



Date : 16/06/2008

Scholarly E-reading Patterns in Australia, Finland, and the United States: A Cross Country Comparison*

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Meeting: 160. National Libraries with Statistics and Evaluation
Simultaneous Interpretation: Not available

WORLD LIBRARY AND INFORMATION CONGRESS: 74TH IFLA GENERAL CONFERENCE AND COUNCIL

10-14 August 2008, Québec, Canada

<http://www.ifla.org/IV/ifla74/index.htm>

*Theme: “Ensuring quality in national libraries: performance measures and quality evaluation supporting cultural heritage and research.”

ABSTRACT

Surveys of academic staff (faculty members) in the United States, Finland, and Australia from 2004-2007 reveal reading patterns of e-articles by academics and can be used to measure the purpose and value of e-reading and to demonstrate the value of library-provided electronic journal collections. Results can also be used to compare differences across subject discipline, age, national boundaries, and how the decisions that libraries make influence reading patterns.

The surveys used a variation of the critical incident technique to focus on the last e-article read, whether from the library collection or from elsewhere. Readings from e-journals and articles provided by libraries are more often for the purpose of research than readings from other sources; are rated as highly valuable to that purpose; and have many reported values, including stimulating new ideas. Academic staff members who publish more also read more.

Although there are some minor variations in e-reading patterns among the countries, most differences in reading patterns result instead from differences in subject discipline. Personal characteristics of the reader, including age and status have much less influence on e-reading habits.

INTRODUCTION

E-journals and journal article databases now form a large part of university libraries' periodical collections. E-articles are also available from other sources, including subject repositories, institutional repositories, author web sites, and open access journals. Scholars who are affiliated with universities that have substantial electronic collections and internet infrastructure thus have the potential to access more journals and scholarly articles than ever before. This unprecedented access is true in many nations with developed infrastructure, but little is known about how reading patterns may differ among academics in different nations.

The authors of this paper surveyed academic staff (faculty members) and university students in several universities in Australia, Finland, and the United States to determine the amount of e-reading, time spent reading, sources of e-article readings, purpose of reading, and the value of reading. Using consistent questions following the form and types of questions asked since 1977 in surveys of scientists by Tenopir and King (Tenopir & King, 2000) allows cross-national comparisons as well as comparisons by demographic characteristics such as subject discipline, age, and rank. This paper reports on the results for academic staff/faculty.

RELATED STUDIES

Three major literature reviews have summarized research studies from the past fifty years that measure journal reading and, more recently, the transition from print to electronic scholarly resources. King & Tenopir (2001), Tenopir (2003), and Rowlands (2007) all describe many national or regional studies that found widespread adoption of electronic resources by academics around the world when the infrastructure is adequate and high quality resources are readily available. Barriers to adoption of e-journals are mainly related to limited access to core resources (Vakkari, 2006), and are often site-specific, such as lack of training and poor computing infrastructure (Raza & Upadhyay, 2006).

Given conditions of adequate infrastructure, training, and library e-collections, few cross-national differences are found or anticipated; differences in reading behaviors instead may be due to other factors. Fry & Talja (2004, 2007), for example, make a strong theoretical case for future studies to consider the cultural differences within and between disciplines. Talja & Maula (2007) and others have explored subject discipline differences in reading patterns.

National studies especially relevant to this paper include previous studies of Finnish academics, who are surveyed from time to time by the FinElib consortium (Vakkari & Talja, 2006) and reading patterns of Australian academics (Wilson & Tenopir, 2008). In addition to these studies and those described in the major literature reviews, recent studies of researchers in Greece (Korobili, Tilikidou, & Delistavrou, 2006), Spanish Catalan Universities (Borrego, et al 2007), Japan (Kurata, et al 2007), and the Netherlands (Voorbij & Ongering, 2006) complete a growing international picture of the shift from print to electronic journals among scholars, with reading from both print and electronic journals still an important part of the scholarly enterprise.

METHOD

The surveys reported here were conducted from late 2004 through May 2007. Two universities in Australia, five in the United States, and a nationwide survey of Finnish academics resulted in a total of over 2,000 academic staff/faculty responses (see Table 1.) The surveys in Australia and the U.S.A. asked respondents to comment on readings, whether from print or electronic sources, while the Finland survey asked questions only about use of e-sources. For purposes of comparison, only those portions of the Australian and U.S. responses that could be determined to be from e-sources are included in this analysis.

Survey Location		Date	Academic Staff/Faculty Response	Response e-sources
Australia	University of New South Wales	Sept-Nov 2004	230	126
	University of Queensland	May 2005	151	82
	Australia Total		381	208
U.S.A.	University of Akron	Oct-Nov 2005	332	129
	Ashland University	Oct-Nov 2005	102	40
	Case Western Reserve	Oct-Nov 2005	415	247
	Malone College	Oct-Nov 2005	47	13
	University of Tennessee	Oct-Nov 2005	411	172
	U.S.A Total		1307	601
Finland (Nation Wide)		April-May 2007	491	491
Three Countries Total			2179	1300

Table 1: Survey Dates and Responses

All surveys were distributed electronically to academic staff/faculty through an email cover letter from the librarian at their university, or by marketing the surveys through university libraries' homepages. In some of the U.S.A. universities a paper copy was also available. Responses were captured or entered into an SPSS data file for analysis.

Respondents were asked several demographic questions, notably their subject discipline, academic rank or level, and age. One general recollection question was asked, namely: “*In the past month, approximately how many scholarly articles [electronic articles in the Finnish survey] have you read? Reading is defined as going beyond the table of contents, title, and abstract to the body of the article*”.

The remainder of the questions focused on the specific incident of the last article reading. This variation of the critical incident technique has been used for many years in surveys of reading patterns by Tenopir & King (2000). The critical incident technique, first introduced by Flanagan (1954), provides a second stage random sample of readings beyond the sample of readers that allows detailed analysis of such things as the purpose and value of readings. By focusing on a recent reading, memory is improved. All common questions are listed in the Appendix.

LIMITATIONS

Some readings from the Australian or U.S. surveys may have been omitted if we could not adequately determine whether the source was print or electronic. Surveys were conducted over a two and one-half year timeframe. Although all of the survey recipients at all of the universities had access to substantial library-provided e-journal collections at the time of each survey, some changes in access or attitudes may be attributable to the passage of time between surveys. All answers are self-reported and, therefore, should be considered estimates. Time spent reading, number of article readings, etc. are all estimated by the respondents to the best of their recollection. Universities surveyed and respondents are assumed to be typical of universities within that country.

RESULTS AND DISCUSSION

Faculty members/academic staff in all three countries undoubtedly read from both print and electronic sources. In the United States, for example, on average over half of all readings are from electronic resources and in Australia two-thirds are from electronic sources. Since in the Finland survey we asked only about e-reading, we report only on e-article reading in this paper when comparing the three countries. It may be expected that the total number of article readings is likely approximately a third to nearly one-half greater than the e-readings reported here when reading from print journals is included. Note that reading from electronic sources does not mean that the final form of reading is on the screen. In a majority of cases, e-articles are printed out for final reading.

Amount of E-Reading

In all three countries, academic staff report many e-readings—15.4 per month in Finland, 14.9 per month in the U.S.A. and 17.1 per month in Australia. If we assume that reading continues throughout the calendar year, the amount of e-readings on average per academic per year is close to 185 in Finland, 179 in the U.S.A., and 205 in Australia. In Finland, where all academics have access to the national e-journal licenses from their FinELib consortia, it is assumed that most of these scholarly readings come from FinELib holdings, but we cannot know for sure. In the U.S.A. and Australian surveys we asked more detailed questions about the reading source, so we know that half of the e-readings in Australia come from library resources (103 of 208 readings or 49.5%) and over two-thirds of the e-readings in the U.S.A. come from the library (412 of 601 readings or

68.6%). Other substantial sources for e-readings include the open web (14.8% in the U.S.A. and 39.9% in Australia) and, to a lesser degree, personal subscriptions (6.5% in the U.S.A. and 10.6% in Australia.) In all countries, the e-resources provided by the library or library consortium are the most important source for e-readings by academic staff members.

Table 2 shows the average number of electronic readings per month by country and by academic standing. Because the academic titles are different in each country, we have grouped together those that are most similar, which may account for some of the differences within each category. In all countries, the number of reported readings differs among individuals, with a range of between zero and over 100 e-articles reported being read in the past month. On average Australian faculty members, followed by Finnish faculty members, report the greatest number of e-readings, although faculty members from all three countries make a substantial investment of their time in e-readings.

Grouped Academic Ranks	Finland		U.S.A.		Australia	
	Mean	Std error	Mean	Std error	Mean	Std error
I. Professor	19.6	1.09	16.0	1.39	18.7	5.38
II. Assoc/Assist Professor/researcher	15.7	1.20	14.8	0.93	24.5	6.68
III. Instructor/Lecturer/Adjunct	11.2	1.87	13.0	1.93	12.2	1.06
Other	N/A	N/A	12.2	1.55	13.8	2.06
Total	15.4	0.78	14.9	0.70	17.1	2.24

Table 2. Average Monthly E-Readings by Academic Rank

In Finland, the number of electronically obtained article readings is significantly associated with academic status ($F=6.4$; $p=.002$). Both professors and associate/assistant professors report significantly more article readings than lecturers (Dunnett C: $p<.05$). Lecturers' teaching loads are typically higher than that of other academic positions, which seems to leave less time for reading research publications, plus they may not have the research expectations of other ranks. In the U.S.A. and in Australia, the number of readings is not significantly associated with the academic status (U.S.: $F=0.819$; $p=0.484$ and Australia: $F=1.89$; $p=.132$).

It is often hypothesized (yet rarely supported by data) that younger faculty members may be more likely to read electronic articles, while older ones rely more on print sources. Age of reader may also be a reflection of academic rank and career stage, so no age-related results can be definitive. Age is not statistically significantly associated with the number of electronic readings in Finland ($F=0.91$; $p=.46$), the U.S. ($F=0.915$; $p=.471$), or Australia ($F=1.284$; $p=.278$). (See Table 3.)

Age	Finland	U.S.A.	Australia
18-25	18.9	11.0	18.0
26-35	16.8	12.6	22.5
36-45	13.5	14.9	12.5
46-55	15.5	16.3	13.2
56-65	14.7	14.3	11.0
66 or above	N/A	19.2	N/A

Table 3. Age of Respondents and Reported Average Number of E-Readings Per Month

In the U.S.A. and Australia, where we asked respondents about reading from both electronic and print sources, we did however find a definite age-related trend, with older readers more likely to read from a balance of print and electronic resources (See Table 4).

Age	Print	Electronic
Under 30	13%	87%
31-40	31%	69%
41-50	44%	56%
51-60	46%	54%
Over 60	50%	50%

Table 4: Source of Readings (Print or Electronic) by academic staff in U.S.A. and Australia, by Age of Reader (n=1251)

In Australia for Table 2, academic rank II is closely aligned with middle-level academics; this group on average read twice as much as junior academics in rank III and also considerably more than senior academics in rank I. In Table 3 this spread is repeated in the number of e-readings by age: the 26-35 age cohort, generally early career/middle-level academics, read nearly twice as much as older academics aged 36-65. The middle-level academic rank and ‘up to 40’ age cohort represent academics who are keen for promotion, spend more time reading mostly for research (see Table 9), and largely prefer reading e-articles (see Table 4).

Subject discipline most likely has an effect on amount of reading and other reading patterns, with humanities faculty members generally reporting reading fewer e-articles per month than faculty members in other disciplines (Table 5). In Finland, academic discipline was significantly associated with the number of electronic article readings ($F=12.2$; $p=.000$). Faculty members in medicine read more than their colleagues in other disciplines. The difference was significantly greater compared to humanities and social sciences (Dunnett C: $p<.05$). Humanists read significantly fewer electronic articles than their colleagues in other disciplines (Dunnett C: $p<.05$). They read on average only 6.8 articles compared to 25.5 items read by the scholars in medicine.

In the U.S.A., academic discipline was also significantly associated with the number of article readings ($F=7.364$, $p=0.000$). As in Finland, U.S.A. medical scholars read (average reading=20.9) significantly more than their colleagues in the disciplines of social science (average reading=11.3, $p=0.000$), humanities (average reading=7.0, $p=0.000$), engineering (average reading=14.4, $p=0.017$) and science (average reading=16.5, $p=0.025$). Humanities scholars read significantly fewer articles than their counterparts in the disciplines of medicine, engineering, and science. However, in the U.S.A. the difference in number of readings between humanities and social science is not statistically significant ($p=0.146$).

In Australia, academic discipline was not significantly associated with the number of article readings ($F=1.009$, $P=0.414$). The results do provide some evidence that scholars from medicine and engineering disciplines read nearly twice as much as scholars from other disciplines, however.

Discipline	Finland	U.S.A.	Australia
Humanities	6.8	7.0	12.1
Social Sciences	14.0	11.3	12.5
Sciences	18.3	16.5	11.9
Engineering	18.6	14.4	20.4
Medicine	25.5	20.9	22.1
TOTAL	15.3	14.9	17.1

Table 5. Average Number of Scholarly E-Article Readings per Month by University Faculty Members by Subject Discipline.

Part of this difference can be accounted for by the fact that a greater percentage of science, technology, medicine, and social science journals are available in electronic form (Vakkari & Talja, 2006). Another reason is that humanities scholars read relatively fewer journal articles (even from print journals) than their science counterparts, relying on books and primary documents more and articles less. In the U.S.A. and Australian surveys, we found that humanities faculty members report an average of 13 article readings per month from either print or electronic sources, compared to an average total of 29 readings for science faculty.

As can be seen in Table 6-1 and 6-2, in Finland and the U.S.A., academic staff who publish more also read significantly more. Because the publication categories were worded slightly differently in Finland surveys from those in the U.S.A. and Australia, results are presented in two separate tables. In Finland, the total number of scholarly items published was significantly associated with the number of electronic article readings ($Rho=.22$; $p=.000$). There is a significant correlation between readings and publishing in journals, conference proceedings, and monographs, but not for text books or manuals.

Correlation	Finland
e-article readings and total publications	R=0.22, p=0.000
e-article readings and monograph publication	R=0.29, p=0.000
e-article readings and publication in journals	R=-0.10, p=0.032
e-article readings and conference article publication	R=0.14, p=0.003
e-article readings and text book publication	R=0.01, p=0.797
e-article readings and publication of manuals	R=0.01, p=0.794

Table 6-1 Correlation Between E-readings and Number of Publications by Academic Staff/Faculty in Finland

In the U.S.A., the total number of publications is also significantly correlated with the number of e-article readings ($r=0.12$; $p=0.004$). The number of publications in refereed scholarly journals is significantly correlated with the number of article readings ($r=0.17$; $p=0.000$). However, the numbers of article in the other publication types are not significantly correlated to article readings. In Australia, where academic staff report the highest amount of reading overall of these three countries, no significant correlation is found between the reported number of e-readings and the number of publications. (See Table 6-2.)

Correlation	U.S.A.	Australia
e-article readings and total publications	R=0.12, p=0.004	R=-0.02, p=0.787
e-article readings and publication in refereed journals	R=0.17, p=0.000	R=0.02, P=0.761
e-article readings and publication in non-refereed journals	R=0.05, p=0.285	R=-0.04, p=0.585
e-article readings and publication in scholarly books	R=0.01, p=0.881	R=-0.03, p=0.687
e-article readings and publication in chapters in books, proceedings, etc	R=0.07, p=0.083	R=-0.03, p=0.634

Table 6-2. Correlation Between E-readings and Number of Publications by Academic Staff/Faculty in the U.S.A. and Australia

Where Reading Takes Place

There is some difference across countries in where e-reading takes place. In Finland, the U.S., and Australia, the office or laboratory is, however, by far the most common place for reading e-articles, with home a distant second and other places only minimally popular. The library is not a place for reading e-articles in any of these

countries, even though most of these articles are retrieved online through the library's e-collection. Within "other", "while travelling" was a notable choice only of Australian academics, with 6.7% of readings done while on the road (See Table 7.)

Reading Location: Percentage	Finland	U.S.A.	Australia
Office	75.7%	66.2%	60.1%
Library	0.8%	1.5%	3.9%
Home	19.9%	26.8%	26.1%
Other	3.7%	4.3%	9.9%

Table 7. Location of E-Readings

In Finland, academic status is significantly associated with reading place (Chi-Square: $p=0.001$), with 82% of e-readings by assistant professors, 68% of e-readings by lecturers, and 65% of e-readings by professors done in the office. In the U.S.A. and Australia, academic status was not significantly associated with the location of e-reading (U.S.A.: Chi-square: $p=0.401$; Australia: Chi-square= 0.12).

In Finland and Australia, there is no association between age (Finland: Chi-Square: $p=0.5$; Australia: Chi-Square: $p=0.39$) and location of e-reading. In the U.S.A., however, age is significantly associated with e-reading location (Chi-square: $p=0.041$), with 74% of readings by academic staff in the age group of 26-35 done at the office or lab, followed by the 36-45 age group (68%), 56-65 age group (67%), and 46-55 age group (64%). Only 48% of e-readings by scholars older than 66 are done at the office and lab, with just as many of their e-readings done at home.

In the U.S.A. and Australia, academic discipline is significantly correlated with reading location (U.S.: Chi-square: $p=0.000$; Australia: Chi-Square: $p=0.004$; Finland: Chi-Square: $p=0.34$). In the U.S.A., 85% of readings by engineering faculty and 80% of readings by science faculty occurred at the office or lab, while only 40% of humanities readings, 58% of social science readings, and 64% of medical/health readings occurred at the office or lab. Over half (55%) of humanities readings by U.S.A. faculty are done at home, which is significantly higher than the other disciplines (only 13% of engineering and 16% of sciences readings are at home.)

In Australia, readings by science academic staff are more likely to be at their school or department office (75%), followed by readings by scholars in medicine and health (73%), social sciences (59%), humanities (53%), and engineering/technology (44%). Humanities scholars are the most frequent users of the university library (13.3%) as an e-reading location. More readings by scholars in social science (35%) and engineering/technology (36%) are from home, compared with readings by scholars in humanities (13%), medicine (20%), and science (17%). Humanities scholars are more likely than the other disciplines to read while traveling (20%). Reading in the office or lab is perhaps practiced more by academics in middle or junior ranks (see Table 2, ranks II and III) in those disciplines engaged in experimental scientific or medical research; these academics aged 35 or younger reported on average over 20 e-readings per month (see Table 3) and at least some of the e-readings are likely to be on computer screens.

How E-Articles Are Found

Not surprisingly, searching is overwhelmingly the most popular method for finding electronic articles, but browsing, following citations, and colleagues are also important ways to locate e-articles (See Table 8). (In Australia, due to the limit of questionnaire design, only browsing, searching, and some other methods can be differentiated by electronic and print. Therefore, in selecting electronic source, only browsing and searching are included and cases with citations and colleagues are excluded.)

Method of Finding: Percentage	Finland	U.S.A.	Australia
Browsing	15%	23%	39%
Searching	65%	34%	49%
Citations	10%	17%	N/A
Colleagues	6%	18%	N/A
Other	4%	8%	12%

Table 8. How E-Readings Are Found

In Finland and Australia, none of the independent variables of academic status, age, or discipline was associated with the search method used for finding electronic articles and in the U.S.A., neither age ($p=0.329$) nor discipline ($p=0.479$) is significantly correlated with the search method. In the U.S.A., however, academic status ($p=0.004$) and degree ($p=0.002$) are both significantly correlated with the search method. Professors are more likely to use their colleagues to find articles (19.4%), compared to assistant professors 19%, and lecturers 10%. More lecturers (44%) use searching to find articles, than professors (27%) or assistant professors (35%).

Principal Purpose of E-Reading

Academic staff read e-articles for many reasons, including research, teaching, keeping up-to-date, and other reasons. Research is by far the most common reason for reading scholarly articles in all three countries (See Table 9).

Principal Purpose	Finland	U.S.A. ¹	Australia
Research	68% (346)	53% (319)	64% (133)
Teaching	11% (58)	20% (119)	11% (22)
Keeping up to date	12% (60)	5% (29)	9% (16)
Other	9% (48)	20% (119)	16% (34)

Table 9. Principal Purpose of E-reading

In Finland, the U.S.A., and Australia academic status is significantly associated with the main purpose of use (Finland: Chi-Square: $p=.000$; U.S.A.: Chi-Square: $p=0.008$; Australia: Chi-Square: $p=0.005$). In Finland, 76% of readings by assistants, 62% of readings by professors, and 52% of readings by lecturers are for research. Reading for teaching was the reverse: 7 % of readings by assistants, 12 % of readings by professors, and 22 % of readings by lecturers were for teaching. This finding is evidently an implication of the heavier teaching load and stronger teaching orientation of lecturers.

In the U.S.A., 61.3% of readings by assistant professors, 51% of readings by professors, and 33% of readings by lecturers were for research, whereas 20% of readings by assistant professors, 18% of readings by professors, and 26% of readings by lecturers were for teaching.

In Australia, readings by academics in the top two ranks, I (74%) and II (71%) are most often for research, compared to readings by junior academics in rank III (59%) (see also Table 2.) Readings by junior academics are more often for teaching (21%) than those of other academic ranks.

The purpose of e-reading also varies with the age of the reader. In Finland and the U.S.A., age is significantly associated with the principal purpose of reading (Finland: Chi-Square: $p=.019$; U.S.A.: Chi-square: $p=0.001$). Readings by younger scholars are more likely to be for research than readings by their older peers, whereas readings by older scholars are more likely to be for teaching. More readings by those in the age group of 26 to 45 are for research, while readings for research decline after age 46 and readings

¹ In the U.S.A., two master's levels universities were included in the surveys along with three research intensive/extensive universities. Although they represent only a small percentage of the total responses (53 of 601 e-reading responses) and, therefore, do not alter the final results greatly, there is a significant difference in purpose of e-readings between the categories of institutions. A slightly greater number of e-readings at the three research-level institutions are for research—55% (296) of total e-readings, compared to 44% (23) at the two master's level institutions. In contrast, 29% (15) of the e-readings are for teaching at the master's level universities, compared to 19.5% (104) for teaching in research level institutions.

for teaching increase. In Australia, scholar's age (chi-square: $p=0.157$) was not significantly correlated with the principal purpose of reading.

In all three countries, the purpose of reading is significantly correlated with method of finding articles (Finland: Chi-Square: $p=.000$; U.S.A.: Chi-square: $p=0.015$; Australia: Chi-square: $p=0.016$). In Finland, the most commonly used method for finding articles for keeping up to date is searching (43 %) followed by browsing (30 %) and other means (13 %). Most articles read for research were found by searching (67%), followed by browsing (13 %) and by following citations (11 %). E-readings for teaching in Finland are also most often found by searching (63 %), followed by browsing (16 %) and colleagues (11 %).

In the U.S.A., the most frequently used method for finding e-readings for research is searching (33%), followed by browsing (25%), citation (21%), and colleagues (16%). Readings for teaching are most often found by searching (35%), followed by browsing (26%), colleagues (20%) and citations (13%). In the U.S.A., readings for keeping up to date are also most often found by searching (28%), followed by browsing (24%), and from colleagues (21%). For writing proposals and reports most articles are found by searching (46%), with citations next most common (23%), followed by browsing (10.8%).

In Australia, the most frequently used method for finding e-readings for research also is searching (53%), followed by browsing (37%). Readings for teaching are most often found by browsing (46%), more so even than searching (41%). Also in contrast to the U.S.A., readings for current awareness are most often found by browsing (56%) by Australian academic staff, followed by searching (33%). For writing proposals, searching (57%) is more common than browsing (38%).

CONCLUSIONS

When university libraries provide access to substantial e-journal collections and adequate infrastructure, academic staff read many e-articles that help improve their research, teaching, and current awareness. They use many methods to find these articles, including browsing, searching, following citations, and colleagues. In all countries, e-articles are an integral part of the academic process, with multiple purposes for reading and multiple methods used for locating articles. Although there are some differences in the amount of reading and patterns of reading among academic scholars in the three countries of Australia, Finland, and the United States, most differences can be accounted for by academic discipline of the reader. Academic rank/status, productivity, and age account for some differences as well. Some differences, such as location when reading, do seem to be country-dependent. Finnish faculty members, for example, are more likely to do their e-reading in their offices or laboratories rather than at home.

The cross-country analysis reported here shows that for academic staff/faculty in Finland, the U.S.A., and Australia:

- in all countries, the number of electronic article readings varies by academic status: senior and middle level academics read more articles than lecturers or junior level
- age does not explain adoption of e-resources, but older readers use both print and electronic resources in a more balanced manner
- both e-article and article reading patterns vary by discipline: scholars in medicine and engineering read more articles than scholars in other disciplines, humanities

and social sciences scholars read both books and journal articles, which explains in part their lower use of e-journal articles

- publication productivity is associated with the number of electronic article readings in Finland and the U.S.A.

There are some cross-country differences, however. In Australia, for example, we found no correlation between publication activity and amount of e-reading, as overall Australian academics report the highest amounts of e-reading. Another significant difference between the countries emerged in the higher use of searching by Finnish scholars in locating e-articles. Finnish academics are also less likely to do e-reading at home. These differences are interesting, and clearly merit further exploration.

It is clear that the decisions that libraries or library-consortia make influence some reading patterns. One university in Australia, for example, had purchased significant numbers of e-journal backfiles prior to the survey. Consequently the academic staff at that university reported more readings of older articles in electronic form. In Finland, the national consortium FinELib licenses e-journal collections and makes them available to academics nationwide. Reading from print resources is likely lower overall, as e-resources are available uniformly to all Finnish universities.

The number of articles read on average continues to increase as electronic journals become more widely available. At the same time, the average time spent per reading is decreasing (from Tenopir & King surveys conducted since 1977; see Tenopir & King, *Towards Electronic Journals*, Washington, DC: SLA, 2000.) Libraries and publishers, therefore, must continue to find ways to help readers locate and obtain the most relevant and high quality articles quickly and efficiently.

When university libraries provide access to substantial e-journal collections and adequate infrastructure, academic staff read many e-articles that help improve their research, teaching, and current awareness. They use many methods to find these articles, including browsing, searching, following citations, and colleagues. In all countries, e-articles are an integral part of the academic process, with multiple purposes for reading and multiple methods used for locating articles.

ACKNOWLEDGEMENTS

The U.S.A. surveys were funded by a grant from the Institute of Museum and Library Services (IMLS). The Australian surveys were funded in part by a University of New South Wales John Metcalfe Visiting Fellowship. The Finnish surveys were funded in part by the FinELib consortium. University of Tennessee, College of Communication and Information graduate students Liuyan Yang and Lei Wu were instrumental in the data analysis, including pulling together somewhat disparate data sets from the three countries.

REFERENCES

- Borrego, Angel; Anglada, Lluís; Barrios, Maite; Comellas, Nuria. 2007. "Use and users of electronic journals at Catalan universities: The results of a survey." *Journal of Academic Librarianship*, 33(1) (January), 67-75.
- Flanagan, J.C. 1954. The critical incident technique." *Psychological bulletin*, 51(4), 327-358.
- Fry, Jenny and Talja, Sanna. 2004. "The cultural shaping of scholarly communication: Explaining e-journal use within and across academic fields." *Proceedings of the American Society for Information Science and Technology* 41 (November 2004): 20-30.
- King, Donald W. and Tenopir, Carol. 2001. "Using and Reading Scholarly Literature," in *Annual Review of Information Science and Technology* Martha E. Williams, ed. Vol. 34, 1999-2000. Medford, NJ: Information Today, Inc., 2001. pp. 423-477.
- Korobili, Stella; Tilikidou, Irene; Delistavrou, Antonia. 2006. "Factors that influence the use of library resources by faculty members." *Library Review* 55 (February), 91-105.
- Kurata, Keiko; Matsubayashib, Mamiko; Minec, Shinji; Muranushid, Tomohide and Ueda, Shuichi. 2007. "Electronic journals and their unbundled functions in scholarly communication: Views and utilization by scientific, technological and medical researchers in Japan." *Information Processing & Management* 43(5) (September), 1402-1415.
- Raza, M. Masoom and Upadhyay, Ashok Kumar. 2006. "Usage of E-journals in Aligarh Muslim University: A Study." *The International Information & Library Review* 38(3) (September), 170-179.
- Rowlands, Ian. 2007. "Electronic journals and user behavior: A review of recent research." *Library & Information Science Research* 29(3) (September), 369-396.
- Talja, Sanna and Maula, Hanni. 2003. "Reasons for the use and non-use of electronic journals and databases: A domain analytic study in four scholarly disciplines." *Journal of Documentation* 59(6), 673 - 691
- Tenopir, Carol. 2003. "Use and users of electronic library resources: An overview and analysis of recent research studies." Prepared for Council on Library and Information Resources Washington, D.C. August 2003. Available at <http://www.clir.org/pubs/abstract/pub120abst.html>
- Tenopir, Carol and King, Donald W. 2000. *Towards Electronic Journals: Realities for Scientists, Librarians, and Publishers*. Washington, DC: Special Libraries Association.

Tenopir, Carol and King, Donald W. 2004. *Communication Patterns of Engineers*. NY: IEEE/Wiley InterScience.

Vakkari, Pertti. 2006. "Trends in the use of digital libraries by scientists in 2000-2005: A case study of FinELib." *Proceedings of the ASIS&T Annual Meeting - 2006* (ASIS&T 2006) Austin, Texas, November 3-9, 2006.

Vakkari, Pertti and Talja, Sanna. 2006. "Searching for electronic journal articles to support academic tasks. A case study of the use of the Finnish National Electronic Library (FinELib)" *Information Research*, 12(1) paper 285. [Available at <http://InformationR.net/ir/12-1/paper285.html>]

Voorbij, Henk and Ongerling, Hilde. 2006. "The use of electronic journals by Dutch researchers: A descriptive and exploratory study." *Journal of Academic Librarianship*, 32(3) (May), 223-237.

Wilson, Concepción S. and Tenopir, Carol. 2008. "Local citation analysis, publishing, and reading patterns: Using multiple methods to evaluate faculty use of an academic library's research collection." *Journal of the American Society for Information Science & Technology*, Published Online: Apr 28 2008. [Available at <http://www3.interscience.wiley.com.wwwproxy0.nun.unsw.edu.au/cgi-bin/fulltext/118903505/HTMLSTART>]

APPENDIX

Questions Common to all Surveys

1. Recollection of amount of reading

U.S.A. and Australia: In the past month (30 days/4 weeks), approximately how many scholarly articles have you read? Articles can include those found in journal issues, Web sites, 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.

Finland: How many scholarly articles that you have obtained in electronic form have you read during the last month (4 weeks)? Reading means going beyond the table of contents, title and abstract to the body of the article. Estimate the number:

2. Critical incident of last article reading

2.1 In Finland: How did you find the last e-journal article you read? In the U.S.A. and Australia: How did you find the last article you read? In both: Choose one of the following (specific names of systems or methods that can be consolidated into browsing, searching, following citations, from a colleague, or other)

2.2 Where did you use/read the last e-journal article you read (reading location)?

2.3 For what purpose have you used or will you use the information obtained from the article primarily?

To keep up with developments in my own field.

For research and/or development work.

For some other private task (e.g. writing a funding application).

For teaching and counselling.

For preparing a dissertation

For some other studies

Other, what?

3. Demographics:

Age, gender, academic rank, academic discipline, highest degree earned, year of last degree, number and type of publications authored