trade journals etc. A book reading may include just reading a portion of the book, such as skimming or reading a chapter (if none, please enter "0" instead of leaving a blank.)
    - Scholarly books _____
    - Scholarly book chapters _____
    - Article in conference proceedings _____
    - Government documents or other technical or research reports _____
    - Article in newspapers/news sites _____
    - Article in magazine/trade journals _____
    - Non-fiction _____

- Fiction _____
- Blogs _____
- Other publications _____

The following questions in this section refer to the PUBLICATION FROM WHICH YOU READ MOST RECENTLY. Note that this last reading may not be typical, but will help establish the range of patterns in reading behavior.

32. What type of publication did you most recently read?
    - Scholarly book
    - Scholarly book chapter
    - Conference proceedings
    - Government document or other technical or research report
    - Newspaper/news site
    - Magazine/trade journal
    - Non-fiction
    - Fiction
    - Blog
    - Other (please specify): _____
33. About how much total time (in minutes) did you spend reading this publication in the past month?

    _____
34. What year was the last publication you read published/posted?

    _____
    - Within the last year
    - Within the last 2–5 years
    - Within the last 6–10 years
    - Within the last 11–15 years
    - More than 15 years ago
35. How thoroughly did you read this publication?
    - I read all of it with great care
    - I read parts of it with great care
    - I paid attention to the main points
    - I read only specific sections (e. g. figures, conclusions)
    - I skimmed it just to get the idea
36. In what language was the publication written?
    - Finnish
    - English
    - Swedish
    - Other (please specify): _____
37. How did you become aware of this last publication from which you read?
    - Found while browsing (without a specific objective in mind)
    - Found while I (or someone on my behalf) was searching (e. g. by subject or author's name)

- Cited in another publication
- Another person (e. g. a colleague) told me about it
- Promotional email or web advertisement
- Do not know/Do not remember
- Other (please specify): _____

38. After you became aware of this publication, from where did you obtain it?
    - I bought it for myself
    - The library or archive collections
    - Interlibrary loan or document delivery service
    - School or department collection (e. g. not managed by library)
    - Institutional or subject repository
    - A colleague, author, or other person provided it to me
    - A free, advanced, or purchased copy from the publisher
    - Author website
    - Other (please specify): _____

39. In what format was the publication when you read it?
    - Print (e. g. book, newspaper, etc.)
    - Downloaded and printed on paper
    - Online computer screen
    - Previously downloaded/saved and read on computer screen
    - On a mobile, e-reader, or tablet screen
    - Other (please specify): _____

40. Had you previously read this publication (i. e. is this a re-reading)?
    - Yes
    - No

41. Where were you when you read this publication?
    - Office or lab
    - Library
    - Home
    - Traveling or commuting
    - Elsewhere (please specify): _____

42. For what principal purpose did you use, or do you plan to use, the publication you read? (Choose only the best answer)
    - Research
    - Teaching
    - Administration
    - Current awareness/keeping up
    - Writing proposals, reports, articles, etc.
    - Writing funding/grant opportunities
    - Consulting, advising others
    - Internal or external presentations (e. g. lecture or conference paper)
    - Continuing education for self

- Check or verify facts
- Interest/pleasure/inspiration
- Other (please specify): _____

43. For what other purposes did you read this publication? (Choose all that apply)
    - Research
    - Teaching
    - Administration
    - Current awareness/keeping up
    - Writing proposals, reports, articles etc.
    - Writing funding/grant opportunities
    - Consulting, advising others
    - Internal or external presentations (e. g. lecture or conference paper)
    - Continuing education for self
    - Check or verify facts
    - Interest/pleasure/inspiration
    - Other (please specify): _____

44. How important is the information contained in this publication to your work?
    - Not at all important
    - Somewhat important
    - Important
    - Very important
    - Absolutely essential

45. In what ways did the reading of the publication affect your work? (Choose all that apply)
    - It improved the result
    - It narrowed/broadened/changed the focus
    - It inspired new thinking/ideas
    - It resulted in collaboration/joint research
    - It wasted my time
    - It resulted in faster completion
    - It resolved technical problems
    - It made me question my work
    - It helped to justify my work or make critical comments
    - It saved time or other resources
    - Other (please specify): _____

46. Did you cite this publication or do you plan to cite it in another publication (e. g. article, report, book, published proceeding)?
    - No
    - Maybe
    - Already did
    - Will in the future

47. Did you share the article or ideas raised by the publication in social media?
    - Yes, I shared the publication
    - Yes, I shared the ideas raised by the publication

– No
– No, but I will in the future

Section 5: Social Media
You're almost finished!

48. How important do you consider each of these platforms to your work (e. g. research, teaching, etc.)?
Scale: not at all important, somewhat important, important, very important, absolutely essential
– Email lists or listservs
– Blogging (e. g. Wordpress, Blogster)
– Microblogging (e. g. Twitter, Tumblr)
– Institutional repository
– Cloud services (e. g. Dropbox, Google Drive)
– Reference management software (e. g. Mendeley, Zotero)
– Research social networks (e. g. ResearchGate, Academia.edu)
– General social networks (e. g. Facebook, Goodreads)
– Collaborative authoring (e. g. Google Docs, Sharepoint)
– User comments in articles
– Image sharing (e. g. Instagram, Flickr)
– Audio sharing (e. g. podcasts)
– Video sharing (e. g. YouTube, Vimeo)

49. How important do you consider each of these e-publication features to your work (e. g. research, teaching, etc.)?
Scale: not at all important, somewhat important, important, very important, absolutely essential
– Mobile phone compatible
– Tablet compatible
– Ability to share publication or content with colleagues
– Enhanced navigation (ability to jump to footnotes, tables, and graphics and back to the body of the text)
– Note-taking and highlighting capability
– Global language support (includes vertical writing and writing from right-to-right and vice versa)
– Video embeddedness component
– Audio embeddedness component
– Other (please specify): _____

50. What other features/characteristics would you like to see in e-scholarly articles in the future?
_____
_____
_____
_____

51. How has your reading and sharing of scholarly materials changed in the last few years and how do you expect it to change in the next year or two?
_____
_____
_____
_____

You've reached the end of the survey. We appreciate your participation. Thank you!

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