The Impact on University Libraries of Changes in Information Behavior Among Academic Researchers: A Multiple Case Study

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To better understand the information needs of young university researchers, an observational study was performed at three universities in Stockholm, Sweden. The observations revealed that most of the researchers used Google for everything, that they were confident that they could manage on their own, and that they relied heavily on immediate access to electronic information. They had very little contact with the library, and little knowledge about the value librarian competence could add. One important conclusion of the project is that librarians have to leave the library building and start working in the research environment, as well as putting some thought into the fact that library use is considered complicated, but Google (etc.) is easy. The findings of this project will influence changes in library services in both near and in a more distant future.

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Introduction

University libraries are dedicated to what they perceive as the needs of students and researchers at the university. To be able to further develop the functions of the university libraries, it is necessary to be attentive to the changing needs and methods of work of younger researchers; otherwise university libraries cannot contribute to the competitiveness of its university's research. This is the reason why the University Library at Karolinska Institutet[1] (KIB), Stockholm University[2] Library (SUB) and the Library at the Royal Institute of Technology[3] (KTHB), all situated in Stockholm, Sweden, embarked on a project looking at the everyday work of young researchers, from the perspective of seeking scientific information. An aim of the study was to get unprejudiced observations to create ideas about future needs for development of library services.

The project was funded by BIBSAM,[4] the Department for National Co-ordination and Development at the National Library of Sweden.

Objectives

The objectives of the study were to understand more the everyday information work and information seeking needs of the researchers at the three universities, and to be able to provide more effective library and IT-support.

The questions the project attempted to answer were the following:

- How do younger researchers search for information?
  - Which sources do they choose to identify the information they need for their research?
  - Which sources do they choose for other information needs?
  - Do they see a difference between the information needs for scientific purposes and other information needs?
  - What strategies for information searching can be identified?
  - Are they satisfied with the information sources they use?
  - Do they find what they need?

- What are their needs for IT-services or IT-support?
  - Do they use the library Web pages, portals, user education, etc., and if so, how?
  - Do they have any ideas for additional services from the library?
  - What conclusions about additional IT-services or IT-support could be drawn from what the librarians have seen them do or talk about?

Literature Review

Abundant literature exists concerning the use of information and the information searching behavior of researchers. Most research is based on quantitative methods, but some examples of observational studies using participant observation can be found. The most common approach to investigating information searching behavior is to use questionnaires, interviews, and focus groups to identify the specific methods used by different user groups within different subject areas. Since access to information has changed so much over the last fifteen years, the validity of older studies for comparison with the situation today can be questioned.

Information Searching Behavior—Before the Year 2000

In his recent book, Case[5] undertakes a thorough survey of research into the topic, characterizing the research area as follows:

- The literature is quite large, ranging somewhere in the thousands of studies.
- The publications have grown more specialized over the years.
- Recent reviews are more likely to focus on occupations, roles, or demographic groups.[6] (Relatively small populations have been investigated, and investigations concerning health information seeking have become the dominant genre in terms of numbers, rivaled mainly by the ever-constant attention to students of all types and ages.[7])

In the chapter on occupational status, Case discusses the change in research from studies on the use of different sources, to the trend for recent investigations to move away from quantitative measures of large numbers of scientists toward more naturalistic observations of information seeking behaviors.[8] The trend, according to Case, is that "the seeker has come into focus, resulting in more attention to the search process, more attempts to 'get inside the head' of the seeker, more time spent with individual subjects, and greater depth of description overall."[9] He then states that there has been a tendency to generalize about metadisciplines – science, social science, and the humanities – which typically place social scientists "between" scientists and humanists in terms of their habits and preferences, coming to the conclusions that the primary literature of science is journals, where that of humanists is more likely to be found in books and archives. Case argues that generalizations about metadisciplines "may be true as they go, but they do not further our understanding of the important mechanisms of information seeking, nor are they particularly useful in application, as in designing university information systems to serve particular disciplines."[10]

Information Searching Behavior—Recent Research

There has been no shortage of studies of this kind performed since Case's book was published. The majority of studies use a survey method to gather information (i.e., Wessel, 2006;[11] Quigley, 2002;[12] Murray, 1999;[13] Barrett, 2005[14]).

One example is Gardiner[15] who has conducted a nationwide study of academics, using a questionnaire, in three disciplines; English Literature, Computer and Information Sciences (CIS), and Business Management. The results support the same differences identified from the above generalizing studies, but here distinguishing between printed and electronic information sources, instead of books or journal articles. Academics studying English literature used more printed information, such as text and reference books, and tended to be the least frequent users of electronic resources. The CIS academics tended to make greatest use of electronic information and least use of printed resources, and the business/management academics fell somewhere in between the other two disciplines.

In a short article in Library and Information Update,[16] Fry describes results from a forthcoming book giving evidence to researchers avoiding traditional information sources and using search engines instead, stating that "In some disciplines they are used as a way of bypassing traditional gatekeepers such as publishers and libraries." Such an example would be where researchers use bibliographic databases to identify interesting material and then use Google to see if the paper is available on the author's homepage as a free download. She goes on to say that "Research is increasingly taking place outside library walls, be they physical or virtual" and that there are indications that researchers prefer to locate material using Internet search engines, rather than digital libraries or subject portals. Fry also highlights the fact that researchers are not aware that the search engines have particular limitations, and even biases.

In two articles,[17,18] Herman discusses in depth the transition to electronic information sources in academia, concluding with the important insight that "…recognizing the variations in information needs of researchers and understanding the motivating forces behind their adoption of innovative information technology for meeting these needs will aid universities in attaining the goal of creating custom-made personal information infrastructures, tailored to the distinctive needs of individual researchers."

Using Ethnographic Methodology

In his article from 1993, Ellis[19] discusses the paradigm shift in the way research has been conducted, shifting from traditional study of large groups (via questionnaires or structured interviews) to a more intensive study of small groups via observation and unstructured interview techniques. He argues that what we want to know is the everyday life of the people being studied, with the aim to understand the needs that exist, and finally to be able to design more effective information systems.

Detlefsen[20] characterizes articles discussing the information behavior of life and health scientists and health care providers, with a short discussion on methodology used. She considers that observational methods or ethnographic methods, where the investigator blends into the environment, watches, and takes notes of what is happening without interfering with ongoing activity, can be severely limited by the willingness of those being observed, as well as such studies being very labor and

time intensive. She argues that combined methods might be the most practical, because even though they are often labor intensive [...], the observational method "offer a way by which information-seeking behavior can be caught in a manner of a snapshot by an investigator." She offers three examples of well-conducted studies using observational methods, and gives them as "among the most useful in describing real-life information behaviors."[21 22 23]

An important article by Baker[24] provides an overview of observation as a method in library and information research, as well as discussing the pros and cons of different varieties of observations. Studies using participant observation exist in the library literature, i.e., Cooper (2004),[25] Cooper (2005),[26] Bell (2005),[27] McKnight (2006).[28] One such article by Forsythe (1998)[29] discusses the reasons for choosing ethnographic methods for library and information science research, and one by Given (2006)[30] discusses the need to incorporate evaluation of qualitative methods into evidence-based practice in library and information science.

Participant observation is an explorative method that does not require specific hypotheses to be validated. In the literature[31] it is described as a method where the field worker is part of the studied environment, talking, socializing, and perhaps working with people, having the same experiences as those observed, while constantly making notes about the environment and what is said and done. The data gathered using observational methods consist of detailed descriptions of people's activities, behaviors, actions, and the full range of interpersonal interactions and organizational processes that are part of observable human experience. Using Baker's[32] definition, the observational method employed in this study is "observer-as-participant," where the observer is more observer than participant. However, they also conduct brief interviews, which Schatzman[33] describes as "limited interaction," where the "researcher engages in minimal, clarifying interaction," but does not attempt to direct interaction into channels of his own choosing. When employing such participant observation, it is possible to find out things that are so natural to people that they would never even think about mentioning them in interviews. This type of observation can also offer opportunities to compare differences in the way people describe what they do, and what they are actually doing. When researching the information needs/behavior, there are several reasons for choosing an ethnological method; interviewing gives "self-report data, which tend to be incomplete or even incorrect; the issue of information needs may be interpreted as reflecting on the competence of the scientist under investigation, giving motive to underreport needs reflecting badly on the competence of the scientist; the scientists researched unperceived information needs; and finally there is the question of interpretation and completeness, have the investigator correctly understood what the respondents were telling him/her, and what about the items they took for granted and did not mention.[34] The advantages of this methodology led to the decision to choose participant observation as the method of choice for the study reported below.

Methodology

This study used participant observations, according to the methodology applied in ethnology. Since none of the librarians taking part in the project had studied ethnology nor had had previous experience with participant observations, a facilitator (PhD in ethnology, senior lecturer, and Director of Studies at the Department of Ethnology, Stockholm University) supported the project with methodological expertise and guidance.

Since the time for observations was limited, the team followed the recommendation of the facilitator in deciding to perform complementary interviews after the observations were completed, as a way to follow up questions and ideas that had occurred to the subjects after the observations, and for the librarians to elicit complementary insights in response to questions on issues not covered during the observations.

The study was lead by a project coordinator (the corresponding author) from KIB, together with two contact persons at the other two other universities. SUB and KTHB each had two librarians and KIB one, performing the actual observations.

The facilitator initiated the work with observations by leading a methodological workshop. At the first meeting, the five participating librarians were given a lecture on the theories and practicalities relevant to participant observation, and an exercise to help them understand the method. For the exercise, they were asked to write down their expectations concerning the observations, do a test observation for two to three hours, take notes, and then write down their impressions after the test observation. At a second meeting, there was a discussion about the method, pros and cons, and an evaluation and feedback of the test observation. The facilitator was available by e-mail and phone throughout the project, as well as being present at all project meetings.

At each university, eight researchers were observed, for about eight hours each (in succession, or divided into two or more occasions), followed by a shorter interview after one or two weeks. During the observations, extensive field notes were taken, which subsequently were typed. The notes were then used as a base for the interview, together with a "log book" in which researchers were asked to write on information searching for one to two weeks after the last observation. The interviewers did not use a prepared list of questions, but tried to let the researcher lead the discussion and focus on what he/she perceived as important/interesting. The interviews were taped and then typed.

After all twenty-four observations and interviews were completed, the complete typed material (amounting to over 200 pages) was distributed to all participating librarians and the facilitator. Staff members from each of the three universities discussed and analyzed local findings separately. The analysis was based on categories and themes originating from the questions in the objectives (above), and using a creative intuitive process. A joint meeting for the whole project group was also set up to discuss analyses and compare similarities and differences. With the help of the facilitator, the project coordinator analyzed one third of the material (from one university) according to the more rigorous methods employed by researchers in ethnology. This attempted to provide an unbiased analysis with the grouping of information under selected "keywords." Since keywords suggested by the facilitator and the project group differed little from the themes of the initial questions, this analysis revealed very little additional information. As this work was also very time-consuming, analyses provided by the project group were considered sufficient.

The study was initiated in September 2005, the subjects were contacted during November–December 2005 and January

2006, and the participant observations were conducted during January–February 2006. The final interviews and analyses were done in March and the study was completed with a last meeting on April 3, 2006.

Subjects

The project targeted younger researchers because they were thought to be able to provide some clues as to how future generations might act. Since the study is qualitative in its nature and randomized selection of subjects therefore of less importance, and the subject group was very small ($n=24$, 8×3 researchers), the facilitator recommended contacting researchers already known to the librarians, as a possible easy way of recruiting potential subjects.

A "younger researcher" was defined as probably in his/her thirties, and either being a post-graduate student nearing completion of the dissertation, or a post-doctoral student (post-doc) having recently finished the dissertation, preferably with even representation of the sexes. SUB decided to contact the faculties of humanities and social sciences, since pure sciences were believed to be sufficiently covered by KIB and KTHB

At Karolinska Institutet, a total of fifty-one persons were contacted to yield eight who agreed to participate in the study. The group consisted of four men and four women, from four different departments, aged between twenty-six and thirty-nine. Five were post-graduate students and three post-docs, and four were guest researchers from abroad (two from China, one from Peru, and one from Italy). This was considered advantageous as Karolinska Institutet has a large body of guest researchers, who enjoy equal access to library services.

At Stockholm University, a large number of researchers were similarly contacted until eight agreed to participate. The final group consisted of three men and five women, from seven different departments, aged between thirty and thirty-five. Five were post-graduate students and three post-docs, none were from outside Sweden, but one had a degree from a foreign university.

The subjects from the Royal Institute of Technology were three women and five men, from six different departments, aged twenty-four to thirty-seven. They were all post-graduate students; one of these was a guest researcher from China.

The subjects were offered no compensation for participating in the project with their only incentive being the possibility to influence and improve access to scientific information for themselves and their peers.

Findings

Since the project was based on a qualitative research method yielding a substantial amount of information and findings, this article focuses on findings regarding information searching and IT-support needs of the younger researchers. As stated above, the analysis was based on categories and themes originating from the questions in the objectives, and the main findings below are structured according to the categories.

The project revealed few differences between researchers at the three different universities. No differences can be traced to age, sex, nationality, or how far they had progressed along their career pathway as researcher.

The most obvious differences were between researchers in the humanities/social sciences, and those in the pure sciences, which came as no surprise since this confirms what is often described in the literature.[35] Differences concern the use of sources of information (books or journal articles), the age of the information (the newest findings or archival material), and also the use of the library building, where, for example, researchers in medicine almost never visit the library, having neither the wish nor the need to do so, compared to researchers in the humanities/social sciences who visit the library several times every week.

Sources of Information

For many researchers, especially in the sciences, Google is the first choice for information—all kinds of information. The researchers use Google for scientific information, looking for everything from methodological information to ISSNs, and some even state having moved from subject specific databases to Google (and Google Scholar). Only a few of the researchers have knowledge about Google Scholar. The researchers use a relatively limited amount of sources, a few subject specific databases (in medicine; PubMed) recommended by colleagues or supervisors, and report their experience of these as positive. For more general information, Wikipedia is a popular source, as well as other encyclopedia and the national phone directory (with maps, etc.). All of the researchers use e-journals, but few of them are familiar with e-books. Only one researcher use an alert service, and only to provide him with articles to present at the local journal club, not to keep up with his own research subject.

Search Methodology

The search methodology of the researchers can be characterized by "trial and error." They have no planned search strategy, but start at random, experimenting both with the actual words and sources to use. Even if they are unsuccessful or fail to understand what went wrong, they never use manuals, etc., for instructions. The idea of contacting the library for help does not occur to them. They have little or no knowledge of the finer points of many information sources. The majority of the researchers seldom use the library Web page as a starting point for information searching, and instead use bookmarks/shortcuts added by themselves on previous visits to the information sources. Subject searches are seldom performed, and when attempted, researchers have difficulties in identifying correct search terms. Searches are often unsuccessful.

Information Technology

The researchers are receptive to new technology; i.e., they use PDAs and make international phone calls over the Internet.

In most libraries, Microsoft Windows and Internet Explorer are standard programs on all computers. For the researchers in one university, Macintosh computers are as common as PCs, and in another university, Unix/Linux is commonly used, as well as Web browsers like Firefox and Maxthon, etc.

The researchers had very few ideas about complementary IT-support the library might be able to offer. Some state the need for support with software (Word, Excel, EndNote), as well as tools to organize pdf files on the personal computer.

Information Searching in a Social Context

For many librarians, the university library and its service to the university is taken for granted, as something researchers cannot live without. Researchers take access to information for

granted, but in this study the lack of an active and working relationship with the library is obvious. The researchers understand that it is the responsibility of libraries to organize access to information, but it is not something they reflect on. Neither is it something that generates contact with the libraries with questions concerning provision of information. The researchers visit the physical library more or less frequently, but often prefer to manage on their own. They seldom contact the library by phone, but e-mail is sometimes used. They do not consider contacting the library as the obvious thing to do neither do they even perceive it as something that would be easy.

When it comes to library user education, many researchers feel they have no need for instruction, and library subject specialists are only contacted when the need for exhaustive searches arises, or perhaps when a researcher is new to a subject area. Existing library liaison roles are not utilized to any extent.

Evident from this study is that personal networks are very important to researchers, and that collaboration between universities is widespread. This contributes to the complexity of library usage, with, for example several different proxy codes (for off-site use of electronic resources) and library cards. Most researchers in the study state that colleagues and supervisors are their most important support regarding information searching, especially for recommendations about relevant databases, journals, journal articles, etc. Even though researchers depend on networks, and often claim they have very good knowledge of the international community within their own field of research, some researchers address questions requiring help by identifying people working with the same questions.

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Time and Money

Several of the researchers describe themselves as "lazy," alluding to the fact that they do not bother to get a journal article if it is unavailable in electronic form. This is primarily because they have become so used to information being just "a click away," not because it takes too long to get the printed version (by going to the library to make a photocopy, or order a photocopy from the library, or as interlibrary loan), even though this is sometimes considered complicated. Some researchers claim that they avoid interlibrary requests of journal articles from "obscure" journals, since it is seldom worth the cost.

Competence

The researchers feel satisfied with their information searching, even though they complain about the difficulties. They feel that they are competent information searchers and state that help from the library must add evident value. During the observations, the researchers were receptive to good advice from the librarians, in addition to demonstrating that they are fast learners. This indicates that the librarians need to be present in the research environment for them to be engaged by the researchers. The researchers have no understanding of librarian competencies, or what value they might add, which of course makes it difficult for them to request help from the library.

Evaluation of Sources

Researchers from different subject areas have different attitudes toward evaluation of Web resources. All researchers seem to understand the differences in content in, for example, Google and a bibliographic database, even if they call everything "search engine," a finding that differs from that of Fry.[36]

When discussing Wikipedia, some researchers expressed the opinion that if the content is scientific you can trust it, because "it is rather hard to cheat in my subject" (the same reasoning was used concerning information found with the help of Google), while others had the opposite opinion, that you can use Wikipedia for general information, but it is not to be trusted with scientific information, since "anyone could add anything."

In some subject areas, non-peer-reviewed material (i.e., lecture notes and preprints) is commonly used, and trusted, supported by the same argument as above.

Discussion

What we are seeing in our libraries today is a shift of paradigm; the library has changed from being the place for researchers to visit for help with information searching and for picking up the actual information, to being the "living room" for undergraduate students, making the researchers who visit the library feel outnumbered, and sometimes unwelcome. Another aspect of the shift in paradigm is of course the Internet, which has made information accessible from your desktop. The first change was being able to search databases by yourself instead of using a librarian as an intermediary, and then, having immediate access to research through subscriptions to e-journals and other electronic sources of information.

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These three shifts have all worked together to make libraries and librarians more removed from the world of the researchers, with librarians and researchers having fewer natural meeting places (in real life) and researchers having less and less understanding of what difference librarian competencies can make, not the least in terms of effectiveness.

As a result of the project, the following issues have emerged, which are important to discuss for librarians interested in (re) connecting with researchers. If librarians are not interested in how their users function when it comes to information and information searching, but keeps on working like today, there is an evident risk that librarians will end up as providers of access

to information (databases, e-journals, etc.) with no role at all to play when it comes to, for example, reference services.

Library Perspective or User Perspective?

The researchers at the three universities do not search for information in the way suggested and preferred by librarians. Their searches seem simple, aimless, and unstructured, they do not read manuals, and they seldom use the alternative for advanced search. They claim to be satisfied with their information searching and to be able to find what they need. Whose interpretation should be privileged—that of librarians or researchers? Is it feasible for librarians to continue to hope that users will adapt to the library way of doing things, or should libraries take the behavior of researchers into consideration when designing their services? Furthermore, one cannot ignore the fact that the search processes that seem random and unfocused might constitute an important process in their everyday life as researchers. An often repeated truth is that it is only librarians that love to search, everyone else wants to find!

Emerging Technologies

Libraries must work even more actively to identify and use new technology, even if it seems odd, to see if it might be used to improve library services. Today libraries tend to be one step behind its users, also when it comes to using other software or platforms than Microsoft Office and Windows. What the emerging technologies might be is of course hard to specify, and they will probably vary between libraries and universities. What we know today is that some researchers state that they would like to find short film tutorials (screen casting) which is not common in Swedish libraries, and that lots of people in Sweden are interested in virtual worlds, such as Second Life, where no Swedish library has yet established its services.

Rethinking the Library Web Site

Libraries spend huge amounts of time and money to work on the structure and content of the library Web page, while few researchers use it as a starting point for information searching. Many researchers in the study used the Web of their own department as a starting point, and this is where the library should establish a presence with direct links targeted to that particular group. In all work with library Web sites, much consideration has to be given to the question of cost effectiveness.

Google vs. the Library as a Starting Point for Information Searching?

The widespread use of Google (and other search engines) came as no surprise, but the almost complete dominance of Google as a starting point for searching *scientific* information was not expected. Furthermore, few of the researchers had any knowledge of Google Scholar. An important aim of libraries should be to change the perception that libraries and library services are complicated, while other sources are easy to use. What can libraries learn and adapt to when looking closer at how Google has succeeded to make information searching seem easy, and, in fact, efficient enough?

Proximity or Distance?

Libraries used to equate to buildings with large collections—this is not the case any more. Today libraries can be said to be the collective competence of the librarians. This competence is completely unknown to most library users, and, consequently, they have little perception of their added value. This study clearly demonstrates, through the receptiveness and gratitude with which the assistance librarians provided during the observations was welcomed, the importance of the everyday presence of librarians in research environments. The question is how this "librarian presence" can be achieved?

One can also question the library liaison system for focusing too much on the perceptions of the library staff, instead of the needs of the users. It is possible that librarians focus too much on what they can do, instead of what is happening within the university departments and the problems and needs of those working there. What is needed is dialogue, on more equal terms, as opposed to the usually completely one-sided distribution of information from the library.

Conclusion

Recently the Research Information Network[37] published a study,[38] based on telephone interviews, interviews, and focus groups, researching the behavior, perceptions, and needs of about 400 British researchers in connection with their use of what they call "resource discovery services." The results from the British study confirm the findings of the described observational study in all aspects, but unfortunately the authors stop short of considering the findings in relation to library and information services in the future.

The design of the present study using participant observation gave the three libraries invaluable information about the working conditions and the information searching habits of the researchers from each university, information that probably never would have been revealed had the project used traditional methods of inquiry. The results can be helpful for other university libraries analyzing the relationship between the library and the research environment.

After this project was terminated, questions about the background of the researchers that were being observed have arisen, with a focus on the extent to which they have or have not been exposed to user education and how this might have influenced their way of searching for information. Interpretation of the results would have been facilitated had the interviews pursued this issue.

For the facilitator, the project inspired thoughts concerning the possibility of ethnologists being able to study environments that are otherwise incomprehensible to them, with the help of other professionals, as exemplified by this project. It also proved that persons without ethnological training are capable of learning relatively quickly how to carry out observations, resulting in good quality material to analyze. One flaw of the study was the similarity of the questions in the objectives of the study to the final keywords used for the unbiased analysis of the notes from the observations and interviews.

This study concludes by suggesting that the following issues, captured from the keywording process, need to be considered if researchers within a university are to be able to utilize the work of the library in a more efficient way:

- simplicity and consistency;
- accessibility; and
- individual (i.e., personalized) solutions.

Only if library staff learn to incorporate these issues into their own perception of the needs of researchers will they be able to

provide them with what they actually want rather than what we think they want.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.acalib.2007.11.010.

Notes and References

1. Karolinska Institutet was founded in 1810, and is one of Europe's largest medical universities. It is also Sweden's largest center for medical training and research, accounting for 30 percent of the medical training and 40 percent of the medical academic research that is conducted nationwide. The university offers undergraduate study programs in Biomedical laboratory science, Biomedicine, Dentistry, Medical informatics, Medicine, Midwifery, Nursing, Occupational therapy, Optometry, Physiotherapy, Podiatry, and Psychotherapy, among others. The university has 6000 undergraduate students, 2300 post graduate students, and about 3500 employees (http://ki.se/ki/jsp/polopoly.jsp?d=130&l=en).
2. Stockholm University, founded in 1878, has four faculties (Humanities, Law, Natural Sciences and Social Sciences) and is one of the largest in Sweden with about 39,000 students and 1800 post graduate students, as well as 5600 employees. With about seventy-five departments offering approximately 1200 courses and fifty study programs each year, the university is able to provide a wide variety of choices to meet the needs of its students (www.su.se/in-eng).
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