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The Digital Information Seeker

Report of findings from selected OCLC, RIN and JISC user behaviour projects

Produced for JISC by Lynn Silipigni Connaway, PhD and Timothy J Dickey, PhD, **OCLC Research**

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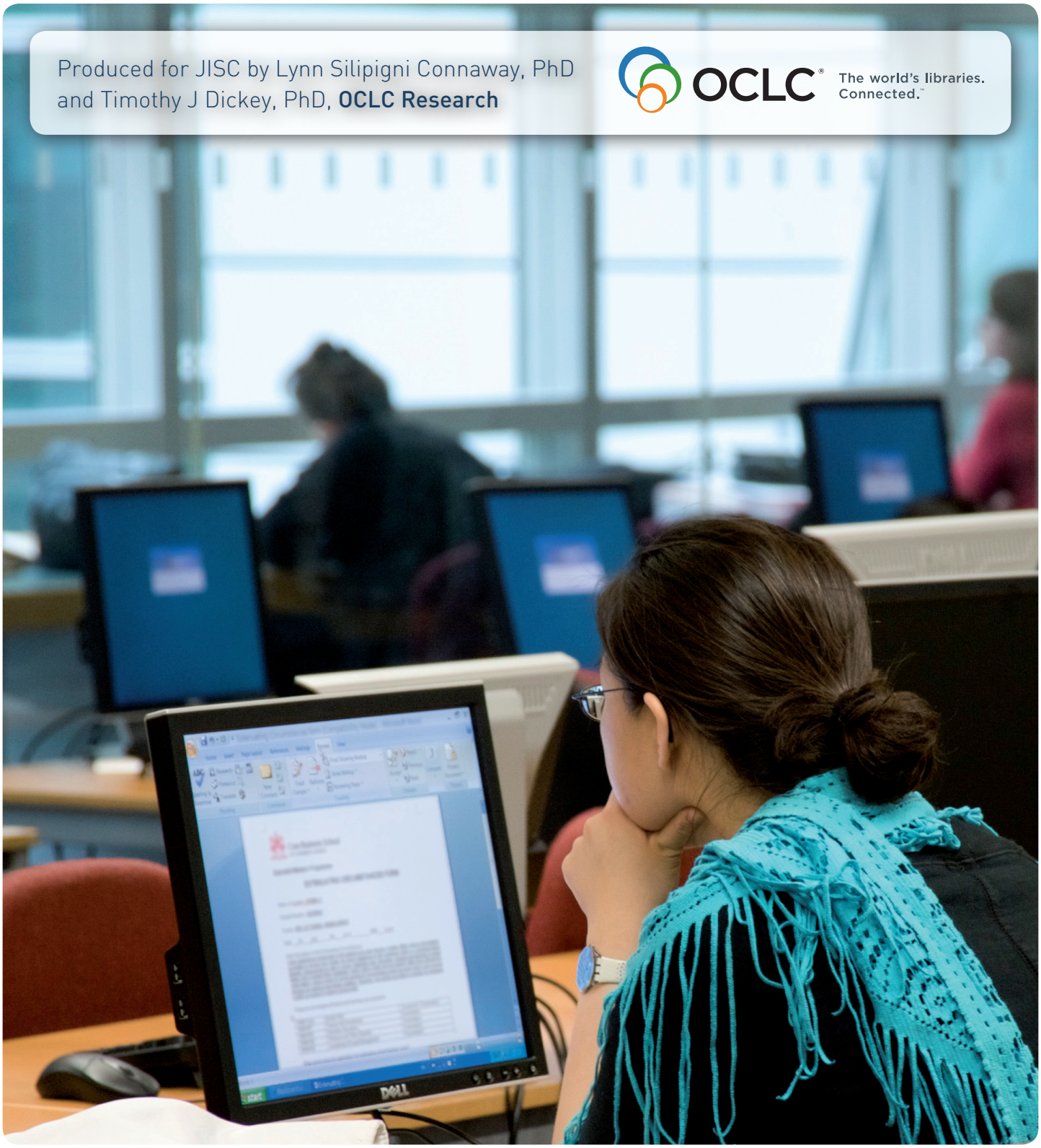

The Digital Information Seeker: Report of the Findings from Selected OCLC, RIN, and JISC User Behaviour Projects

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Introduction

There are numerous user studies published in the literature and available on the web. There are studies that specifically address the behaviours of scholars while others identify the behaviours of the general public. Some studies address the information-seeking behaviours of scholars within specific disciplines while others identify the behaviours of scholars of multiple disciplines. There are studies that only address undergraduate, graduate, or post graduate students or compare these individual groups' information-seeking behaviours to those of scholars. Still other studies address the behaviors of young adults (Screenagers (Rushkoff 1996) and Millennials).

In the interest of analyzing and synthesizing several user behaviour studies conducted in the US and the UK twelve studies were identified. These twelve selected studies were commissioned and/or supported by non- profit organizations and government agencies; therefore, they have little dependence upon the outcomes of the studies. The studies were reviewed by two researchers who analyzed the findings, compared their analyses, and identified the overlapping and contradictory findings. This report is not intended to be the definitive work on user behaviour studies, but rather to provide a synthesized document to make it easier for information professionals to better understand the information-seeking behaviours of the libraries' intended users and to review the issues associated with the development of information services and systems that will best meet these users' needs.

The twelve studies included in this report are listed in chronological order:

Perceptions of libraries and information resources (OCLC, December 2005), http://www.oclc.org/us/en/reports/2005perceptions.htm

College students' perceptions of libraries and information resources (OCLC, April 2006), http://www.oclc.org/us/en/reports/perceptionscollege.htm

Sense-making the information confluence: The whys and hows of college and university user satisficing of information needs (IMLS/Ohio State University/OCLC, July 2006), http://www.oclc.org/research/projects/imls/default.htm

Researchers and discovery services: Behaviour, perceptions and needs (RIN, November 2006), http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-and-discovery-services-behaviour-perc

Researchers' use of academic libraries and their services (RIN/CURL, April 2007), http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-use-academic-libraries-and-their-serv

Information behaviour of the researcher of the future (CIBER/UCL, commissioned by BL and JISC, January 2008), http://www.jisc.ac.uk/media/documents/programmemes/reppres/gg_final_keynote_11012008.pdf

Seeking synchronicity: Evaluating virtual reference services from user, non-user and librarian perspectives (OCLC/ IMLS/ Rutgers, June 2008), http://www.oclc.org/research/projects/synchronicity/default.htm

Online catalogs: What users and librarians want (OCLC. March 2009), http://www.oclc.org/us/en/reports/onlinecatalogs/default.htm

E-journals: Their use, value and impact (RIN, April 2009), http://www.rin.ac.uk/our-work/communicating-and-disseminating-research/e-journals-their-use-value-and-impact

JISC national e-books observatory project: Key findings and recommendations (JISC/UCL, November 2009), http://www.jiscebooksproject.org/

Students' use of research content in teaching and learning (JISC, November 2009), http://www.jisc.ac.uk/media/documents/aboutus/workinggroups/studentsuseresearchcontent.pdf

User behaviour in resource discovery (JISC, November 2009), http://www.jisc.ac.uk/whatwedo/programmes/inf11/userbehaviourbusandecon.aspx

A description of the key findings reported in each of the selected studies is included in this document. After this, the common findings of the studies as well as contradictory findings are discussed. The report ends with the identification of issues that librarians must address in order to meet the needs of diverse user groups. Some suggestions for further research and development are included.

Summaries of Each of the Selected Studies Included in this Report

A brief summary of the findings of each study is provided to give the readers a basic overview and understanding of each study. URLs are included for each of the studies for those who are interested in more detailed and in-depth information about the studies.

Perceptions of libraries and information resources (De Rosa 2005) and *College students' perceptions of libraries and information resources* (De Rosa 2006) present two views of a global *online* survey of library use. The 2005 report includes both academic and non-academic users. The results reinforce the library's brand as one of "books" and the overwhelming nature of search engine use. Most users do trust library resources and information as much as they trust search engines. They do not think of the library for accessing electronic resources. The general population is using libraries and electronic resources of all kinds less often.

Sense-making the information confluence: The whys and hows of college and university user satisficing of information needs (Dervin et al. 2006; Connaway, Prabha, and Dickey 2006; Prabha, Connaway, and Dickey 2006) includes qualitative data from undergraduate, graduate student, and faculty perspectives on information-seeking and library systems. It offers a rich portrait of academic users' information behaviours, including their rational and contextual decisions, their valuation of familiarity, convenience, and currency, and nuances to their use of Google and other search engines; each section concludes with concrete recommendations to improve library systems.

Researchers and discovery services: Behaviour, perceptions and needs (Research Information Network 2006) reports on a lengthy qualitative study using telephone surveys of researchers and librarians in UK universities, followed by in-depth interviews and focus-groups with postdoctoral researchers. The study indicates a "general satisfaction with the research discovery services available" (ibid, p. 6). The main frustration of researchers in the sciences and arts and humanities is accessing online journals, which is supported by librarians who report accessing online journals as a key problem. The most utilized resources are general search engines, internal library portals and catalogues, specialist search engines, and subject-specific gateways; researchers see the search as an integral part of the research process and have developed methods of searching to minimize any sort of information overload (ibid, p. 8).

Researchers' use of academic libraries and their services (Consortium of University Research Libraries, and Research Information Network 2007) utilizes quantitative data and "qualitative insights" (ibid, p. 2) from researchers and librarians to provide information about how researchers interact with academic library services in the UK. The majority of researchers has embraced digital content and uses digital aides to find information, creating a decrease in library visits. However, the respondents do believe librarians

will play a key role in this new information environment, and in new types of information resources. Evidence illustrates the importance researchers place on direct access to all kinds of digital materials. *Information behaviour of the researcher of the future* (Centre for Information Behaviour and the Evaluation of Research 2008) attempts to recreate a longitudinal study from the literature together with some new primary data mining from the British Library and JISC web sites. The authors describe the project as a "virtual" longitudinal study…refining many popularly-held notions of the information behaviours of the "Google generation." The findings state that although young people have "apparent facility with computers" and confidence in their own ability, these are actually masking their lack of information literacy skills and performance. It concludes with predictions that the information environment of 2017 will be that of "a unified web culture," e-book prominence, mass book digitization, and additional forms of publication.

Seeking synchronicity: Evaluating virtual reference services from user, non-user and librarian perspectives (Radford, and Connaway 2008) evaluates the practice, sustainability, and relevance of virtual reference services (VRS) to libraries, with several complementary data collection phases from librarian providers, and both users and non-users of VRS. Among the outcomes of the project are significant implications for librarians' best practices, data on user behaviour differences by age demographics, and empirical data on the "elusive" non-users of library services.

Online catalogs: What users and librarians want (Calhoun et al. 2009) includes end-user (both academic and the general public) focus group interviews, online pop-up surveys for WorldCat.com users, and a Web-based survey of librarians to compare librarian and user perspectives on metadata and interface needs in library systems. The report identifies differences between the two respondent groups, and reinforces users' desires for discovery-to-delivery seamless access and for enhanced catalogue content.

E-journals: Their use, value and impact (Research Information Network 2009) encompasses a deep log analysis of several months' usage of ScienceDirect and Oxford Journals in UK universities, in order to provide an analysis of how academic researchers in the UK have responded to the growing availability of e-journals. Data indicate that e-journals are a critical component to research institutions in the UK and prove to have a good return on investment.

JISC national e-books observatory project: Key findings and recommendations (JISC, and UCL 2009) combines data from a deep log analysis report, a user survey report, focus group interviews, and print and circulation data reports for e-book usage at UK universities. It aims to find current attitudes towards e-books held by students and staff, and to evaluate JISC e-book usage. Overall, "e-books are now part of the academic mainstream" (ibid, p. 5) and "libraries…are a key player in the emerging market for e-books at present. Age and gender are also important predictors of e-book take-up" (ibid, p. 6). Most e-books are discovered through the library catalogue and links on the library web pages.

Students' use of research content in teaching and learning (Hampton-Reeves et al. 2009) reports on a survey of undergraduates at three UK universities, with follow-up focus group interviews based upon the initial data. The students generally prefer keyword searches in a large number of tools, but do distinguish between more traditional sources of research information (journals, library catalogues) and the potential pitfalls of the internet.

User behaviour in resource discovery (JISC 2009) uses qualitative data gathered in focus group and in-depth user interviews to "identify, understand and compare the information-seeking" behaviour of students and researchers in the Business and Economics disciplines who are "using subscribed and free resource discovery systems available" in three UK institutions (p. 17). The "poor usability, high complexity, and lack of integration" of many resources "acts as a barrier to information search and retrieval" (p. 6). That level of difficulty keeps the user from being able to concentrate on the actual content of the material. Additionally, information literacy skills were found to be lacking. Even though users may be able to use a search engine or other resource, they did not necessarily know how to get quality information from it.

Common Findings

These studies allow us to draw several broad conclusions about the state of user studies. Evidence produced by multiple studies is limited by the common problem that some studies have small sample sizes and purposive samples. However, this meta-analysis combines both quantitative and qualitative studies. Both have strengths and weaknesses and are complementary. The qualitative, exploratory studies provide rich data portraits of specific user groups while the large-scale quantitative studies confirm them. These rich data portraits combined with the large-scale quantitative analyses offer several common themes that were identified in the review of the twelve user behaviour studies.

Among the central findings are the following:

- **Disciplinary differences do exist** in researcher behaviours, both professional researchers and students.
- **E-journals are increasingly very important** to the process of research at all levels.
- The evidence provided by the results of the studies supports the **centrality of Google** and other search engines.
    - Google is often used to **locate and access e-journal content**.
- At the same time, the entire **Discovery-to-Delivery process** needs to be supported by information systems, including increased access to resources.
    - **Journal backfiles** are particularly problematic in terms of access

The realities of the online environment observed above led several studies to some common conclusions about changing user behaviours:

- Regardless of age or experience, academic discipline, or context of the information need, **speed and convenience are important** to users.
    - Researchers particularly appreciate **desktop access to scholarly content**.
    - Users also appreciate the **convenience of electronic access over the physical library**.
- Users are beginning to desire **enhanced functionality in library systems**.
- They also desire **enhanced content** to assist them in evaluating resources.
- They seem generally **confident in their own ability** to use information discovery tools.
- However, it seems that **information literacy has not necessarily improved**.
    - **High-quality metadata is thus becoming even more important** for the discovery process.

In addition, some common findings regarding content and resources arise:

- **More digital content** of all kinds and formats is almost uniformly seen as better.
- People still tend to think of **libraries as collections of books**.
- Despite this, researchers also **value human resources** in their information-seeking.

In some cases, the studies reviewed included findings which seem to contradict one another, and for which evidence may be mixed:

- There is evidence for both broad and narrow **range of tools used for scholarly research**.
- There is evidence both in favour and against **formal training in electronic searching**.
- There are mixed conclusions on the question of whether **recommendations, provided by recommender systems, and social media** are having an impact on information seeking.

In a few cases, the above findings from the studies under review offered evidence that runs counter to popular perceptions of the current information scene.

- Many popular media claims about the “Google generation” may not be supported by all the evidence.
- In choosing among search engines, some evidence indicates that speed may not be the most important evaluative factor.
- The studies that addressed library OPACs provide little support for the advanced search options which are still popular in these systems.

Implications for Libraries

A synthesis of findings from these major user studies points toward a number of implications for libraries. The implications below represent broad tendencies. The various user studies themselves do take into account differences in behaviour based on age and gender of the subjects, and context and situation of the information needs. Differences based on academic discipline have been a common finding throughout the user behaviour studies. The studies ask different questions of their subjects. In order to generalize findings and to present a valid portrait of user behaviours, it is necessary to conduct longitudinal studies of large populations.

Implications for libraries which are shared by multiple studies include the following:

- The library serves many constituencies, with *different needs and behaviours*.
- Library systems must do better at providing seamless access to resources.
- Librarians must increasingly consider a greater variety of digital formats and content.
    - More digital resources of all kinds are better.
- Library systems and content must be prepared for changing user behaviours.
- Library systems need to look and function more like search engines, i.e., Google and Yahoo, and Web services, i.e., Amazon.com, since these are familiar to users who are comfortable and confident in using them.
- High-quality metadata is becoming more important for discovery of appropriate resources.
- The library must advertise its brand, its value, and its resources better within the community.

This review concludes with suggestions for future research. The studies included in this meta analysis used both qualitative and quantitative research techniques, which complement each other. The large-scale online and interview surveys conducted in the quantitative studies, coupled with the rich data portraits provided by the qualitative studies, identify key issues which can be studied using more statistically generalizable methods. A large, random sample of specific demographic groups of information seekers should be identified in order to conduct a wide-ranging user behaviour study to identify how individuals engage in both the virtual and physical worlds to get information for different situations. Such an investigation would contribute to a better understanding of how individuals navigate in multiple information environments and could influence the design and integration of systems and services for devices and applications, as well as cloud computing. Such a study, undertaken at this pivotal moment in both library funding and explosion of information resources, could provide invaluable guidance for both libraries and the field of information science.

1. Key Findings Reported by Each of the Selected Studies

1.1 De Rosa, Cathy. 2005. *Perceptions of libraries and information resources: A report to the OCLC membership*. Dublin, Ohio: OCLC Online Computer Library Center.

These findings include the responses from all study participants, who are identified in the report as "information consumers" (De Rosa 2005, p. xii), which includes both academic information users and the general public. A total of 3,348 "information consumers" responded to the online survey. These respondents were grouped by geographic area for analysis. The respondents were identified as being from the United States, the United Kingdom, Canada, or the geographic grouping of Australia, Singapore, and India (ibid, p. xi).

- "Survey results indicate a high level of both use and familiarity with a wide variety of information resources" (ibid, p. 1-1).
    - Ninety-six percent of those surveyed stated they had visited a public library, but only 27% had visited a public library website (ibid, p. 1-2).
    - Familiarity with different types of resources varies: 36% of the respondents reported being "extremely familiar" with search engines while 26% reported being "very familiar" with libraries. Twenty percent of the respondents stated they "have never heard of" online libraries. A 30-year-old from Australia stated, *"Advertise? i have forgotten about librarys since i left school"* (ibid, p. 1-8).
- Search engines are the primary source to begin an information search. Eighty-four percent of all users responded that they began an information search with a search engine while only 1% indicated they began on a library web site (ibid, p. 1-17).
    - The study reported that 90% of the respondents were "very satisfied" or "satisfied" with their most recent search for information using a search engine compared to 84% who responded that they were "very satisfied" or "satisfied" with their most recent experience with a librarian when searching for information (ibid, p. 2-26). However, respondents tended to trust the results from a search engine "about the same" as results from libraries (ibid, p. 3-6).

        A 71-year old from the United States, stated, *"…also, the internet has now put all the librarys of the world [at] your fingertips"* (ibid, p. 1-13).

        "Looking and reading an entire book takes too long when the specific information can be gained online in a matter of minutes," stated a 38-year-old from the United States (ibid, p. 3-14).
    - Ninety percent of the respondents described a search engine as a "perfect" or "good" fit for their lifestyle, as opposed to 49% who described the library as a "perfect" or "good" fit for their lifestyle, while slightly fewer viewed the online library as a "perfect" or "good" fit for their lifestyle (ibid, p. 3-27-28).
- "Quality and quantity of information are top determinants of a satisfactory information search" (ibid, p. 6-2).
    - The respondents indicated that search engines are preferred instead of libraries because of speed, convenience, ease of use, cost-effectiveness, and reliability (defined as being always available; ibid, p. 2-18).

"Make a way to search through all of the databases with one search engine, instead of having to search each database individually," stated a 21-year-old from the United States (ibid, p. 1-19).

Another 21-year old from the United States explained, *"My schedule rarely fits their [libraries'] schedule"* (ibid, p. 3-29).

- Other key criteria for making choices identified by "information consumers" include "worthwhile" information (77%), free information (72%), and fast information (63%). Only 28% of the respondents mentioned recommendations as a criterion for making a choice of information source (ibid, p. 3-2).

- In determining quality, 63% value "credible, trustworthy" information (p. 3-3). The 86% of the respondents stated that they most often make judgments based upon their own knowledge or common sense. This was followed by 75% stating that they most often make judgments based upon the "reputation of the company/organization," (75%), 65% on "cross-referencing" (65%), and credible recommendations as to the quality of a source (59%; ibid, p. 3-4).
    - The respondents indicated that when they cross-check information they most often check other websites (82%), print resources (68%), and subject experts (51%); they indicated they only refer to librarians 16% of the time (ibid, p. 3-14).

- College students tend to score higher than non-academic users on both library use and electronic source use. (See the follow-up study, *College students' perceptions of libraries and information resources*, discussed below).

1.1.1 Implications of Findings for Libraries

- Libraries are widely viewed as being about *books*.

    "A library should primarily provide books and study resources. Music and DVDs are cool, but popular titles should not be carried since they can be rented from the video shop for very little," stated a 33-year-old Australian respondent (ibid, p. 2-4).

    A 41-year-old Canadian respondent said, *"Books, books, books, rows and rows of books, stacks of books, tables filled with books, people holding books, people checking out books. Libraries are all about books"* (ibid, p. 3-31).

- Libraries should better advertise their presence and could offer different formats and content.

    "Advertise what you offer more for general public. If you don't have kids or are not studying – you don't often know what the library offers" (ibid, p. 2-6).

- Libraries are advised by the respondents to increase their collections.

    "Get more copies of current and classic bestsellers, then sell off the books to reduce inventory when they are no longer in as high demand" (ibid, p. 4-7).

1.2 De Rosa, Cathy. 2006. *College students' perceptions of libraries and information resources: A report to the OCLC membership*. Dublin, Ohio: OCLC Online Computer Library Center.

This study is a subset of the study, *Perceptions of libraries and information resources* (De Rosa 2005), which is discussed above. It highlights and contrasts the views of 396 college students (from the U.S., U.K, Canada, Australia, Singapore, and India) and 691 U.S. 14-17-year-olds, all of whom responded to the original survey (De Rosa 2006, p. viii).

- The findings indicate that college students and younger people tend to use the library more than older people (ibid, p. 1-1-3), but 39% use the library "less frequently" since they began using the Internet (ibid, p. 3-19). Thirty-three percent of the respondents to the *Perceptions* study stated they tend to use the library "less frequently" since they began using the Internet (De Rosa 2005, p. 3-27).

  A twenty-year-old undergraduate from the United States stated, *"Just remember that students are less informed about the resources of the library than ever before because they are competing heavily with the Internet"* (De Rosa 2006, p. 1-4).

  - This group of respondents indicated they are using every type of electronic resource more often than the general population identified in the 2005 Perceptions study (De Rosa) (ibid, p. 1-6). This population is twice as likely to have used a library web site and e-journals. Fifty-six percent claim to use the library web site at least monthly (ibid, p. 2-5).

    "Being at University allows you membership of a large and well respected library on campus. There are librarians and other staff who can help you if you need advice, whereas searching online you cant ask anyone for help," stated an 18-year-old undergraduate from Australia (ibid, p. 1-10). However, only 10% claimed that the library website was "the only resource I needed to use" (ibid, p. 2-8).

  - Forty-eight percent of this demographic group of respondents reported that their most common activity in the physical library is to "do homework/study" compared to 12% of all respondents (ibid, p. 2-1).

- Using search engines for an information search is the first choice of 89% of all the college student respondents, compared to 2% who said they begin an information search with a library web site. Only 1% of all respondents of the *Perceptions* study stated they begin an information search with the library web site (ibid, p. 1-7).

  "Have to actually go into the library Takes a lot of time to search through all the books," stated an 18-year-old undergraduate from the UK (ibid, p. 2-9).

  - Ninety-three percent of the student respondents stated they are "very satisfied" or "satisfied" with their most recent search for information using a search engine, while 84% said they were satisfied with their most recent interaction with a librarian for an information search (ibid, p. 2-14).

  - Seventy-three percent of the respondents stated they value "credible/trustworthy information." When asked how they determine whether the information is credible and trustworthy, 83% of the college students said they most often judge based upon their own knowledge or common sense, followed by 71% stating they cross-check, with 69% stating they make judgments based on the "reputation of the company/organization" (ibid, p. 3-3), and 68% said they make judgments based on credible recommendations (ibid, p. 3-3-4). Cross-checking most often involves checking other websites (80%) and consulting

teachers (78%) and print resources (76%). Cross-checking using library materials (64%), subject experts (59%), and librarians (36% of students compared to 16% of all respondents) are mentioned less often (ibid, p. 3-10).

> However, some students reiterate their trust in the library as quoted by an 18-year-old undergraduate from the United States. "*A library is vital in order to get information. I trust and love libraries. The Web cannot take over because the library is sacred"* (ibid, p. 3-5).

- College students rate libraries significantly higher than all respondents in terms of a lifestyle fit. Sixty-three percent of the student respondents stated that both online and physical libraries are a "perfect" or "good" fit for their lifestyles compared to less than 50% of all respondents. However, they still rate search engines "good" or "perfect" fits for their lifestyles (94%; ibid, p. 3-20).

1.2.1 Implications of Findings for Libraries

- Academic users would like the library to be more convenient.

> A 35-year-old graduate student from Singapore stated, *"Setting up a physical library at major offices can be good"* (ibid, p. 4-7).
>
> *"It could be a bit more accessible for independent use by mobility impaired users,"* stated a 50-year-old graduate student from Australia (ibid, p. 4-7).
>
> A 21-year-old undergraduate student from the United States suggested that libraries, *"open up earlier in the morning so that i can use the facility before my morning classes"* (ibid, p. 4-7).

1.3 *Sense-making the information confluence:* Phases 1-4 and Final Report

Dervin, Brenda, CarrieLynn D. Reinhard, Zack Y. Kerr, Mei Song, and Fei C. Shen, eds. 2006. *Sense-making the information confluence: The whys and hows of college and university user satisficing of information needs. Phase II: Sense-making online survey and phone interview study.* Report on National Leadership Grant LG-02-03-0062-03 to Institute of Museum and Library Services, Washington, D.C. Columbus, Ohio: School of Communication, Ohio State University. Connaway, Lynn Silipigni, Chandra Prabha, and Timothy J. Dickey. 2006. *Sense-making the information confluence: The whys and hows of college and university user satisficing of information needs. Phase III: Focus group interview study.* Report on National Leadership Grant LG-02-03-0062-03, to Institute of Museum and Library Services, Washington, D.C. Columbus, Ohio: School of Communication, The Ohio State University.

Prabha, Chandra, Lynn Silipigni Connaway, and Timothy J. Dickey. 2006. *Sense-making the information confluence: The whys and hows of college and university user satisficing of information needs. Phase IV: Semi-structured interview study.* Report on National Leadership Grant LG-02-03-0062-03, to Institute of Museum and Library Services, Washington, D.C. Columbus, Ohio: School of Communication, The Ohio State University.

This is a research project that investigated how undergraduate and graduate students and faculty get their information for personal and academic or professional purposes. The sense-making technique was used for the four phases of the study - online surveys, telephone interviews, focus group interviews, and semi-structured interviews. Three hundred and seven academics responded to online surveys and telephone interviews. There were 107 faculty (35%) and one hundred each graduate (32.5%) and undergraduate (32.5%) students. Seventy-eight academics participated in eight focus group interviews (twenty-eight undergraduate students, nineteen graduate students, thirty-one faculty). A subset of fifteen

of the focus group interview participants also participated in semi-structured interviews (five undergraduate students, four graduate students, six faculty).

- The findings from this study indicate that these academics made rational decisions, which are contextually based, as they carried out their information searches.
    - They usually chose a search strategy, and a level of effort, based upon their situational needs, and they differentiated between quick and thorough searches (Connaway, Prabha, and Dickey 2006, p. 12, 15; Prabha, Connaway, and Dickey 2006, p. 10).

        When asked how one goes about finding information, one undergraduate focus group interview participant stated, *"For me it depends on what the topic is, where I'm gonna go first"* (Connaway, Prabha, and Dickey 2006, p. 12).

    - Information seekers are adept at searching for their personal needs, and often demonstrated signs of performing certain actions throughout the search process without realizing or recognizing that they were performing them. (Prabha, Connaway, and Dickey 2006, pp. 12-13).

- "Faculty, for example, turned more to co-workers, colleagues; other professionals (i.e. not mentors); articles, chapters; non-fiction books (other than reference books); and ads, commercial materials (used particularly in consumer situations). In contrast, both student groups turned more to students, classmates; family, friends, relatives; and museums (the latter, the qualitative data suggested, for class assignments and away-from-home leisure). Graduate students turned more as well to professors, advisors, mentors; and electronic database systems, understandable given the mandates of their institutional roles. Undergraduates turned more to webdiaries, blogs and public libraries, presumably for ease of access to the less specific resources required for undergraduate assignments" (Dervin et al. 2006, p. 75).

- The participants acknowledged the value of databases and other online sources to both academic and personal information needs.
    - Some users did not understand what resources were actually available in libraries nor could they distinguish between databases held by a library and sources merely available online (Connaway, Prabha, and Dickey 2006, p. 13-14).

        "Yeah, I don't step in the library any more… better to read a 25-page article from JSTOR," explained an undergraduate who participated in a focus group interview (ibid, p. 13).

    - Participants also stated that library OPACs are difficult to use; this belief is held by all types of participants. Many indicated they use electronic mediation to reach more traditional library resources (ibid, p. 11-14).

        This is demonstrated by a faculty response in a focus group interview: *"I do use Google, but … [I also] use two different library homepages"* (ibid, p. 12).

- Information seekers value familiarization, convenience, currency, and authority, and embody these values in their search strategies and behaviours (Prabha, Connaway, and Dickey 2006, pp. 3; 15); therefore, many information seekers, regardless of academic demographics tended to demonstrate a "heavy reliance on Google and other web information sources" (ibid, p. 13-14; Connaway, Prabha, and Dickey 2006, p. 10-11).

    As stated by one undergraduate focus group interviewee, *"The thing about Google is that I generally find the little somethings under the search results and the relevance to anything to actually be fairly good"* (ibid, p. 11).

This was reiterated by a graduate student focus group interview participant: *"Google, I don't have to know, I go to one spot"* (ibid).

1.3.1 Implications of Findings for Libraries

- Many of the study participants indicated they continue to value traditional browsing of library materials, and praised the library as a space for authoritative and academic information. However, even these study participants offered some specific suggestions for re-envisioning the library services and spaces (ibid, p. 17; Prabha, Connaway, and Dickey 2006, p. 19).
    - New data indicating how users "browse" online was identified (ibid, p. 16-18).

      "I know I went to Google and typed in 'embryonic stem cell research' and then it listed a whole bunch of websites and I just clicked on websites that looked like they were pertinent to what I was needing and read through them and then if it was really something that I felt could benefit my paper, I printed it off. If not, then I kind of let it pass…," stated an undergraduate participant of the semi-structured interviews (ibid, p. 17).

- Participants indicated a desire for more digitized sources of all kinds, including digitization of older literature, sheet music, and art images (ibid, p. 15, 19).

- Participants also discussed enhancements and changes to the library's electronic resources and suggestions to "make the library catalog more like search engines" (Connaway, Prabha, and Dickey 2006, p. 16). These include Selective Dissemination of Information (SDI) [although the participants did not use this term, this is the service they described], 24/7 reference, and expanded online sources, including all print and other physical materials available online (ibid, p. 16-17).

1.4 Research Information Network. 2006. *Researchers and discovery services: Behaviour, perceptions and needs.* London: Research Information Network.

Three hundred and ninety-five researchers from all disciplines and fifty-five librarians were interviewed for this study. Postdoctoral researchers representing a range of disciplines participated in "more in-depth interviews" and in focus group interviews, "to try to identify whether there were behavioural differences between researchers at the beginning of their careers whose experience was formed entirely in the digital environment and those who have faced a transition in working practices. The study is essentially qualitative in nature" (Research Information Network 2006, p. 6).

- "Increasingly, the boundary between resources themselves and discovery services is a permeable one" (ibid, p. 5). There is a need for a seamless process from discovery-to-delivery (D2D).

- Researchers want access to more digital content. "[I]t is clear that academic researchers have recently become rapidly so accustomed to getting resources directly on their desktop from anywhere in the world, that dissatisfaction when something isn't available is now the normal reaction" (ibid, p. 11).

  A life sciences researcher with more than twenty years experience said, "*Completeness of journal coverage [in my institution]. It's easy to find the paper; the problem lies in accessing full papers. Does the university subscribe to it? Is it subscribed to on a national basis? Once or twice a week I cannot access a paper - so move on to next abstract and miss a lot of information* (ibid).

Another life sciences researcher with 10-20 years experience stated, *"The main problem is access to free journal articles once I have discovered they exist. Our library does not subscribe (electronically or in print) to all the journals I consult"* (ibid).

- Researchers experience general satisfaction with the availability of discovery services. Forty-nine percent could identify no gaps in provision of services for their fields (ibid, p. 65).

- Some problems arise when it comes to accessing identified sources and materials. Most of these problems involve accessing journals in full-text and retrieving irrelevant results (ibid, p. 67).

  A life sciences researcher with 5-10 years experience stated, *"The most irritating thing is to eventually find the right paper and then find you need to have a subscription to read it"* (ibid, p. 71).

  - Other specific gaps in D2D provision included foreign language materials (especially for social sciences and Arts and Humanities researchers; ibid, p. 75), chapters in multi-author collections, short journal back files, and lack of specialist search engines (ibid, p. 67).

  - Some disciplinary differences exist in the researchers' satisfaction with D2D services. Researchers in the sciences are most satisfied. Arts and Humanities researchers indicated serious problems in unavailable content, irrelevant information in result lists, and in the discovery of non-English content (ibid, p. 75).

- "Most researchers are using a range of resource discovery tools, selecting an appropriate tool for a specific inquiry" (ibid, p. 7). The "less experienced" researchers are more likely to use more types of service and tools (ibid, p. 39). This, too, may reflect the researchers' desire for access to information.

  Another life sciences researcher with 1-2 years experience, stated, *"Step 1) Google it, and then hope we're subscribed to the online version Step 2) Surf the web for the author's homepage and see if it is available for download Step 3) email the author and ask for PDF"* (ibid, p. 38).

  - The most common tools used for discovery include general search engines. Eighty-three percent of the respondents stated they used search engines "very often" or "regularly" (ibid, p. 38), 72% indicated they used specialist search engines, and 66% stated they used internal library portals for discovery. This tends to support the researchers' valuation of the convenience of desktop access (ibid, p. 9).

  - A very few tools are named by a large number of researchers. These include Google, Web of Science, PubMed, Science Direct, and JSTOR (ibid, p. 27), although Google is often used for relatively simple tasks, and in conjunction with other sources (ibid, p. 29).

- Journal articles were reported as the central type of resource of interest to researchers. Ninety-nine and a half percent mentioned journal articles as their primary resource and 71% ranked them among their top three resources. However, monographs are still considered important since 83% mentioned them as a primary type of resource and 32% ranked them as one of their top three resources (ibid, p. 34-35).

- Ninety percent of the researchers mentioned the expertise of individuals as an important resource, but only 19% ranked experts in the top three resources (ibid, pp. 7, 34-35).

- Fifty-nine percent of the researchers identified "refining down from a large list of results" as their most common search strategy (ibid, p. 59). This leads to a key problem of irrelevant results and the fear of missing significant items (see quotes from survey respondents; ibid, p.60).

> *"Refine – getting first results is very fast and that gives a good indication of how to adjust the phrase,"* stated a physical sciences researcher with 10-20 years experience (ibid, p. 60).
>
> Another physical sciences researcher with 1-2 years experience stated, *"It's generally better to blunder about with variations on a theme"* (ibid, p. 60).

- Most researchers are self-taught in the use of discovery services with 62% of the researchers reporting they had no formal training (ibid, p. 64). However, they are relatively confident in their own skills (ibid, p. 9).

- Similarities across the disciplines are "more striking than the differences" (ibid, p. 44-46, 48).

1.4.1 Implications of Findings for Libraries

- The most serious gaps in provision of access include access to foreign–language materials, chapters in multiple-authored books, short back files of online journals, and lack of specialist search engines. Librarians could provide more robust metadata for chapters in multiple-authored books.

> *"It can be difficult for a UK professional who does not speak foreign languages to get a good academic translation. Would like a very good translation service specifically geared for academics,"* stated a physical sciences researcher who has more than 20 years experience (ibid, p. 69).
>
> Another physical sciences researcher with 1-2 years experience explained, *"The online archives only go back a few years especially for commercial journals. The library holds most pre-1970s journals in a store and it takes a day to access it. Yes, it is very difficult to access unusual journals (e.g. from former USSR)"* (ibid, p. 68).

- Access is more of an issue to researchers than discovery. Researchers expect to access more full-text resources on their desktops.

1.5 Consortium of University Research Libraries, and Research Information Network. 2007. *Researchers' use of academic libraries and their services: A report*. London: Research Information Network and Consortium of University Research Libraries (CURL).

In an attempt to identify how researchers use academic libraries and their services, surveys, expert panel, focus group discussions, and telephone interviews were conducted with "more than 2250 researchers and 300 librarians" (Consortium of University Research Libraries, and Research Information Network 2007, p. 9).

- Immediate access from a desktop computer is almost taken for granted by academic users. Seventy-nine percent reported they access electronic information from their office (ibid, p. 23-24).

> *"The majority of researchers in all disciplines have adapted readily to the widespread availability of digital content, accessible directly from their desktops"* (ibid, p. 23).

- Researchers retain a sense of the importance of the library and 72% indicated satisfaction with its services (ibid, p.10). However, "there has been a sharp fall over the past five years in the number of researchers who visit their institution's library regularly" (ibid, p. 2). Between 10 and 20% in

every discipline reported they did not visit the library regularly. However, 40% of the Arts and Humanities researchers report going to the library once a week, and 46% of them strongly agree that the "main objectives" of their research are physically in the library (ibid, p. 20-21; see p. 29 for the Arts and Humanities researchers' valuation of specific print resources).

    - Convenience is a major factor in this choice. Location, opening hours, noise levels, etc. are aspects of convenience (ibid, p. 22).

- Researchers use digital finding aids, and expect not to spend much time locating the actual item. This leads to a kind of "satisficing" behaviour (ibid, p. 31; 33), whereas researchers settle for "good enough."

    - An implication for library services is the need to provide accurate and robust metadata.

    - Librarians believe there is relatively little recent change in demand for interlibrary loan (ibid, p. 34-35).

- Researchers "place a very high value on electronic journals, but a much lower value as yet on libraries' provision of other kinds of digital resources." Current issues of journals were rated "very useful" by 60-80% of the respondents (ibid, p. 39).

    - There is a preconceived notion that non-digital means invisible to researchers. This study suggests it is not entirely true, though respondents would prefer to have everything available in digital form (ibid, p. 38).

- Both researchers (72%) and librarians "expect that libraries will have a key role as custodians and managers of digital resources" (ibid, p. 48). This includes institutional repositories (IRs).

    - Approximately 85% of the librarian respondents also believe that information literacy teaching will remain a "core role" (ibid, p. 47).

- Fifty percent of the researchers and 75% of librarians who participated in the surveys believe Virtual Research Environments (VREs) will grow in importance to scholarly research (ibid, p. 59).

- Researchers' awareness of open access (OA) issues "is low;" only 45% of the Arts and Humanities researchers indicated awareness of OA issues while 71% of life scientists were aware of them (ibid, p. 59). Seventy-two percent of the respondents did not know whether their own IRs were open access (ibid, p. 64).

1.5.1 Implications of Findings for Libraries

- Librarians believe that attaining top-level funding is a serious issue. However, only 22% believe this is possible at their institutions (ibid, p. 16).

- "Simplified reciprocal access" to both print and electronic materials should be promoted among institutions (ibid, p. 26).

- Many "information resources that could be useful to researchers currently remain under-used, mainly because they exist *only in hardcopy or are inadequately catalogued*" (ibid, p. 59, emphasis added). There is a great demand for access to full-text resources.

- The growth in both VREs and digital research outputs must be met by librarians. Seventy-five percent of librarians surveyed believed that this would become a major professional role (ibid, p. 54).

- The successful research library of the future needs to forge a stronger brand identity within the institution" (ibid, p. 4).

1.6 Centre for Information Behaviour and the Evaluation of Research. 2008. *Information behaviour of the researcher of the future: A CIBER briefing paper*. London: CIBER.

This is a "virtual" longitudinal study that includes a review of the literature to compare "the information behaviour and preferences of young people over the past thirty years" (CIBER 2008, p. 6). Primary data from log analysis of "British Library Learning, a service aimed at schoolchildren and teachers, and Intute, a JISC service that is aimed across and beyond the university Community" (ibid, p. 14), were collected and analyzed in an attempt to identify how people currently behave in virtual libraries (ibid, p. 10).

- Very little time is spent using content. Approximately 60% of e-journal users view less than four pages and 65% do not return to the journal. Academic users "will "squirrel away content in the form of downloads." However, there is no evidence that these are read (ibid, p. 10).

- Many popular media claims about the Google generation are not supported by evidence.

    - They are not alone in preferring quick chunks of information; researchers from undergraduate student to professor share this characteristic (ibid, p. 19).

    - They are *not* expert searchers (ibid, p. 12).

        "Digital literacies and information literacies do not go hand in hand" (ibid, p. 20).

    - Other claims of the Google generation's behaviour characteristics, including multi-tasking and visual information use, may not be true, and preferences for immediate answers may not be unique to their generation (ibid, p. 18-20).

- Log analysis indicates that, regardless of the age of the information seeker, the majority of British Library web site visits were from a search engine (ibid, p. 14).

- College students are unlikely to participate in 'social networking' features provided by the library (ibid, p. 16-17).

1.6.1 Non-academic (Younger People) User Findings

- Younger people tended to spend little time, and with little effectiveness in evaluating search results. They preferred natural-language searching and trusted Google to understand them. Many do not find library resources intuitive (ibid, p. 12).
    - Forty percent of the school-age searchers who visited the British Library's web site entered the site via an image search (ibid, p. 14).
- Teachers of the Google generation tended to be information literate, but are not always sharing or teaching this literacy to the pupils (ibid, p. 23).
    - The younger people "do not recognize that they have a problem: there is a big gap between their actual performance in information literacy tests and their self-estimates of information skill" (ibid, p. 24).

1.6.2 Implications of Findings for Libraries

- Librarians must *now* consider the implications of new "power browsing" behaviours, in which users "view only a few pages, many of which do not even contain real content, and in any case do not stop long enough to do any real reading" (ibid, p. 31).
- Librarians need to consider a wider variety of formats and content. "Library users demand 24/7 access, instant gratification at a click, and are increasingly looking for 'the answer' rather than for a particular format" (ibid, p. 8).
    - Specific recommendations include improving library brand, becoming more "e-consumer-friendly," avoiding being decoupled from the publisher to user chain, increasing user evaluation, and improving information skills (ibid, p. 33-34).

1.7 Radford, Marie L., and Lynn Silipigni Connaway. 2008. *Seeking synchronicity: Evaluating virtual reference services from user, non-user, and librarian perspectives: IMLS final performance report.* Report on Grant LG-06-05-0109-05, to Institute of Museum and Library Services, Washington, D.C. Dublin, Ohio: OCLC Online Computer Library Center.

The study was comprised of four phases – virtual reference transaction analyses and focus group interviews, online surveys, and individual telephone interviews with librarians and users and non-users of Virtual Reference Services (VRS). Twenty-one librarians, twenty-two VRS users, and forty VRS non-users participated in eight focus group interviews. One hundred and seventy-five librarians, 137 users, and 184 non-users completed online surveys while one hundred librarians, seventy-six users, and 107 non-users participated in telephone interviews. In addition, 850 virtual reference transcripts were analyzed for a number of qualitative and quantitative measures.

- Empirical data supported "convenience" as the most important factor in choosing among information sources. Ninety-seven percent (n=143) of VRS users surveyed rated this feature as "very important" or "important," with 74% (n=101) citing availability after hours (Radford, and Connaway 2008, p. 7).

> *"Here's the answer to your problems: you can't get to the library, get out of the house, they are right there, willing to help, it is like having a reference librarian at your house,"* reported one telephone interview respondent (UTI-24).

- When evaluating success of a reference encounter in the virtual environment, "getting an answer" was the most-often cited factor contributing to success (43% of users' survey responses to positive critical incidents (ibid, p. 7-8).
    - The Critical Incident (CI) technique analysis revealed a mixture of relational and content facilitators contributing to perceptions of success (ibid, p. 8).

> *"I will try chat reference, because it seems like an easy and convenient way to get my questions answered*," one non-user online survey respondent stated (ibid, p. 15).

- When asked directly, VRS users indicated mixed preferences between features of face-to-face (F2F) and VRS (ibid, p. 9).
    - Thirty-eight percent (ibid, n=28) of user telephone interview respondents preferred VRS because of the immediacy or convenience of chat (15%, n=11).
    - Those preferring F2F (18%, n=13) felt that there was clearer communication with the librarian in this mode (12%, n=9; ibid).
    - The large number of VRS users who did not have a clear preference (41%, n=30) saw numerous strengths and weaknesses in each format (ibid).

> Another Net Gen user said, *"I had to find a book on reserve for a school project so I went to the circulation desk and communicated face-to-face with a librarian, in order to find what I was looking for. I was intimidated and the librarian was not too friendly. I just felt stupid and uncomfortable"* (Connaway, Radford, and Williams, p. 7).

- Differences emerged in communication patterns in this medium between generations of users (Connaway et al. 2008, p. 131).
    - The online survey results indicated that Millennial VRS users (N=49) were much more comfortable in the chat medium, and enjoyed it more than older people. Seventy-six percent (n=39) of the Millennial VRS users "are least intimidated by" chat, with adults (N=88) responding 76% (n=67) for chat intimidation and only 4% (n=3) for F2F (Radford, and Connaway 2009).
    - Millennials were more likely to express a "desperate need for quick answers," and were more comfortable multi-tasking. In the user online survey, 82% (n=40) of Millennial VRS users rate "quick answers" "very important" or "important," as opposed to 63% (n=21) of Boomers. Eighty-six percent (n=42) of the Millennial VRS users indicated it was important "being able to do other things while using chat reference, compared to 45% (n=15) of Baby Boomers (Connaway, and Dickey, under review).

> *"I felt the encounter was successful because she quickly and successfully answered my question, and actually helped me with understanding other parts of the story as well,"* one Net Gen respondent explained (Connaway, Radford, and Williams, p. 6).

- Non-users of virtual reference services were open to the possibility of trying VRS. Many also expressed very positive F2F experiences with librarians (Connaway, Radford, and Dickey 2008, p. 27-28).

> One non-user respondent explained, *"I like the one-on-one interaction, which enabled me to have my specific questions answered on the spot. The librarian was able to address my specific needs with practical, useful information. She was friendly and appeared genuinely glad to be helping me"* (Connaway, Radford, and Williams, p. 7).

1.7.1 Implications of Findings for Libraries

- Librarians need to market their services and resources with higher visibility: the most often reason cited for non-use of virtual reference was not knowing the service exists (Radford, and Connaway 2008, p. 9).
    - Users of VRS, however, are very active in viral marketing, recommending the service to their peers (Connaway and Radford 2009).
- Librarians need to accurately answer reference questions but be friendly and approachable (even in a virtual environment). Clarifying the question increases the accuracy rate (Radford, and Connaway 2008, p. 102-103).
- Ready reference is not dead! Librarians need to be familiar with both print and electronic sources (other than Google) in order to accurately and efficiently answer reference questions (Radford, and Connaway 2007).

1.8 Calhoun, Karen, et al. 2009. *Online catalogs: What users and librarians want: An OCLC report*. Dublin, Ohio: OCLC.

Three data collection methods were utilized – focus group interviews, "a pop-up survey on WorldCat.org" (Calhoun et al. 2009, p. v), and "a Web-based survey targeting librarians and library staff" (ibid, p. 9). Three end-user focus group interviews (N=24), with eight undergraduates in each focus group, representing "casual searchers" and "scholars" were conducted. The WorldCat.org pop-up survey solicited 11,151 responses (4% response rate) of which 68% (N=7,583) were end users (ibid, p. 7). There were 1,397 responses to the librarian and library staff survey (ibid, p. 9).

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- "The end user's experience of the delivery of wanted items is as important, if not more important, than his or her discovery experience" (ibid, p. v).
    - Fifty-five percent of survey respondents stated they would immediately try to obtain a copy of the item based on information they discover, 30% would "Request the item from a library," 21% would "Visit a library listed here," and 4% would "Purchase the item;" (ibid, p. 20).
    - Twenty-four percent of the respondents indicated that a "list of libraries that own the item" is the most essential data element for them while 14% cited "the ability to see what is immediately available" as essential to them (ibid, p. 12).
    - Thirty-six percent of survey respondents believed that "more links to online content/full text" was the "most helpful" change to identify a needed item in the catalogue (ibid, p. 13). However, this enhancement was in the bottom third of librarians' desired changes (ibid, p. 44).

- End users who participated in the focus group interviews indicated that they wanted the retrieved results to be obviously relevant and suggested that catalogues "use weighting in the search algorithm" (ibid, p. 14). They also suggested the catalogue contain helps to the user for navigation within the catalogue and evaluation of sources.

    - "End users rely on and expect enhanced content." Thirty-two percent of survey respondents' preferred more subject information and 18% indicated a preference for summaries, abstracts, and tables of contents (ibid, p. 13).

    - "An advanced search option and facets help end users refine searches, navigate, browse and manage large result sets" (ibid, p. 15-16).

    - "The focus group interview participants offered a mixed reaction to social features" in the catalogue (ibid, p. 18-19).

- "Important differences exist between the catalog data quality priorities of end users and those who work in libraries." Fifty-two percent of the librarians indicated that the most desired data enhancement was to "Merge duplicate records" (ibid, p. 25). This enhancement might improve users' searching tasks and their retrieved results. However, users necessarily would not understand the implications of duplicate records on searching and retrieval; therefore, they probably would not mention this.

1.8.1 Implications of Findings for Libraries

- One size does not fit all. Different constituencies value different parts of an interface, and different levels of metadata based on the situation and context of their information needs.

- Librarians should consider placing more emphasis on user-centred design principles.

    - "As it became clearer to Web developers what worked and what didn't, many also learned to take advantage of new opportunities in the Web's virtual world—lessons that have emerged as some very different ways of organizing large volumes of information, for example, on Flickr or Facebook" (ibid, p. 51).

- Catalogues probably would better serve users with better delivery, more links, and more online content. This is indicative that access to resources, not necessarily discovery, is the major issue in the current information-seeking environment.

- The library catalogue should look more like search engines, i.e., Google, Yahoo, and Web services, i.e., Amazon.com, since most people are more familiar with this type of search, display, and interface.

    "Make it as easy as a Google Book Search," one survey respondent requested when discussing the catalogue (ibid, p. 14).

    One survey respondent suggested, *"I wish the results page would list a short blurb (one line) about the book similar to the way Google shows you a tiny bit about what a site link is about"* (ibid, p. 17).

1.9 Research Information Network. 2009. *E-journals: Their use, value and impact*. London: Research Information Network.

The data for this study were secured from publishers' logs for the UK. Four months of ScienceDirect logs and twelve months of Oxford Journal logs were mined and analyzed. A statistical database was created to relate "library indicators, article downloads, and measures of research success for all UK universities and colleges" (RIN 2009, p. 12). The research is centred on academic users.

- *"E-journals are the life-blood of UK research institutions"* (ibid, p. 6). E-journals are an integral part of UK academic libraries. Within four months, "users at ten UK research institutions visited nearly 1400 ScienceDirect journals…, half a million times and viewed a million and a half pages" (ibid).
    - The number of titles and the number of article downloads have nearly doubled from 2001-2007 and 2003-2007, respectively (ibid, pp. 14-15).
    - Of all the journals available in the sample, 98% of them were used in a four-month period. This suggests an excellent return on investment (ROI) (ibid, p. 6).
- Users are getting content rapidly, visiting "for only a few minutes" (ibid, p. 6; see also the 24/7 usage patterns identified on page 23).
- Users are tending to ignore publishers' platforms more than ever. Ninety-two percent of chemists and physicists do not use these platforms at all (ibid, p. 22).
    - Approximately one-third of the traffic to ScienceDirect came from Google four months after the content was opened to Google. More than half of the traffic to the Oxford Journals was via Google (ibid, p. 21).
- User behaviours vary if they are affiliated with a "research-intensive" institution. The users in "research-intensive" institutions tend to have shorter sessions, more focused searches, and view fewer pages, articles and titles (ibid, pp. 26, 34). The users at the "research-intensive" institutions also tend to view journals with higher impact factors (ibid, p. 31). This could imply that researchers are skilled searchers and spend little added time online or that they are under time pressure. Either way, these findings seem to contradict the notion of hard-core "professional" researchers. Behaviours also vary by discipline. Historians are more likely than life scientists to use Google, and subsequently to use search tools once inside a publisher platform (ibid, p. 25).

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- The ROI is considered very good for e-journals since the average download cost/article is estimated at eighty pence (ibid, p. 4).

    "On average, every registered FTE library user downloads 47 articles a year" ibid, (p. 8).

    "Per capita expenditure and use of e-journals is strongly and positively correlated with papers published, numbers of PhD awards, and research grants and contracts income" (ibid, p. 8; see charts on pages 41, 40, and 39).

1.9.1 Implications of Findings for Libraries

- E-journals are highly used and considered to be a strong investment in libraries' success. They provide full-text content and are heavily used.
- Opening discovery of e-journals to Google provides users with easy access to full-text content.

- Since the majority of researchers access e-journals via Google and not through the publishers' platforms, librarians may be able to work with publishers to develop new resource discovery services to aggregate publishers' metadata and e-journal full-text content. This has begun with Serial Solutions' Summon and Ex Libris' Primo Central.

- The finding that users in "research-intensive" institutions tend to have shorter sessions, more focused searches, and view fewer pages, articles and titles contradicts the concept of the hard-core researcher. Librarians may need to provide more bibliographic instruction for researchers as well as provide varying levels of complexity for searching library systems.

1.10 JISC and UCL. 2009. *JISC national e-books observatory project: Key findings and recommendations: Final report.*

The study employed a large variety of data collection techniques and concentrated on the academic environment and its users. E-book user surveys (N=52,154) were conducted; twenty-six e-book logs (Nov. 2007- Dec. 2008) were analyzed; focus group interviews with students, teaching staff and librarians at eight UK universities were conducted; library circulation data for thirty-seven universities and retail sales data were reviewed. E-books in specific disciplines were investigated in this study. The disciplines included business studies, engineering, medicine, and media studies (JISC, and UCL 2009, p. 9).

- Sixty-five percent (N=14,963) of both teachers and students have used e-books either for leisure or study (ibid, p. 13).

    "E-books are now part of the academic mainstream" (ibid, p. 5).

- "Libraries are … a key player in the emerging market for e-books" (ibid, p. 5). Fifty percent (N=14,095) of the respondents reported using e-books provided by the library (ibid, p. 13).

    - E-textbooks, specifically, are a "valuable back-up for hard-pressed short loan collections" such as course reserves (ibid, p. 5). However, users report significant technical difficulties. These include the usability of the interface, difficulty printing (ibid, p. 21) and issues with the digital rights management software (ibid, p. 28).

- Convenience is a major factor in e-book usage. The deep log analyses revealed that 37% of the e-book pages were used off-campus, 24/7 (ibid, p. 19). "Online access" was cited by 52% of survey respondents (N=11,763, n=6,169) as the most important advantage of e-books; "searchability" (13.2%, n=1,556) is the second most cited advantage of e-books compared to print books (ibid, p. 22).

    - Student complaints about print resources not being available during peak times dropped slightly between 2008 and 2009 and this is attributed to the availability of "unlimited concurrent access to course text e-books" (ibid, p. 14).

    - Users are confused by the various access methods for e-books, which include library catalogues and library web pages. The findings indicate that high quality metadata is critical in the discovery of e-books (ibid, p. 16).

- The log analysis indicates that e-book users do not spend much time in the book and use them to quickly find facts, viewing only a few pages. Eighty-five percent of the users spent less than one minute viewing a page (ibid, p. 17).

- Students' e-book use varied by discipline. There was higher use in business studies than in engineering; business studies accounted for 19% of the titles under study, but fully 45% of all use (ibid, p. 33).

- E-availability did not significantly reduce print circulations (ibid, p. 29) or publisher sales (ibid, p. 35); therefore, print and e-versions of important course texts should be considered "complementary, not substitutes for one another" (ibid, p. 6).

1.10.1 Implications of Findings for Libraries

- Libraries are an important player in providing e-books.

- Librarians need to provide high-quality metadata for discovery of e-books and to simplify the various methods of e-book access.

1.11 Hampton-Reeves, Stuart, Claire Mashiter, Jonathan Westaway, Peter Lumsden, Helen Day, Helen Hewerston, and Anna Hart. 2009. *Students' use of research content in teaching and learning: A report of the Joint Information Systems Council (JISC).*

Surveys were conducted in four UK universities (N=429). Ninety percent were undergraduate students with 68% between the ages of 18-22. Thirty-two percent were identified as "mature students" (p. 17). In addition to the surveys, seven focus group interviews (N=44), including subjects from three UK universities (Hampton-Reeves et al. 2009, p. 3), and a final set of eight semi-structured interviews were conducted (ibid, p. 4).

- Students predominantly use keyword searches on a "mixture of tools usually including internet search engines, library catalogues and specialist databases" (ibid, p. 45; see also survey responses, p. 30). Journal articles (97%, n=415) and books (96.7%, n=414) dominate as research sources (ibid, p. 26).

  > One university student stated, *"I take key words from the title and look at what I can find quickly and easily, I'll also read the source list, I'll type them in Google and then go to the library"* (ibid, p. 36).

- Seventy-nine percent (n=340) of "users assess research content based on its relevance to their assignment" (ibid, p. 19). When asked in a different question what they value most about the information they find, 90% (n=384) "agree" or "strongly agree" that it is the relevance to their assignment (ibid, p. 33).

  - The most common use (90%, n=381) for the research content is "to validate and substantiate a point in an assessment" (ibid, p. 46) and 428 respondents said they "frequently" or "always" use the research content to "give substance to" their own arguments (ibid, p. 20).

  - More than half the sample (N=248) identified obstacles affecting access. The comments include immediacy of access to and accessibility of full-text articles and texts online, "even from the library," (ibid, p. 22-23).

  - Fifty-four percent (n=232, N=429) stated the convenience of a home computer is the "main way" they gain access to research content (ibid, p. 29).

- Students are very aware of the difference between formal research and basic internet content, perhaps because they believe their tutors will penalize use of the latter (ibid, p. 47).

A Humanities student stated, *"The internet is difficult to use, you're unsure of the validity"* (ibid, p. 39).

Another student said, *"You can't trust everything on the internet, anyone can publish something"* (ibid, p. 39).

A Social Science student agreed, *"Some of it [internet information] is interesting but some is waffle"* (ibid, p. 39).

- ***In situations of formal research for these students***, this leads them to the library catalogue first and to use it more (32%, n=137, N=428; ibid, p. 24). However, the researchers stated, "it is very clear that Google has emerged as a real force in the accessing and discovery of research content which is rivalling university library catalogues" (ibid, p. 30).

1.11.1 Implications of Findings for Libraries

- Students need "more guidance and clarity on how to find research content and on how to assess its worth as well as its relevance" (ibid, p. 46).

- Access, rather than discovery, is the biggest issue. Librarians need to provide students with access to as much immediately accessible material as possible – open source materials, longer journal backfiles, repositories, and other full-text sources.

1.12 Wong, William, Hanna Stelmaszewska, Nazlin Bhimani, Sukhbinder Barn, and Balbir Barn. 2009. *User behaviour in resource discovery: Final report.*

The study applied a two-stage approach. Stage 1 included two focus group interviews with a total of nine participants. Stage 2 combined user observation, using a cue recall technique and three sets of tasks with in-depth interviews. The thirty-four participants (16 male and 18 female) in Stage 2 included business and economics students from three UK universities who demonstrated different levels of information literacy and represented undergraduate, postgraduate, and expert researchers who were between 22-55 years old (Wong et al. 2009, p. 24-26).

- Information literacy skills are generally lacking; they have not necessarily kept pace with digital literacy (ibid, p. 6).

  One researcher said, *"I don't always know which is the most appropriate [database]"* (ibid, p. 63).

- The students who participated in the study used a wide variety of sources – both subscription resources and the open internet. However, "when the level of information literacy as well as the domain knowledge increases, there is an increased tendency to use better quality library resources" (ibid, p. 6-7).

- Users found access hindered by the difficulty of using database interfaces (ibid, p. 7).

  One participant stated, *"I don't know why you can't … they might have changed the functionality. You used to be able to just put in Times in 'Publication Title' which is really good because it would bring the normal Times, the Financial Times and the Times on Sunday but now something seems to happen in ProQuest here .. you can't do that and so … which I don't understand. Because now I have to pick each publication but this makes the amount of searching I have to do more"* (ibid, p. 67-68).

- Access was identified as a problem.

  A participant explained, *"I don't know if this is going to be a relevant article or not. It's not relevant. This is something which irritates me. I was looking for something that might be of relevance to me. … I had to go in find a link, click on that link and it asks me a couple of things. I didn't click the link properly, my mistake. It wasted my time"* (ibid, p. 65).

- Access barriers to journal backfiles are a specific frustration (ibid, p. 8).

  Another participant explained, *"Because we don't have the full text, I'd go to SFX and follow any link it'll give me. Although sometimes this is frustrating because even though you follow the links, we don't have access to it. So you get there and you still can't download it, which is just plain irritating"* (ibid, p. 69).

- Search strategies change by context, during the course of the process. "When using freely available Internet resources, Google is top of the list, followed by Google Scholar, Wikipedia and YouTube. Participants' decisions about which resources to use were based on their prior knowledge and experience with a resource and a belief that resources provided by Google and Google Scholar are reliable and relevant and most of all always return a list of results. On the other hand, library resources were perceived as credible, providing quality material from a broad subject coverage" (ibid, p. 7).

  "I'm very surprised that … my search terms have brought up things to do with porn and sex [laughing] … so I am going to have to think of something else it's [keywords] obviously wrong," described a participant (ibid, p. 56).

  Another stated, *"I'm feeling annoyed by the search I have done – and this is all I have found. … I am going to go to Google" (*ibid, p. 57).

1.12.1 Implications of Findings for Libraries

- Improve usability of library and publisher systems, to increase visibility and navigability of various forms of digital content, making it easier for users to identify appropriate resources for their study (ibid, p. 83).

- Increase information literacy instruction for users at the time of need.

- Make library catalogues more like search engines. Participants describe Google and Google Scholar as "reliable and relevant" systems that "always return a list of results" (ibid, p. 78).

1.12.2 Centre for Information Behaviour and the Evaluation of Research. 2009. *JISC user behaviour observational study*. London: CIBER.

This is a supplementary report from CIBER at University College London looking at Web log analysis for business/ economics resources and surveys representing more than five thousand people. The data were collected for The Virtual Scholar programme, which consisted of four research projects, as well as "from the JISC national E-Book Observatory project and the RIN funded E-journals study" (ibid, p. 7). The report addresses the digital usage and information-seeking behaviour of tens of thousands of business/ economics/ management students, researchers and academic staff.

- The information-seeking behaviours of business and economics students and researchers are similar to colleagues in other disciplines (Centre for Information Behaviour and the Evaluation of Research 2009, p. 7). However, they do use e-textbooks and e-books somewhat more than

others (69% reported usage as opposed to 68% for engineering students and 56% for medicine; ibid, p. 26), tend to “search off campus” and in off-hours, and they are “bouncers” (they quickly move from one web site or link to another) and demonstrate briefer searches and visits than the norm for the virtual scholar. Google and Google Scholar are more popular with them, and they prefer current sources (ibid, p. 8).

    - Survey respondents raised issues encountered when accessing e-books and they accounted for 13.3% of all negative free-responses in the survey. The respondents mentioned technical issues with e-books and problems transitioning from e-books to “getting hold of hard copies from library or other sources” (ibid, p. 31).

- “Power browsing of multiple e-textbooks is characteristic and there seems to be very little extended reading of e-books” (ibid, p. 8). E-books are used to get snippets of information.

1.12.2.1 Implications of Findings for Libraries

- Librarians should try to acquire more full-text resources, with quick and convenient discovery services that are integrated into the library catalogue, journal databases, and the open Web. The metadata for e-books should link them to print versions of the books.

- Librarians should maximize access to full-text resources by local digitization, increasing the availability of full-text content in repositories, special collections, and virtual research environments.

2. Discussion of Common Findings of the Studies

These studies allow us to draw several broad conclusions about the state of user studies. The rich data portraits offer several common themes that were identified in the review of the twelve user behaviour studies. The following discussion includes the key findings shared among the twelve studies; each table lists key findings from all applicable studies in chronological order, as follows:

Perceptions of libraries and information resources (De Rosa 2005)
College students' perceptions (De Rosa 2006)
Sense-making the information confluence (Dervin et al. 2006; Connaway, Prabha, and Dickey 2006; Prabha, Connaway, and Dickey 2006)
Researchers and discovery services: Behaviour, perceptions and needs (RIN 2006)
Researchers' use of academic libraries and their services (CURL, and RIN 2007)
Information behaviour of the researcher of the future (CIBER 2008)
Seeking synchronicity (Radford, and Connaway 2008)
Online catalogs: What users and librarians want (Calhoun et al. 2009)
E-journals: Their use, value and impact (RIN 2009)
JISC national e-books observatory project (JISC, and UCL 2009)
Students' use of research content (Hampton-Reeves et al. 2009)
User behaviour in resource discovery (Wong et al. 2009)

2.1 Key Findings

Several studies indicate that some **disciplinary differences do exist** in researcher behaviours, both professional researchers and students (see Table 1).

Table 1: Finding: Disciplinary Differences

Study	Finding
Researchers and discovery services, 2006	Some disciplinary differences exist
E-journals, 2009	Behaviours also vary by discipline
JISC national e-books, 2009	Students' use varies by discipline

The evidence suggests the **increasing importance of e-journals** to researchers (see Table 2); one study specifically on *E-journals* (Research Information Network 2009) identified them as a "critical part" of the current research climate.

Table 2: Finding: E-journals

Study	Finding
Researchers and discovery services, 2006	Journal articles central type of resource
Researchers' use of academic libraries, 2007	Researchers place a very high value on electronic journals
E-journals, 2009	– E-journals are a powerful part of academic libraries – Article downloads have nearly doubled – ROI considered very good for e-journals – User downloads 47 articles a year – Strongly correlated with papers published, numbers of PhD awards, research grants, contracts income

Even more evidence exists for the increasing **centrality of Google** and other search engines in researchers' behaviours (see Table 3). This means that keyword searches are becoming a more dominant search behaviour, and that resource access via search engines should be a major concern to our institutions. In the *Researcher of the Future* study, the majority of students' visits to the British Library site came from search engines (CIBER 2008, p. 14).

Table 3: Finding: Google

Study	Finding
Perceptions of libraries, 2005	– Search engines dominant place to begin – Search engine as lifestyle fit – Search engines are preferred over libraries
College students' perceptions, 2006	– Search engines overwhelming first choice for an information search – 94% lifestyle fit
Sense-making, 2006	Heavy reliance on Google and other web information sources
Researchers and discovery services, 2006	– Common tools include general search engines, specialist search engines – Google is often used for relatively simple tasks in conjunction with other sources
Researcher of the future, 2008	– Majority of BL visits were from search engine – Prefer natural-language searching and trust Google to understand them – 40% of school-age visits to the BL visits were via an image search
E-journals, 2009	Currently a third of the traffic to this content is via Google
Students' use of research content, 2009	Students are found to predominantly use keyword searches, on a "mixture of tools."

2.2 Google and Access

Google is often used to **locate and access e-journal content**, and other library resources, both by students and by "professional" researchers. One-third of the traffic to e-journal content in the *E-journals* study was via Google (RIN 2009, p. 7; see also Table 4).

Table 4: Finding: Locate and Access E-Journals via Google

Study	Finding
Sense-making, 2006	Some evidence for use of Google in this way
E-journals, 2009	– Users are tending to ignore publishers' platforms – A third of the traffic to this content now is via Google

At the same time, the entire **Discovery-to-Delivery process** needs to be supported by information systems, including increased access to resources; a large number of studies identified particular problems with platforms, and noted that the boundary between discovery and actual access to resources is increasingly permeable (see Table 5). This conclusion is echoed elsewhere in the literature (see, for instance, University of Minnesota Libraries 2009) in which seamless access to resources is a major trend). The results of these studies indicate that discovery is no longer the major issue – access is the biggest issue. Retrieving large results lists does not intimidate or frustrate users (they may be accustomed to this because of search engines, such as Google). The biggest frustration is not being able to access the materials/resources because of proprietary information that requires subscriptions, logins, passwords, etc.

Table 5: Finding: Discovery to Delivery

Study	Finding
Researchers and discovery services, 2006	– Boundary between resources and discovery services is permeable – General satisfaction with the availability of discovery services – Gaps in D2D provision included foreign language materials, chapters in multi-author collections, short journal backfiles, and lack of specialist search engines
Researchers' use of academic libraries, 2007	Users expect not to spend much time locating the actual item
Online catalogs, 2009	User's experience of delivery is as important, if not more important, than discovery experience
JISC national e-books, 2009	– Users do tend to be confused by a variety of platforms for discovery and delivery – Level of student complaints about print resources being unavailable is dropping
Students' use of research content, 2009	Accessibility is seen as a secondary (but still important) criterion
User behaviour in resource discovery, 2009	– Users are finding access hindered by the difficulty of using database interfaces – Access is a problem, both for e-books and for moving from e-books to locating print volumes

One area of special concern arose: **journal backfiles** are particularly and routinely problematic in terms of access (see Table 6).

Table 6: Finding: Journal Access

Study	Finding
Researchers and discovery services, 2006	– Problems arise when it comes to accessing identified materials – Gaps in access included journal backfiles
Students' use of research content, 2009	Libraries should improve students' access to open source materials, journal backfiles, repositories
User behaviour in resource discovery, 2009	Journal backfiles are a frustration in terms of access

2.3 Changing User Behaviours

The realities of the online environment observed above, led to some common conclusions about changing user behaviours. It is clear that regardless of age or experience, academic discipline, or context of the information need, **speed and convenience are important** to users and are factors when selecting discovery tools and resources (see Table 7).

Table 7: Finding: Speed and Convenience

Study	Finding
Perceptions of libraries, 2005	– Search engine as lifestyle fit – Search engines preferred over libraries for speed, convenience – Key criteria in choices include fast
College students' perceptions, 2006	Rate search engines better lifestyle fit than libraries
Sense-making, 2006	Users value convenience
Researchers' use of academic libraries, 2007	– Convenience is a major factor – Users expect not to spend much time locating the actual item
Researcher of the future, 2008	– Preferences for immediate answers may not be unique to their generation – Users demand 24/7 access, instant gratification, and "the answer"
Seeking synchronicity, 2008	Convenience is the most important factor for choosing virtual reference services
JISC national e-books, 2009	Convenience is a major factor in e-book usage
Students' use of research content, 2009	54% claim the convenience of a home computer is the main way they gain access

Researchers particularly appreciate **desktop access to scholarly content**, from e-journals to VRS (see Table 8).

Table 8: Finding: Desktop Access

Study	Finding
Researchers and discovery services, 2006	Valuation of the convenience of desktop access
Researchers' use of academic libraries, 2007	Immediate access from desktop computer is taken for granted
Seeking synchronicity, 2008	VRS' convenience is from home computer
Students' use of research content, 2009	Home computer is main way they gain access

Users also appreciate the **convenience of electronic access over the physical library**, with several studies marking decreased visitation of the library (see Table 9).

Table 9: Finding: Convenience over Library

Study	Finding
College students' perceptions, 2006	Use the library less since they began using the Internet
Researchers' use of academic libraries, 2007	Sharp fall in the number of researchers who visit their institution’s library
Seeking synchronicity, 2008	Convenience often dictates choices between physical and virtual library

User behaviours in this electronic environment tend toward **quick views of a few pages**, and "bouncing" between resources (see Table 10). This seems to contradict the notion of the hard-core researcher but supports the need for more user behaviour research addressing situation and context.

Table 10: Finding: User Behaviours

Study	Finding
Researcher of the future, 2008	– Very little time using content, "squirreling" of downloads by academic users – All users preferring quick chunks of information
E-journals, 2009	– Users are visiting only a few minutes – User behaviours vary but demonstrate shorter sessions, using basic search, and viewing fewer pages
JISC national e-books, 2009	Users tend to use e-books quickly, viewing only a few pages
User behaviour in resource discovery, 2009	Users make short visits, with simple searching of Google-like interfaces; power browsing for snippets of information

Users are beginning to desire **enhanced functionality in library systems**, to assist in managing large result sets (see Table 11). This is both an access issue (a finding from *Researchers and discovery services,* Research Information Network 2006) and a usability issue (with several studies identifying lists of enhanced features desired, or valued by users).

Table 11: Finding: Enhanced Functionality

Study	Finding
Sense-making, 2006	Users re-envision library services and spaces
Researchers and discovery services, 2006	Key problem of irrelevant results and the fear of missing items
Online catalogs, 2009	– List of libraries that own the item is essential – Search results must be obviously relevant and contain helps to the user for navigation/evaluation – Advanced search option and facets help end users refine searches and manage large results – Participants offered mixed reaction to social features
JISC national e-books, 2009	Users confused by variety of platforms
User behaviour in resource discovery, 2009	Improve usability of library and publisher systems

Users also desire **enhanced content** to assist them in evaluating resources (see Table 12).

Table 12: Finding: Enhanced Content

Study	Finding
Perceptions of libraries, 2005	Libraries advised to increase collections
Online catalogs, 2009	– Links to online content/full text was helpful change – End users rely on and expect enhanced content

Both professional researchers and younger people do seem generally **confident in their own ability** to use information discovery tools (see Table 13).

Table 13: Finding: User Confidence

Study	Finding
Perceptions of libraries, 2005	– Respondents are satisfied with their search; tend to trust results the same as results from libraries – In determining quality, users judge based upon their own knowledge or common sense
College students' perceptions, 2006	– Students are satisfied with their search – In determining quality, users judge based upon their own knowledge or common sense
Sense-making, 2006	Users are adept at doing searches for personal needs
Researchers and discovery services, 2006	Researchers are self-taught but remain confident in their own skills
Researcher of the future, 2008	Big gap between performance and self-estimates
Seeking synchronicity, 2008	– Getting an answer was cited most often for success – A mixture of relational and content facilitators contributing to perceptions of success

However, it seems that **information literacy has not necessarily improved** with users' digital literacy (see Table 14).

Table 14: Finding: Information Literacy

Study	Finding
Perceptions of libraries, 2005 **College students' perceptions, 2006**	– In determining quality, users judge based upon their own knowledge or common sense, institutional reputation, cross-checking, and recommendations – Cross-checking most often involves other websites
Sense-making, 2006	Participants acknowledge the value of databases and other online sources
Researchers and discovery services, 2006	Most common search strategy is refining down from a large list of results
Researchers' use of academic libraries, 2007	Researchers' awareness of OA issues is low
Researcher of the future, 2008	– They are *not* expert searchers – Tend to spend little time, little effectiveness in evaluating search results; prefer natural-language searching and trust Google; do not find library resources intuitive – Teachers not passing literacy on to the pupils – A big gap between their performance and their self-estimates
E-journals, 2009	Shorter sessions, using basic search, and viewing fewer pages
Students' use of research content, 2009	– Users assess content based on its relevance to their assignment – Students are aware of difference between formal research and basic internet content
User behaviour in resource discovery, 2009	– Information literacy skills are lacking; they have not kept pace with digital literacy – When level of information literacy and domain knowledge increases, increased use of quality resources

One important finding related to this is that **high-quality metadata is becoming even more important** for discovery of appropriate resources (see Table 15).

Table 15: Finding: Metadata

Study	Finding
Perceptions of libraries, 2005	– Quality of information a determinant of satisfactory information search – Other key criteria determining satisfaction include "worthwhile" information
Researchers' use of academic libraries, 2007	– Need to provide good metadata – Many resources under-used because inadequately catalogued
Online catalogs, 2009	– List of libraries that own the item is essential data element – Links to online content/full text was helpful change – Differences exist between the catalogue data quality priorities of users and librarians

2.4 Content and Resources

In several studies, **more digital content** of all kinds and formats is almost uniformly seen as better (see Table 16).

Table 16: Finding: Digital Content

Study	Finding
Sense-making, 2006	Desire more digitized sources, including digitization of older literature, sheet music, art images
Researchers' use of academic libraries, 2007	Respondents would prefer to have everything available in digital form
JISC national e-books, 2009	Libraries are a key player in the market for e-books

People still tend to think of **libraries as collections of books**; this is evident in several OCLC-sponsored studies of larger populations (see Table 17). They do not think of libraries as providing electronic resources.

Table 17: Finding: Library as Place

Study	Finding
Perceptions of libraries, 2005	Libraries viewed as being about books
College students' perceptions, 2006	Most common activity in the physical library is do homework/study
Sense-making, 2006	Users value traditional browsing, praise library as space for information
Researchers' use of academic libraries, 2007	Researchers retain a sense of the importance of the library
Seeking synchronicity, 2008	Those who visit the library continue to experience satisfaction

In addition, several studies indicated that despite the increasing prominence of digital research and electronic resources, researchers also **value human resources** such as colleagues, peers, family, friends, and teachers, in their information-seeking (see Table 18). In addition, VRS users tend to use recommendations to spread the word about the help available (Connaway, and Radford 2009).

Table 18: Finding: Human Resources

Study	Finding
Researchers and discovery services, 2006	Colleagues and peers are an important resource
Sense-making, 2006	Human resources (family, friends, colleagues, teachers) very common
Seeking synchronicity, 2008	Recommendations by peers are an important part of the marketing of VRS

2.5 Mixed Evidence

In some cases, the studies reviewed included findings which seem to contradict one another, and for which evidence may be mixed. In terms of the **range of tools used in information-seeking**, there is evidence for both broad and narrow ranges of tools (see Table 19). Some of the differences might relate to differences in the context for users' information needs, and especially their status within academic research or more "everyday life" information. In general, most studies which specifically targeted scholarly contexts for information-seeking produced findings on a wider range of tools. *Researchers and discovery services* reported that users generally value a variety of tools (Research Information Network 2006, p. 7), as did *Students' use of research content* (Hampton-Reeves et al. 2009). *Researchers' use of academic libraries* did not focus as much on a range of tools, but did highlight the emergent uses of VREs (CURL, and Research Information Network 2007, p. 59).

The various categories of academic users in the *Sense-making* study chose almost every possible tool that was suggested to them in the online survey, and found every one helpful in different situations (Dervin et al. 2006, p. ES-79; see also the "range of paper-writing activities" in Foster, and Gibbons 2007, pp. 80-81). In the two OCLC *Perceptions* studies, scholarly information behaviours may be directly compared to the general public, and college students are seen to use every type of electronic resource more often than the general population (De Rosa 2006, p. 1-6). *E-journals*, on the other hand, (Research information Network 2009) focused on narrower patterns of use, which are generally limited to Google and a small number of resolvers. The more general study population in *Seeking synchronicity* also displayed mixed preferences between using VRS and more traditional F2F services (Radford, and Connaway 2008, p. 9).

Table 19: Contradictory Findings: Range of Tools

Study	Finding
Perceptions of libraries, 2005	– A wide variety of information resources – Familiarity with different types of resources – Search engines still dominant
College students' perceptions, 2006	– Using every type of electronic resource – 10% claimed that the library website was the only resource they needed
Sense-making, 2006	Very few sources were found to be unhelpful
Researchers and discovery services, 2006	– Foreign language materials, multi-author collections, short journal backfiles, specialist search engines – Researchers are using a range of resource discovery tools – General search engines, specialist search engines, and internal library portals; Journal articles; Monographs – Expertise of individuals is also important
Researchers' use of academic libraries, 2007	– Relatively little change in demand for ILL – VREs will likely grow in importance to scholarly research
Seeking synchronicity, 2008	– Users indicated mixed preferences between face-to-face and VRS – Open to the possibility of trying VRS
E-journals, 2009	– Much traffic from Google, some link resolvers
JISC national e-books, 2009	– E-books either for leisure or study – Print and e-versions of course texts are complementary, not substitutes – E-textbooks are valuable back-up
Students' use of research content, 2009	– Keyword searches on a mixture of tools – The library catalogue
User behaviour in resource discovery, 2009	A wider variety of sources, subscription and the open internet

There is evidence both in favour and against **formal training in electronic searching** (see Table 20). *Researchers' use of academic libraries* (Consortium of University Research Libraries and Research Information Network 2007) speaks to both librarians' and users' valuation of librarians' expert knowledge in discovery. (Foster, and Gibbons 2007, pp. 11-12, agree on at least the librarians' valuation of professional searching, though "The student model of service is self-service," p. 75). As noted above, the *College students' perceptions* study reported much higher instances of library use, electronic resource

use, and even library website use than the general population (De Rosa 2006, pp. 1-6; 2-5). In these cases, the academic context of the study may or may not have bearing on the results, as other academic users under study did not find formal training as valuable as those who participated in this study. *Researchers and discovery services* (Research Information Network 2006, p. 64) provided empirical evidence for researchers being self-taught. The academic users of *Sense-making* (Connaway, Prabha, and Dickey 2008 p. 3) were relatively unschooled in using library OPACs and in understanding databases. *The researcher of the future* (Centre for Information Behaviour and the Evaluation of the Research 2008) also highlighted the self-taught nature of young people in search, as a contributing reason for their failures. Similarly, in *Seeking synchronicity* (Radford, and Connaway 2008), users thought they were adept researchers and trusted their skills more than librarians. Transcript analysis of VRS transactions included examples of "teachable moments."

Table 20: Contradictory Findings: Formal Training

Study	Finding
Perceptions of libraries, 2005	Tend to score higher on both library use and electronic source use
Sense-making, 2006	– Participants believe that library OPACs are difficult to use – Focus group participants indicated that once a librarian taught them to use a database, etc., and they found relevant information, they always used it even though it was not appropriate to the current, specific information need
Researchers and discovery services, 2006	Researchers tend to be self-taught
Researchers' use of academic libraries, 2007	Librarians believe that information literacy teaching will remain a core role
Researcher of the future, 2008	Amateur young searchers are over-confident
Seeking synchronicity, 2008	"Teachable moments" in transcripts show librarians engaged in bibliographic instruction

Several studies addressed the question of whether **recommendations**, in the form of recommender systems, **and social media** are having an impact on information seeking, again, with mixed conclusions (see Table 21). *The Researcher of the future* (Centre for Information Behaviour and the Evaluation of the Research 2008, p. 17) argued they are not important; *Students' use of research content* (Hampton-Reeves et al. 2009, p. 17) found very little evidence for an impact, but *Discoverability* (University of Minnesota 2009, p. 18) argued that at least from the literature, social tools are becoming important. However, none of these studies offered much evidence for their conclusions. *Sense-making the information confluence* findings (Connaway, Prabha, and Dickey 2006, p. 17) suggested specific social enhancements to library systems, and the *College students' perceptions* study (De Rosa 2006, p. 3-4) found college students much more likely to judge information quality based upon a recommendation than the general population (De Rosa 2005, p. 3-2). Recommendations to the service are found by *Seeking synchronicity* (Connaway, and Radford 2009) to be an important part of VRS marketing, especially among younger people. *Online catalogs* found a "mixed reaction to social features" (Calhoun et al. 2009, p. 18).

Table 21: Contradictory Findings: Recommendations and Social Networking

Study	Finding
Perceptions of libraries, 2005	In determining quality, 28% of the respondents cited using recommendations
College students' perceptions, 2006	In determining quality, collegiate users more often judge quality based upon credible recommendations (68%)
Sense-making, 2006	Participants also speak of enhancements and changes to the library's electronic resources
Researcher of the future, 2008	College students are unlikely to participate in social networking features provided by the library
Seeking synchronicity, 2008	Recommendations by peers are an important part of the marketing of VRS
Online catalogs, 2009	Mixed reaction to social features
Students' use of research content, 2009	Little evidence of impact found

2.6 Common Preconceptions Exposed

In a few cases, the above findings from the studies under review offered evidence that runs counter to popular perceptions of the current information scene. Many popular media claims about the "Google generation" may not be supported by all the evidence. The study by the Centre for Information Behaviour and the Evaluation of Research (2008, pp. 18-19) indicated there is no hard evidence to suggest that young people are more impatient than others. However, an analysis of 850 VRS transcripts found that young people were more impatient than adults (Radford, and Connaway 2008, p. 7; Connaway et al. 2008, pp. 129-130). One study, at least (Hampton-Reeves et al. 2009, p. 47) concluded that students are quite aware of the qualitative difference between "formal" research and basic internet content; many students in this study preferred a library catalogue over search engines. *Sense-making the information confluence* (Prabha, Connaway, and Dickey 2006, pp. 12-13) reported that users (many of whom in this case were college students) are adept at searching for personal needs and similarly tend to prefer human information sources over search engines. In choosing among search engines, some evidence indicates that speed may not be the most important evaluative factor. Although advanced search options are still popular in library OPACS, there is little evidence provided in these studies for the ongoing development and support of these features. Three different British studies (Centre for Information Behaviour and the Evaluation of Research 2008; JISC, and UCL 2009, and Research Information Network 2009; see Table 10 above, "User behaviours") provided conclusions about user behaviours which ignore advanced search features, while the types of enhanced functions users envision (see Table 11 above, "Enhanced Functionality") do not include traditional OPAC advanced search features.

2.7 Non-academic users

The majority of the studies under review are exclusively concerned with academic users (or at least users of academic systems, with no explicit information on non-academic users). Thus the majority of findings discussed above pertains to academic users in particular (and are reinforced by the conclusions of Foster and Gibbons (2007) and Head and Eisenberg (2009)). Nonetheless, a few conclusions specific to non-academic users are supported by the research, especially the two OCLC *Perceptions* reports (De Rosa 2006; De Rosa 2005; see also Radford, and Connaway 2008). Specifically among non-academic users, the younger ones tend to be much less competent in searching and evaluating results than they think (see Table 13 above, "User confidence"). The population at large is using both libraries and electronic resources of all kinds less often than academic users (see Table 17 above, "Library as Place"). Finally, the value placed on convenience by non-academic users in their information searches tends to be even stronger than the value placed by their academic counterparts (see Table 7 above, "Speed and Convenience").

3. Implications for Library Services and Systems

A synthesis of findings from these major user studies points toward a number of implications for libraries. The implications below represent broad tendencies. The various user studies themselves do take into account differences in behaviour based on age and gender of the subjects, and context and situation of the information needs. Differences based on academic discipline have been a common finding throughout the user behaviour studies. Even though the studies ask different questions of their subjects, the findings present a rich portrait of user behaviours. In order to generalize findings and to present a valid portrait of user behaviours, it is necessary to conduct longitudinal studies of large populations.

Implications for libraries which are shared by multiple studies include the following:

- The library serves many constituencies, with *different needs and behaviours*.
- Library systems must do better at providing seamless access to resources.
- Librarians must increasingly consider a greater variety of digital formats and content.
    - Both academics and non-academics believe more digital resources of all kinds are better.
- Library systems and content must be prepared for changing user behaviours.
- Library systems need to look and function more like search engines, e.g., Google and Yahoo, and services, e.g., Amazon.com since these are familiar to users who are comfortable and confident in using them.
- High-quality, robust metadata is becoming more important for discovery of appropriate resources.
- The library must advertise its brand, its value, and its resources better within the community.

The library serves many constituencies, with different needs and behaviours (see Table 22). One size does not fit all. The differences identified by the studies under review include different behaviours based on academic discipline, research experience, demographic category, and information-seeking context, as well as consideration of new features and new types of curation (more on this below). Unfortunately, in this economic environment, libraries must provide services and materials in multiple modes and formats. A model that can assist librarians in accurately calculating how to allocate resources for the different types of services and materials is needed.

Table 22: Implication: Different Constituencies

Study	Finding
Researchers and discovery services, 2006	Some disciplinary differences exist
E-journals, 2009	Behaviours vary by discipline
JISC national e-books, 2009	Students' use varied by discipline
Students' use of research content, 2009	Students need "more guidance and clarity on how to find research content and on how to assess its worth as well as its relevance."
User behaviour in resource discovery, 2009	Increase information literacy instruction for users

Library systems must do better at providing **seamless access to resources**, instead of mere discovery (see Table 23). This implication was inferred by studies across a wide range of resource types, from e-journals and their backfiles (see above, Table 6, "Journal access"), to online foreign-language materials, to e-books, to the variety of electronic publishers' platforms, to virtual reference services.

Table 23: Implication: Seamless Access

Study	Finding
Researchers and discovery services, 2006	Gaps include access to foreign–language materials, chapters in multiple-authored books, short backfiles of online journals, specialist search engines
Researchers' use of academic libraries, 2007	Joint access should be promoted among institutions
Researcher of the future, 2008	Recommendations include avoiding being decoupled from the publisher-to-user chain
Seeking synchronicity, 2008	Users desire *answers* in VRS
Online catalogs, 2009	Catalogues would better serve with better delivery, more links, more online content
JISC national e-books, 2009	Libraries need to help solve barriers to access
Students' use of research content, 2009	– Need more guidance to find content – Libraries should improve access to open source materials, journal backfiles, and repositories
User behaviour in resource discovery, 2009	Improve usability of library and publisher systems, to increase visibility and navigability of various forms of digital content

Librarians must increasingly consider a **greater variety of digital formats and content** (see Table 24). This goes beyond the e-journal revolution to include the curation of data sets, and the providing of emerging services such as VREs, open source materials, non-text-based and multi-media objects, blogs, and digital resources which have not yet been envisioned. The studies under review almost unanimously see libraries uniquely placed to offer and curate these resources going forward.

Table 24: Implication: Variety of Resources

Study	Finding
Perceptions of libraries, 2005	– Libraries can offer different formats and content – Libraries advised to increase their collections
Sense-making, 2006	– Users speak of enhancements and changes to electronic resources – Users blamed the lack of sources
Researchers' use of academic libraries, 2007	Growth in VREs and digital research must be met by librarians
Researcher of the future, 2008	Users demand 24/7 access, instant gratification, and 'the answer'
E-journals, 2009	E-journals are a strong investment
JISC national e-books, 2009	Libraries can be important in providing these resources
Students' use of research content, 2009	Libraries should improve access to open source materials, journal backfiles, repositories

In particular, both academics and non-academics believe **more digital resources of all kinds** are better (see Table 25), yet they do not necessarily equate the provision of electronic resources with libraries.

Table 25: Implication: Digital Resources

Study	Finding
Sense-making, 2006	– Users desire digitized sources, including digitization of older literature, sheet music, art images – Users speak of enhancements to the library's electronic resources
Researchers' use of academic libraries, 2007	Information resources remain under-used because they exist only in hardcopy
Researcher of the future, 2008	Recommendations include becoming more e-consumer-friendly
E-journals, 2009	E-journals are considered a strong investment

Library systems and content must be prepared for **diverse and rapidly changing user behaviours** which include power searching, demands for immediate access, and little time spent with resources (see Table 26, and Table 10 above, "User behaviours"). This tends to contradict the notion of the hard-core researcher. Researchers rarely use publisher platforms; the majority access e-journals from Google, if the content is open. This may provide librarians with an opportunity to cooperate with publishers for the development of new resource discovery services such as Serial Solutions' Summon and Ex Libris' Primo Central, which aggregate publishers' metadata and full-text e-journal content. These behaviours are a consequence of the current digital environment, but do not have to be problematic for libraries. The outward-facing systems librarians use and manage, from the OPAC to the e-journal platform to the virtual reference client, need to evolve in ways that make them better centred on how the users are behaving.

Table 26: Implication: User Behaviours

Study	Finding
College students' perceptions, 2006	Users would like library to be more convenient

Sense-making, 2006	– Make the library more like
	  – Google
	  – Amazon.com
	  – Coffee shop or book store

Researcher of the future, 2008	– New power browsing behaviours, users view only a few pages, do not stop long enough to do any real reading – Users demand 24/7 access, instant gratification, 'the answer' – Researchers tend not to use publishers' platforms to access e-journals but access them via Google, if available
E-journals, 2009	– Users are visiting only a few minutes – User behaviours vary shorter sessions, using basic search, and viewing fewer pages
JISC national e-books, 2009	Users tend to use e-books quickly, viewing only a few pages
User behaviour in resource discovery, 2009	Users make short visits, with simple searching of Google-like interfaces; power browsing for snippets of information (CIBER 2009)

High-quality metadata is becoming more important, not less, for discovery and evaluation of appropriate resources (see Table 27). This is a direct consequence of the explosion of resources and formats, and the expansion of results lists. It also derives, in part, from inadequate cataloguing of legacy materials into an online environment.

Table 27: Implication: Metadata

Study	Finding
Researchers and discovery services, 2006	Key problem of irrelevant results and the fear of missing items.
Researchers' use of academic libraries, 2007	Information resources remain under-used because inadequately catalogued
Online catalogs, 2009	List of libraries that own the item is essential data element. Other elements are keys for discovery and evaluation by users.

Finally, **the library must advertise its brand, its value, and its resources** better within the community (see Table 28). *Almost unanimously*, the studies under review either include among their recommendations a stronger sense of "brand identity" for the library among its community, or offer evidence of that brand's weakening. Fortunately, the various resources and services libraries have to offer their communities – from the traditional view of books to e-journals to the plethora of emerging formats and services – have demonstrable value. The problem becomes for a library to demonstrate it clearly and unambiguously. In one study, students appeared confused by content in journal abstract databases, not understanding that the content they accessed was actually provided (at great cost) by the library (Connaway, Prabha, and Dickey 2006, p. 13-14). The resources have value, and users by and large still trust the library as an institution; therefore, the library must continue to promote and broadcast the message of all it has to offer.

Table 28: Implication: Library Brand

Study	Finding
Perceptions of libraries, 2005	– Libraries viewed as being about *books* – Libraries can advertise presence better
College students' perceptions, 2006	Students trust library, but are visiting less since they began using Internet
Sense-making, 2006	Users described institutional information sources as being in the background
Researchers' use of academic libraries, 2007	Library of the future needs stronger brand identity
Researcher of the future, 2008	Recommendations include improving library brand
Seeking synchronicity, 2008	Libraries need to market their services and resources more highly
E-journals, 2009	E-journals (provided by the library) are critical part of research process
Students' use of research content, 2009	Students are aware of the difference between formal research and basic Internet content

4. Conclusions and Future Research

There are many more published user behaviour studies than the twelve included in this synopsis and analysis. However, this was an attempt to review major, funded studies that were published within the last five years and that specifically addressed electronic content, users' perceptions of their information-seeking behaviours, and library catalogues. In addition, an emphasis was placed on studies of U.K. users.

This analysis provided an opportunity to identify the common findings as well as the contradictory findings reported in the studies. The contradictory findings, as well, may be attributed to the design of the twelve studies. The two types of research design provide. a combination of large-scale quantitative studies as well as qualitative studies that provide rich portraits of specific user groups. Many of the findings presented in this meta-analysis could be used as hypotheses for subsequent testing and generalization; therefore, the next logical step is to further explore and quantify these findings by conducting large, random-sample online and interview surveys.

A large, random sample of specific demographic groups of information seekers should be identified in order to conduct a wide-ranging user behaviour study to address how people find information in different contexts and situations. It would be optimal to conduct a longitudinal study. However, the cost of such an intensive study involving a large, random sample could be prohibitive. Regardless, a study that includes a large, random sample to identify how individuals engage in both the virtual and physical worlds to get information for different situations could be conducted. Such an investigation would contribute to a better understanding of how individuals navigate in multiple information environments and could influence the design and integration of systems and services for devices and applications, as well as cloud computing. Such a study, undertaken at this pivotal moment in both library funding and explosion of information resources, could provide invaluable guidance for both libraries and the field of information science by possibly contributing to the development of a physical/virtual resource allocation model for libraries.

As Robert Darnton (2009) said, "the future is digital" and "digitize and democratize." The findings from the twelve studies indicate that users want access to even more full-text digital content. Though they value the traditional library services and human sources of information, they are already adapting to new realities in the information world, and new opportunities in access to information resources.

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