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# Information behaviour and practices of PhD students

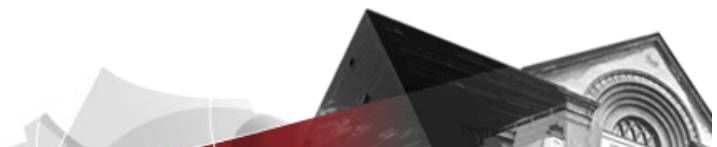
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# 1. Executive Summary

This report addresses the information behaviour and practices of PhD students and its implications for library services. Academic libraries and their services are part of the information network of PhD students. Therefore libraries should pay special attention to the needs and practices of this important academic subgroup.

The University Librarian at Copenhagen University Library and Information Service (CULIS) commissioned this study. It was conducted by representatives from CULIS, University of Oslo Library and from Vienna University Library. The study consisted of a survey and interviews targeting the PhD students at the three involved universities.

The most important findings

- Services are requested which are already in existence but are not communicated effectively enough to the target audience.
- Journal articles were identified as the most important information source.
- Convenience of access is key, material not easily available is often disregarded. This is probably due to time pressure.
- Google is widely used during all stages but especially in the beginning of the search process.
- Online library services are very much in use, physical buildings very much less so.
- Reference management software is not as widely used as could be expected.
- A great variety of methods are in use for searching and keeping informed, this is something that develops significantly during the PhD.
- Information research habits are often established long before the PhD studies. They further develop during the PhD process but mostly without library support.
- Supervision and courses are requested from the library but need to be efficient, effective, and tailored.

The most important recommendations

- Take drastic steps to improve marketing and branding.
- Offer ad hoc specialised rather than general support.
- Offer short, specialised and to the point courses at the beginning of the PhD
- Libraries should teach PhD students the most efficient methods for searching early in their studies.
- Expand the number of electronic resources and offer online support and online courses to accommodate needs of PhD students working and/or not giving time to attend courses in person.
- Library catalogue and search tools should be made as intuitive to use as possible.
- The library should maintain and update knowledge about local research workflows to facilitate knowledge based library development aimed at the local research communities.
- The libraries should offer dedicated PhD workspace, which is a particular desideratum by Vienna and Oslo PhD students.

We found differences in the PhD workflow which might be disciplinary, local, or individual. These need to be taken into account when developing, improving, or marketing library services for this target group and researchers in general. Failure to do so will lead to services being overlooked, disregarded, or considered irrelevant.

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## 4. Introduction

This report addresses the information behaviour and practices of PhD students and its implications for library services. The report summarizes the results of a study commissioned by the University Librarian at Copenhagen University Library and Information Service (CULIS) which was conducted by representatives from CULIS, University of Oslo Library and from Vienna University Library. The aim of the study was to gain information that would help the libraries to improve and develop their services for researchers.

University libraries are increasingly involved with different aspects of scholarly communication and the research work flow. Besides traditional services - like delivering literature and scholarly information or teaching search skills - libraries need to meet new demands from their universities' research communities and PhD students: Storing, securing and sharing research data, connecting researchers, tailored teaching and providing support for PhDs who wish to publish research are among the new or emerging tasks of libraries.

Since the libraries involved in the study aim at improving and developing their services for researchers it was considered crucial to find out more about this target group, in particular about the way they seek, find, gain access to and make use of different kinds of information. The working assumption was that PhD students' information seeking behaviour can act as an indicator for the development of scholarly communication and research practices. By conducting this study at three different European universities the libraries hoped to gain comparative information and a better understanding of how beginning researchers in different disciplines seek scholarly information and use their library's support in doing so.

The study itself began with a look at a selection of the growing body of international literature on PhD students' information behaviour. Themes for further investigation were identified: What do different groups of candidates see as the most relevant types and formats of scholarly information? How do they validate the literature they choose to apply to their research? Which finding tools are in use? What are the challenges they experience? What kind of support do they receive, and from whom? Are there any subject differences and similarities? What is the role of libraries?

Based on the themes identified with the help of the literature the research group designed a survey questionnaire, and later an interview guide for a second, qualitative part of the study. The survey was sent out to all PhD students at the universities of Vienna, Copenhagen and Oslo. The survey was followed up by qualitative interviews with PhD students from different disciplines at the three universities, which completed our understanding of how doctoral researchers seek, find, gain access to and make use of different kinds of information.

This report has been written as a contribution to the knowledge-based development of library services at the involved libraries. It should not be read as a scientific paper since no statistical analyses have been conducted on the survey results. Even so, the authors believe valuable information has been obtained as to what our three university libraries can do to help the information search, retrieval and management fit better into the workflow of the researcher.

The report consists of three parts. Part One (section 5) is a review of our reading of the selected contributions from the international body of research literature. Part Two (section 6) is a summary

of the findings from the survey and the qualitative interviews. Part Three (section 7) consists of recommendations for the future development of services at the libraries involved. The eager reader may consult the more detailed presentations of the data in the appendices.

The authors hope that readers will find the report both informative and enjoyable.

## 5. A look at the international literature

### 5.1. Scope and purpose

In order to base the project survey and interviews on existing research, we decided to consult relevant publications on academic information behaviour. Since a comprehensive literature review was not possible within the constraints of the project, it was decided to take a more limited approach. First a general definition of information behaviour relevant to the purpose of the study was established. Then a number of exhaustive studies commissioned by RIN, CURL and OCLC were reviewed as well as a small sample of studies very specifically pertinent to our research purpose, namely studies focusing mainly on doctoral students or studies concentrating on the information behaviour in specific subject fields. Since the focus of the project has been on current trends in academic information behaviour, only recent literature was chosen for the review. The international nature of our project has meant that only English language literature has been taken into account. Furthermore, the decision was taken not to summarize all aspects of the literature but to analyse the literature with a view to establishing themes that would help us formulate meaningful survey and interview questions. Whenever possible, questionnaire or interview questions were extracted as well as research themes. This procedure resulted in a number of individual excerpts, extracts and summaries that supported us in the phases of survey and interview development. For the purpose of our final report, it was later decided to further summarize our main findings from the literature review and to add some information from some recent RIN reports as background information.

### 5.2. Information behaviour

In the 1980s the focus of research on information began to move from information systems to information users and their information behaviour. (See for instance Wilson 1997) Information behaviour was defined by Davenport (1997) as 'how people approach and handle information' (as cited in Meyer, 2009). Since then the concept has been continuously evolving as different perspectives have been introduced to the debate on how to define information behaviour. In the discussions of the concept there has been a strong focus on the cognitive and the affective components of information behaviour. Kuhlthau (2004), for instance, describes cognitive, affective, and action oriented aspects of the information search process. Later, partly as a critical response to Kuhlthau, context was recognized as an important factor in information behaviour. (See for instance Hyldegård (2009) and Meyer (2009).) Meyer (2009), referring to Hepworth (2007) and Olsson (1999), pointed out that context involves issues of power and social hierarchies and that it becomes internalized in what an individual knows and expects and also becomes an integral part of his or her norms. There are also external factors such as technology or the organisation to which the individual belongs and its social practices. These internal factors and external factors in turn influence the individual's information behaviour.

It should be mentioned that some researchers prefer the term "information practices" to the term "information behaviour". For a discussion of this issue, see Savolainen (2007). For the purposes of this project, we have kept the term "information behaviour", albeit without any strict commitment to a purely cognitive standpoint. Rather, we have chosen to include a social-



constructionist perspective on how researchers search for, find and manage information and to keep the more commonly used term.

### **5.3. Overview over the studies focusing on academic information behaviour or a new generation of researchers consulted for this project**

A number of studies have addressed the cognitive, affective, action-oriented and contextual aspects of information behaviour in an academic context. A number of these have included or indeed focused on the information behaviour and needs of PhD students.

#### **5.3.1. Macro studies**

Approximately five years ago, a number of institutions presented findings of broad studies across universities:

The *College students' perceptions of libraries and information resources* report (De Rosa, Cantrell, Hawk, & Wilson, 2006) is a companion report to a 2005 report of on perceptions of libraries and information resources based on a survey of a wide selection of information users in North America, Australia, India, UK and Singapore. The 2006 report concentrated on the attitudes and beliefs relating to libraries and information resources of the 396 college students who participated in the original survey. They were from all six countries, undergraduate or graduate students, their ages ranging from 15 to 57. Younger (14-17 year old) respondents from the USA were included as potential future college students to provide an additional perspective for the future. The survey was across all subjects and yielded information on the themes of college students' library use, their knowledge and utilization of electronic library resources, their use of the internet and search engines, their attitudes towards the price of information and the brand identity of libraries.

The aim of the RIN *Researchers and discovery services* study (RIN, 2006) was to assess the use and perceptions of the means that researchers use to discover and locate the information resources relevant to their work. The authors based their findings on telephone interviews with 395 researchers across all disciplines (of which 29 were postdoctoral researchers), and 55 librarians and information officers in various UK universities. These interviews were complemented by in-depths interviews and focus groups with post-doctoral researchers. One aim of the study was to establish whether members of a new researcher generation show different information behaviour compared to their older peers.

The *Researchers' use of academic libraries and their services* study (Brown & Swan, 2007) was carried out on behalf of two British institutions, the Research Information Network (RIN) and the Consortium of Research Libraries (CURL) in order to arrive at a better understanding of the possible future of library services for academic research. The study focused on researchers' attitudes and beliefs concerning the support they receive from academic libraries in the United Kingdom and on the implications of these findings for the future of library services. The report was based on quantitative surveys of 2250 researchers and 300 librarians in the United Kingdom, which were followed up by focus group discussions and interviews. Emerging from this research, issues relating to perceived problem areas such as funding, to the role of the library as a physical entity, to researchers' use of print and digital materials, to researcher behaviour, to suggestions for library services and to the issue of the accessibility of material were discussed in the report.

### 5.3.2. Microstudies

A number of studies were consulted for this project that focused more specifically on PhD or graduate students or on specific academic subjects:

George, C., et al. (2006) studied the graduate student information seeking behaviour at an American university in order to draw conclusions as to how academic libraries can improve their support of this group of researchers. Taking definitions of information behaviour by Wilson and Kuhlthau and Dervin's theory of sense-making as their starting point, the authors looked at affective, cognitive and physical aspects of the graduate students' experience. The study combined qualitative and quantitative methods. The authors carried out in-depth, semi-structured interviews with 100 graduate students from Carnegie Mellon University, who represented the full range of subjects of their university. The authors explored four aspects of information behaviour, namely the students' methods for looking for and finding information, the information resources they use, the role of people for their information research and other factors.

Green and Macauley's (2007) study compared how PhD students deal with information research within the two quite different postgraduate education systems of American and Australian universities. The authors discussed earlier research findings and conducted semi-structured, in-depth telephone interviews with 2 American and 2 Australian doctoral students as well as with 2 librarians. In their research, Green and Macauley (2007) explored how students collect information and what they learn during the literature review phase of their PhD. The authors argued that libraries should respect PhD students as self-directed and independent learners when it comes to information literacy training.

Vezzosi (2008) conducted qualitative interviews with 18 PhD students in the field of biology at an Italian university. Her purpose was to gain a better understanding of the PhD students' needs, which, she argued, would lead to improved library services. The students belonged to different sub-fields of biology, i.e. environmental, molecular biology, and biotechnology and were years 1, 2, and 3 of their Ph.D.

Jamali and Nicholas (2008) carried out a survey among PhD students and staff of the Department of Physics and Astronomy at University College London in order to find out more about their information seeking behaviour. The study focused on two specific aspects of scientific information behaviour, how scientists kept up-to-date and how they identified articles for their research. It was established that there are differences in the information behaviour of different subject groups within one discipline.

In their study Fleming-May and Yuro (2009) analysed data provided through qualitative focus-group interviews with 24 social sciences doctoral students at an American university and a web-based survey among librarians from a variety of American universities. The authors' research goal was to show how PhD students conduct information research and what their information needs are in order to enable librarians to provide specialised support for PhD students.

### 5.3.3. PhD students' information behaviour: findings from the international literature

From the international literature, the following themes emerged as particularly relevant:

- Information needs
- Types and formats of scholarly information
- Validation
- Tools

- Methods
- Skills and development as scholars
- Challenges
- Support
- Subject differences and similarities
- Suggestions for support by libraries

#### **5.3.3.1. Information needs**

RIN (2006) identified a range of information needs of researchers and related them to their information behaviour. Researchers need to find references of known sources, find sources in new research areas not yet known to them, keep up-to-date in their own research fields, find published and unpublished data, find non-textual sources like images or audio-files and find organisations and individuals as well as sources of research funding.

#### **5.3.3.2. Types and formats of scholarly information**

There is a clear trend in all disciplines for researchers to either mainly or increasingly use electronic resources from their desktop. Brown & Swan (2007) reported that researchers are interested in even more resources to be made available electronically and see this as a key function of libraries. Humanities and arts scholars, however, still use print resources even to discover scholarly information.

RIN (2006) found that most researchers look for journal articles, book chapters, web sites, the expertise of individuals, conference proceedings, and monographs in their information research. Of these journal articles were the most important.

Convenience and ease of access are important factors in PhD students' choices when it comes to information resources. This is confirmed by the findings of George, C., et al. (2006) as well as other studies. Brown & Swan (2007) even came to the conclusion that only immediate availability will lead to an information resource to be used, others, not immediately available, will be ignored.

#### **5.3.3.3. Validation of scholarly information**

The issue of validation of information is raised by De Rosa et al. (2006), who reported that students' methods for assessing the quality of information on the internet include what they already know, common sense, cross-referencing, checking other internet resources and consulting their teachers.

#### **5.3.3.4. Tools**

According to RIN (2006) most researchers use a variety of search tools to discover information, mostly general search engines, multiple specialist search engines, library internet portals and subject gateways. There are a number of differences according to subject or research experience in which resources are used and how they are used.

Searching for scholarly information is nearly always done with the help of digital resources. Brown & Swan (2007) found that researchers in all discipline rely on electronic finding tools to find both digital and printed resources and that only very few of them, even in the arts and humanities, use print resources to locate materials. A number of studies reported the importance of either Google or of general search engines as a starting point for information researches: According to De Rosa, et al. (2006) nearly 90 percent information searches by college student begin with a search engine. George, C., et al. (2006) also stressed the importance of digital resources and especially of search engines as finding tools, with some disciplinary differences as to how much these were used. They also showed that electronic library catalogues are important tools for graduate students'

information research. De Rosa, et al. (2006) reported that nearly half of the students starting their information research with a general search engine end up using library website resources. However, they also noted that college students in general do not put libraries at the top of their choices of how to access electronic resources.

#### **5.3.3.5. Methods**

RIN (2006) provided a comprehensive overview of ways in which scholarly information is discovered by researchers, which revealed that different search purposes, different disciplinary backgrounds and different degrees of research experience are associated with different ways of searching, finding and managing information.

George, C., et al. (2006) characterized two kinds of behaviour when graduate students search for scholarly information. Depending on what they are doing their behaviour is either random or organised: The random motions of information seeking are in effect during the planning stage, when choosing an area of focus, developing a search strategy, or general browsing for background information or a general idea of their field of research. The organized information seeking behaviour includes regular planning sessions with an advisor, planned search strategies and use of citation chaining. What George, C., et al. (2006) also noted was what they described as the "iterative" character of the information seeking behaviour of the students they interviewed. Students returned to earlier phases of searching when necessary.

As noted above, the internet - and more specifically Google - serves as a starting point for many scholars. George, C., et al. (2006) noted different methods used by graduate students to find information with the help of the internet or Google. They reported that students use the internet or Google for searching with the help of keywords when their searches are non-specific and open-ended but even more to find websites as well as papers and to do citation searches by citation chaining.

Green & Macauley (2007) identified a number of information related tasks and strategies typical of PhD students' information behaviour. These included personalized learning plans, mind-mapping, seeking information sources from academics including their supervisor, exchanging of information with other academics, being aware of their own information-seeking strategies and of having to learn other strategies, seeking information from many different sources and in a variety of ways (including browsing, serendipity, and other methods), identifying key citations from readings and using footnotes, endnotes, and bibliographies to find sources, creating their own bibliographies, writing research articles and conference papers, and finally the dissertation itself.

#### **5.3.3.6. Skills and development as scholars**

The literature consulted showed that PhD students can be expected to change their information practices and their identities as researchers.

George, C., et al. (2006) noted that with increasing research experience graduate students' developed finer information seeking skills and that their search behaviour became more organised.

Vezzosi (2008) reported how the understanding of the research process of PhD students in the field of biology becomes more professional and differentiated over time. This means that they are more likely to use general search tools in the beginning but learn to regard bibliographic research as important. The stage when they begin to be more organised as well as take a greater interest in the issue is when they begin the writing process and start publishing papers.

This confirmed earlier findings by Green & Macauley (2007) that in the early stages of their PhD students begin searches with the help of less specialized tools such as Google and in later stages reported use of academic databases and academic sources.

Fleming & Yuro (2009) similarly described how students' identities change as they advance in their doctoral studies. They identified three aspects of this change in identity, as PhD students transform "from undergraduate to graduate student[s]" (p.208-209), from "generalist[s] to specialist[s]" (p.209-210) and from "student[s] to scholar[s]" (p.210-211). All three aspects can be related to the students' self-perceptions and practice in information research, for instance in the observation of how their own searching and research has become more focused, more efficient or more systematic. Fleming & Yuro (2009) also showed that PhD students in the social sciences reported using different sources, mainly journals and conference proceedings, which they had not used as undergraduates.

The findings of Jamali and Nicholas (2008) and RIN (2006) indicate that the information behaviour of PhD students is likely to develop further as they gain academic status and expertise since researchers of older generations show differences in information behaviour that is related by these studies not to their belonging to an earlier generation but to longer research experience. Jamali and Nicholas (2008) pointed out that for keeping up-to-date more experienced researchers rely more on personal networks and hear about developments from other researchers, for example during conferences, while PhD students did not do so but often used alerting services. The reason for this was seen in the greater integration into scholarly networks by older researchers. While RIN (2006) saw no great differences in information behaviour across researchers according to research experiences, they did establish that more experienced researchers generally use information discovery resources less than other groups, which could indicate a greater expertise in their field of research.

#### **5.3.3.7. Challenges**

Researchers and PhD students in particular encounter challenges as they look for, find or manage scholarly information. According to RIN (2006), researchers worry about irrelevant search results and about missing important information during information searches and complain about time pressure. Time pressure is also a factor in PhD students' search behaviour, as reported by Vezzosi (2008), who found biology students felt lack of time influenced the way they searched for information.

#### **5.3.3.8. Support**

In the studies consulted it was repeatedly pointed out that people are an important source for scholarly information as well as for information on scholarly information resources for PhD students. Here academic teachers and peers have the most important role to fulfil. According to RIN (2006) research colleagues are an important source for finding scholarly information. De Rosa et al. (2006) also reported that college students in general do not only learn about new resources with the help of web sites (61%) or from news media (44%) but quite often from friends (67%) and teachers (50%) and to a much lesser extent from librarians (33%). Jamali & Nicholas (2008) found that hearing about developments and colleagues are important means for researchers of keeping up to date. George et al. (2006) confirmed the importance of interpersonal communication for the information behaviour of Ph.D. students. As their study showed, graduate students' information research is supported by professors or advisers (96%), and they receive recommendations (65%) or resources (58%) directly from academic staff. Their information research is enhanced by the help of other students (73%), who give them either recommendations (34%) or resources (30%). The extent to which this happens actually varies within subjects. Library staffs give help too (40%), as do other people (12%). Fleming-May & Yuro (2009), however, found that the PhD students that took part in their focus groups reported that they prefer to ask their peers for help, seek some assistance from

faculty, and hardly any from librarians. As a reason the feeling was given that one should already be expert enough not ask for help.

#### **5.3.3.9. Subject differences and similarities**

The studies consulted revealed that there are subject-related differences in information behaviour among researchers. Brown & Swan (2007) established that a key difference between arts and humanities researchers and researchers from other disciplines was that they were the only group among whom library buildings and their services were appreciated by a significant majority and who used print resources to a great extent. There are extreme disciplinary differences from where online resources are used, too. Whereas 90% of physical and life science researchers prefer to access electronic information from their offices, the corresponding figures for social science and arts and humanities researchers are 76% and 58% respectively. Life scientists are least likely to access such information from the library: only 10% gave this as their second choice, while 22% of arts and humanities researchers did so.

Even though general search engines like Google are a starting point for most researchers, there are clear disciplinary differences here, too. George, C., et al. (2006) found that while only 50% of humanities graduate students used Google for information seeking 93% of computer science graduate students did so.

Another instance of subject-typical choices of information seeking methods can be found in Fleming-May & Yuro (2009), who confirmed that it is typical of social sciences students to use citation chaining as their main method of finding literature.

Jamali and Nicholas (2008) even found that within disciplines differences between what they call "narrower subject communities" are important. (p.18) Depending on the research areas of physicists and astronomers, they either tracked references or searched databases as their main activity to discover articles.

#### **5.3.3.10. Suggestions for support by libraries**

There are a number of recommendations for libraries with regard to providing better services to PhD students and researchers in general:

Brown & Swan (2007) suggested a number of important issues that libraries need to consider in this respect. They pointed out that differences in the ways in which researchers and librarians see the future of the library mean that there should be an increase in communication. Furthermore they found that it is librarians more than researchers who see information literacy as a core function of the library and that there remains much to be done to ensure that these services become more accepted among researchers.

With regard to information skills training by the library, RIN (2006) reported that only few researchers (for instance, 38% of postdoctoral researchers) had ever undergone training with regard to finding resources. Those postdoctoral researchers who had mostly did so during their PhD phase and received the training from librarians or other information professionals and found it helpful.

Fleming-May and Yuro (2009) argued that in order to make their services more relevant to PhD students, library services need to be tailored towards the special needs of this advanced user group. Library instruction should not be too basic or general and is only suitable if it addresses more specialized information needs. This view is in accordance with Green & Macauley's (2007) view that librarians need to understand PhD students better. They need to take a look at how the students' needs are determined by the doctoral system to which they belong and adopt a more learner-centred approach. This means that doctoral learners' independence and their experience are taken into account.

## 5.4. Recent relevant studies

Although not consulted in the preparation stage of the current project, a number of recent study reports on the information behaviour or practices of researchers should be mentioned as relevant to our own results. Again, this is not a comprehensive overview of recent publications. However, the following two reports were identified as complementary to our own results and might be consulted when considering subject specific issues of information behaviour, which turned out to be more complex and varied than expected.

In a number of case studies, the RIN (2009) report identified how life science researchers use and exchange information. The report made clear that there is a great variety in the services and strategies researchers use. Individual contexts have an important influence on the information behaviour of researchers. One focus of the report was on how researchers view the sharing of data. They preferred to have more control over their data and over who was allowed to use it than provided by institutional repositories. The report argued for service providers to take the particular contexts and situations of researchers into account. Interestingly, PhD students were reported as being more limited in their information behaviour than other, more experienced researchers.

RIN (2011) reported on case studies revealing how humanities scholars from various disciplines use information in their research. Due to the choice of case studies there was a slightly greater focus on how these researchers used new technologies but more traditional ways of finding information and more traditional use of print and manuscript resources were included. The report showed that humanities researchers use a great variety of sources and approach them in different ways. Trends observed included a greater ease with digital resources and new technologies which are used alongside manuscript and print sources, which remain important to humanities researchers. Furthermore humanities research was shown to be more collaborative than previously thought. It turned out that data-sharing was considered less of an issue by humanities scholars possibly because it is not as central to humanities research. As RIN (2009) did for life science, the RIN (2011) report also stressed that there is great variation within the humanities with regard to information behaviour and information needs. Web 2.0 tools or social media were, for example, used only in a limited way, with the exception of PhD students in a philosophy department who used them to learn about and spread new research. There were a number of barriers to humanities researchers adopting new technologies although they did so if it served their purposes. The report noted that more support was needed for humanities scholars to fully embrace the possibilities of digital resources and digital services. In this respect it was made clear that certain issues need to be addressed. Such issues included how complete or permanent digital archives are, how much or how little the work invested by researchers in such resources or competencies inputs into their careers or what specialist support there is for developing resources or competencies.

## 5.5. Summary

What emerges from the literature consulted is that although PhD students may form a group of information users in terms of their being at a similar stage in their development as researchers they are not a homogenous mass, and neither are researchers within disciplines. However, there are certain trends that can be established.

The information behaviour of PhD researchers seems very much influenced by three "C"s, by

- Content
- Convenience
- Context

In other words, PhD researchers are not focused on how to find information or how to manage it, they are interested in finding what they want to know (=content). **Content** is also what they most want from libraries, and they do not necessarily care for whether or not the content is provided by the library or some other source. Since they are pressed for time, PhD researchers are very much influenced by considerations of **convenience** when it comes to what information resources they use and how they use them. Finally, PhD researchers' information behaviour is very much influenced by the particular **contexts** they find themselves, as students or staff of particular institutions, as emerging experts of very specific sub-disciplines, as one in a peer group of students or researchers, as individual human beings. Any service providers should take these into consideration when developing services. Some of these themes as well as more specific issues will re-emerge in the findings of the present study.



## 6. Results summarized

This section presents a thematic summary of the findings of the survey and interviews.

The survey was conducted using SurveyXact. 4.453 PhD students attending the universities of Copenhagen, Oslo and Vienna answered a questionnaire containing 35 questions. Survey results were divided by discipline (see below) and location (Vienna, Copenhagen, and Oslo).

Discipline groups:

- Arts, humanities and philosophy (including performing arts, history, languages, linguistics, literature, cultural studies, archeology, religion and theology, philosophy)
- Social Sciences (including economics, business, political science, social anthropology, sociology, human geography, gender studies)
- Natural Sciences (including mathematics, biology, chemistry, physics, astronomy and earth sciences)
- Engineering (computer sciences, informatics)
- Medicine (dentistry and other health related disciplines)
- Psychology
- Education
- Law (including criminology)
- Media and communication

Survey respondents had the option of multiple answers and of skipping questions altogether. This means that one needs to be very careful when reading e.g. a graph, to take into account the number of respondents to a given question before drawing meaning from that graph. For further survey methods, see beginning of Appendix C. The survey results are presented in full in Appendices A (graphs) and B (textual analysis).

After the survey 20 PhD students from the universities of Copenhagen, Oslo and Vienna were interviewed in single sessions from November 2010 to February 2011. Interviews were conducted in the interviewees' native language or in English. Number of interviewees was around one per university per discipline area. In Vienna, the number of interviewees was increased to up to two PhDs from similar subject backgrounds to include students whose PhD project was independent from any employment as well as researchers whose PhD project was part of a university job, since this was considered an important distinction at that university. For the interview guide and further methodological remarks, see appendix D.

### 6.1. Finding, evaluating, and choosing literature and information

The results of the interviews show that PhD students think it is a very important part of the research to get hold of the appropriate literature. They state clear preferences about what genres of literature they find most relevant. However, PhD students seldom apply formal criteria (such as journal impact factor) for choosing and evaluating reading material within a range of potentially relevant

items. Also many of the respondents find searching and obtaining literature to be a time consuming process.

When it comes to types of information PhD students want, search for and use in their projects, we see that articles are ranked as the most important publications for their projects. In fact a large majority of the candidates give articles top rank, both in the interviews and the survey. Within humanistic disciplines books are still considered at least equally important but candidates report that articles are getting increasingly central to their research. Within law studies, primary sources are also ranked as important. These findings are underpinned by survey answers concerning preferred publications independent of format (print/electronic) (see table 1).

Table 1: information sources ranked the most important in the survey

	1st place	2nd place	3rd place
Vienna	Journal articles	Book articles	Handbooks
Copenhagen	Journal articles	Handbooks	Book articles
Oslo	Journal articles	Book articles	Handbooks

From the survey the picture regarding the use of print versus electronic material is quite clear: Arts/humanities, Social Sciences, Law, Media/communication and Education use print information more often than the other subjects in all three universities. The only exception is in Psychology in Copenhagen, where the majority uses print material equally to electronic. In Oslo and Vienna the Psychology groups' majority is in the "Electronic most of the time" category.

When evaluating what is relevant for the project, most of the interviewees do not rely on formal criteria when selecting literature for their research. We also find interviewees who haven't thought through what kind of criteria they go by. A wide range of considerations are relevant when the candidates consider reading for their research:

- Title
- Renowned author
- Abstract / summary
- The conclusion
- Check that the method is in order. In some subjects, it is easy to see if the argument in relation to the method is tenable.
- How it is written, how the material is disposed.
- Does the text correspond with what I already know?
- Table of Contents
- Recognized journal, already know the journal
- Peer review
- Literature that is much cited. Most PhDs are not concerned with impact factor.
- Use key works as a starting point
- Reviews
- Check the book on the shelf, check Google books
- "Scientific texts are expected to be valid, so that texts published in a scientific context, are valid in principle".
- "Publishers can be trusted"

Furthermore there is also a clear tendency that material which is difficult to get hold of may be disregarded. The most recent material is prioritised.

Most PhD candidates do not know what Open Access is, a few have heard about it. One of them believes that the view on Open Access will be different when OA becomes more established.

## 6.2. Tools for searching

In the interviews and the survey, Google or Google scholar is described as the most commonly used search engine, and the main tool for searching. In the interviews it was pointed out that the reason for this is that Google is more user friendly than the other databases offered by the library. To search effectively requires knowledge of databases and searching. The interviewees feel the databases do not function very well. Vienna is the only exception in this regard. Interviewees from Vienna answer that they start searching the databases, and only a few mention Google.

In the interviews candidates from all three universities also mention Google books as useful when searching for books. New technologies seem to have an effect on how students relate to literature. For example Google books is not only used as a tool for finding books to read but also to scope information and get an impression of content or to consult specific text passages for citing.

Table 2: Answers given in the survey show that Google and Google Scholar are the most commonly used tools for finding information for PhD projects across all three universities.

	1st place	2nd place	3rd place
Vienna	Google	Library online catalogue	Online bookstore
Copenhagen	Google	Google Scholar/Library online catalogue	Publisher's website
Oslo	Google	Google Scholar	Scholarly database

Beyond the various Google databases PhD students' choices of search tools differ between subjects, but none of the interviewees mention a large variety. This may indicate that they do not use a wide range of databases but stick with the main databases commonly used in their fields or even very specialized databases.

Some PhD candidates search directly from the journal's (or the publisher's) web pages, others carry out broad searches in journals they know (key journals in their discipline).

## 6.3. Methods for searching and keeping informed

The survey data show that the by far most common way of becoming aware of relevant literature is by checking references in literature already read. The interview data confirm this finding but also give a more nuanced picture of PhD students' search practices.

A majority of the interviewees mention reference chasing as an effective way of searching for literature and some point to this as their main search strategy. A search method suggested by the respondents in this context is using lists of references as a starting point and then further search for the references in Google or Google scholar to obtain the documents. Conferences are mentioned as occasions to get tips on names of authors and search terms.

In some disciplines subject searches seem to be common. In disciplines where such searches yield too many results, other strategies are used. These include finding out who are important

authors in the fields of their PhD topics either from colleagues, from their supervisors or at conferences and then find out what they have written. A further strategy mentioned in this context is using lists of references.

There is a difference between how PhD students search for unknown versus known topics. When looking for topics already known to them, they describe how they look for/browse journals or track references from the publication history of key authors. When they need to familiarise themselves with topics that are new or unfamiliar to them, they do keyword and topic word searches in databases. The PhD candidates invest a lot of time developing an overview of their topic. Some of them find this difficult, and some of them felt lost in the beginning. They described information research for their PhD project as a chaotic process, especially in the beginning. After a while this situation improved as they felt did their search skills. The reason they got better at this was especially because they developed greater knowledge of their topic and were able to find what was relevant more intuitively.

According to the interviews, the PhD students usually do not plan their searches. When needs occur they search in an ad hoc manner. A minority of the survey respondents have a more systematic approach. After formulating their topic, they plan their search. Only a minority of the PhD students save search histories. There were a few comments on wanting to become more systematic concerning this.

To keep up to date PhD students use the same strategies as the strategies described above, but some of the interviewees emphasize professional networking, discussions, conferences and news blogs as ways of keeping up to date. Some of them say that they work on such a broad topic that keeping up to date seems impossible. Some of the interviewees also use alert services to keep up to date.

## 6.4. Getting hold of items not locally available

Libraries are important information providers. If the local university library does not hold a particular book, PhD students use national and international interlibrary loans. However, several of the interviewees buy books if the international interlibrary loans are much delayed or the book is reserved by several people before them. They also use booksellers, also on the internet, to buy books. They search the booksellers on the internet by author or by search terms.

## 6.5. Reference management

The survey shows that the usage of reference management software is much higher at the universities in Oslo and Copenhagen than in Vienna for all disciplines. In Vienna EndNote is dominating the market, while users in Copenhagen/Oslo are more divided between EndNote and Reference Manager. Furthermore the number of users finding the tool extremely useful is lower in Vienna than in Copenhagen and Oslo and the number of users answering “Don’t know” is significantly higher in Vienna.

In the interviews several candidates express that reference management tools are experienced as difficult to use not least due to technical problems. However, some PhDs believe they manage reference management tools well. Many of them do not use reference management tools, such as EndNote or Reference Manager, but use their own system like typing the references in a Word document, by printing out the documents and make notes on them, or by writing notes attached to the documents. A majority of the interviewees download documents to the computer

and store them in files. Some print out documents. In the interviews most PhD candidates express concerns about being unsystematic and unstructured in their management of references and documents. However, in the survey the respondents who were asked to rank a list of research skills ranked “using reference management software” as least important. All other skills are considered equally important across all disciplines (see appendices A and B question A3).

## 6.6. Skills and development as scholars

As mentioned above, using reference management software” was ranked as the least important skill in the survey. For the respondents of the survey in Copenhagen and Oslo “[k]nowing how to use the library catalogue” was additionally ranked low as a research skill. This may correspond with the fact that most respondents, regardless of university or discipline, replied they learnt about using library services during their undergraduate studies or that they figured it out for themselves. However, many respondents in Copenhagen and Oslo replied they did not know they could get help or guidance from their libraries.

When looking at interview data we also see that the understanding of the applicability of search tools to academic work processes changes from lower to higher levels of university studies. During studies at lower levels, it appears to be common to get references from others, and exclusively to check for known literature. At the PhD level, one must search more broadly and get an overview over all relevant literature of academic quality. However, most of the interviewees report that they find it easier to search for literature at the stage they are at now than before. They seek more intuitively because they have become more academically competent. They have become better at finding material and understanding its importance. A few of the PhDs say they haven’t developed during the PhD project but rather did so during the master studies or in between the master and the PhD.

Thus, a majority of the PhDs feel they are getting by but at the same time they report that they do not search professionally or in a structured way. A number of them even express concerns about this.

Ethics do not seem like a prominent theme in any PhD program. Some seem to include courses where ethics is a topic but just a few of the interviewees have attended one. Plagiarism is hardly felt to be an issue at this level of study. Most PhDs say referencing and citation is part of being a researcher and they simply do not plagiarise. In some disciplines more emphasis is put on the number of references than in others. However, there are other issues that the candidates are likely to address under the heading of ethics: One PhD candidate in medicine told us that co-authorship in particular was an issue. Others mention privacy as an issue. Where interviews are part of the PhD research, there is a particular focus on privacy and ethical use of data. Self-citation is also mentioned as a problem. Some interviewees mention the issue of stealing other people’s ideas and they are therefore reluctant to talk about what they are working on.

## 6.7. Feelings and challenges

When asked about the process of searching and finding information, many interviewees expressed the following frustrations:

Frustrations occur when students are not able to get hold of things they know exist, books are not on the shelves, or they do not have access to a particular database or other identified

electronic resources. One of the interviewees pointed out that when collected works not available online this makes some of the literature much more difficult to find.

It can be a problem that the sharing culture is poor among researchers. One interviewee talks about having difficulties obtaining graphs for experiments. Others talk about not sharing ideas because they are afraid that others may steal them.

In the survey pressure of time was mentioned by PhD students from all three universities. (see table)

Table 3: Factors affecting PhD progress negatively

Vienna: Pressure of time (55%), Necessity of working to support research (45%), Lack of money (39%), Licensing or other restrictions imposed by e-journals and other information services (33%), Family obligations (26%), Difficulties in getting hold of relevant scholarly materials (22%). Medical students also feel constrained by Restrictions imposed by the regulation of research libraries (27%). Copenhagen: Pressure of time (62%), Family obligations (23%), Lack of money (20%). Students in media and communication also feel constrained by Difficulties in getting hold of relevant scholarly materials (27%). Students in engineering (29%), psychology (39%), education (30%), and media and communication (27%) feel constrained by Licensing or other restrictions imposed by e-journals and other information services.

Oslo: Pressure of time (55%), Family obligations (34%). Students in media and communication feel constrained by Difficulties in identifying relevant scholarly materials in your field (29%). And students in engineering (28%) and education (32%) feel constrained by Licensing or other restrictions imposed by e-journals and other information services.

	1st place	2nd place	3rd place
Vienna	Pressure of time	Necessity of working to support research	Lack of money
Copenhagen	Pressure of time	Family obligations	Lack of money
Oslo	Pressure of time	Family obligations	n/a

## 6.8. Library and other support

Answers received in the interviews when asked about support in the search and retrieval process reflected a general reluctance towards contacting the library for support, which sometimes is due to their feeling they should already know about certain issues.

When asked if they feel the university library supports their research enough, generally we received a “neither satisfied nor dissatisfied” answer in the survey with the Oslo students seeming more content with the services and the students from Vienna slightly less so. A few of the PhD students received help from the library in a course and find this help positive but most survey respondents have either found help from a librarian or found the information from the library web page.

Some PhD students find it embarrassing to ask for assistance, some because they have already received it before. However, often they do ask when in need of assistance: Many PhD students receive help from fellow students and senior academics. Most PhD students have not attended courses run by the library during the PhD program; some have attended courses in previous studies.

The interviews revealed that PhD students get help from others concerning keywords or search terms. It is common to discuss keywords or literature with colleagues or other professionals

but this differs between disciplines. Some of the PhD students work more on their own and therefore discuss little with others. It is not common to discuss search methods.

For some of the PhD students who were interviewed supervisors play an important role in their information-seeking process. Several mentioned that they get author names from their supervisors and that they also receive documents from them. Supervisors also refer students to other people who can help.

It is common to borrow books from colleagues and to e-mail other researchers to receive help or article reprints. The latter is especially common if the library does not subscribe to the journal. A few PhD students are members of professional online forums where they receive assistance.

## 6.9. Use of library facilities

When asked about the use of the library's online facilities in the survey, almost all students stated that they visit online a few times a week, regardless of university and discipline, whereas the use of the physical facilities is low in Copenhagen and Oslo.

In Vienna, 70-80% of survey respondents conduct most of their searches from home, in Copenhagen, 90% search from their place of work at the university, whereas in Oslo, most search in four locations: 1) from the place of work at the university, 2) from home, 3) from the place of work outside the university, and 4) at the university library; in a falling order.

From the survey and the interviews we learn that very few PhD students visit the physical library very often. In Vienna, most PhD students visit the library a few times a month/week (difference between soft/hard disciplines), in Copenhagen, most visit a few times a year, and in Oslo, most visit a few times a year/month (difference between soft/hard disciplines), apart from PhD students in law, who visit on a weekly basis.

## 6.10. Requests for support and suggestions for improvement

Regardless of their subject and university, survey respondents saw providing access to scholarly information as the most important support libraries could offer. Providing social space was generally not rated as important by Copenhagen and Oslo PhD students but more so for students from Vienna, and overall 25% of the Viennese PhD students are dissatisfied with the support in this respect regardless of discipline. Copenhagen PhD students are generally most dissatisfied with the support on issues concerning writing and publishing research.

According to the survey and the interviews, the **library's role** is described by the PhD students as:

- Getting hold of things (Order articles and books)
- Providing access to everything through subscription
- Providing help with searches and assistance in managing the searches and results (librarians should be experts on reference management programs)
- Improving existing search systems, for example by providing good keywords on material registered in the databases

Desirable **topics** mentioned for **courses** are:

- In depth and discipline specific help at the beginning of the PhD, both in information searching/search terms, and reference management.
- "Could need help to work more structured"
- How to get an overview
- Tips and tricks, practical things
- Opportunities in the databases
- Advice on the publishing process
- Advice on Open Access
- Copyright
- Impact factor

The PhD students consider it desirable that **courses** are:

- Short local and professionally relevant (crash courses), not too detailed or lengthy
- Integrated into the PhD program, which gives points
- Early in the PhD program
- Seminars/teaching outside normal working hours (Viennese comment)

Further expressed wishes for **general library support** are:

Services

- Help with proof reading for academic journal papers
- The library taking care of primary data (several Copenhagen comments)

Facilities

- Space for PhD students in the library, working places, places for discussion etc (Vienna comment)
- Material should be collected in one place, from an interdisciplinary perspective. For example, new acquisitions should be gathered in one place in the library (for all disciplines)
- When books and journals are found in different locations and they have to travel around to find literature, sometimes they choose other material instead
- Longer opening hours (Vienna comment)
- A coffee machine

Branding and advertising

- Better advertising for the services the library already has
- Offer book reviews, author portraits, be more like a bookstore
- The library should be more visible, more information should be aimed at researchers.
- Function that is useful: like the Amazon function: "the person who bought this item also bought..."
- Communication in English for foreign PhD students (especially with regard to standard messages and texts) (Oslo comment)



### Content

- Everything should be searchable from the same place, through the same search tool
- More subscriptions
- More e-books
- Streaming of new books, more accessible lists of new books
- Visible table of content through the library database
- Databases containing pictures, charts, and graphs
- Book and journal acquisition suggestion
- Remote access to databases
- Remote access to the electronic services
- Free inter library loans (Vienna comment)
- Problems with foreign languages. Subject-specific dictionaries are important

### Contact with the librarian

- Closer contact with the library
- Getting a librarian to the institute or office
- Personalised help.
- Friendly staff at the libraries, the feedback from the PhD students is very varied from high praise to the opposite.
- The librarians should participate in meetings and arrangements where PhD candidates meet
- The PhD students who have been in the U.S. in connection with studies or the PhD program say the contact with the library is much closer there and the library is a place where you study and get help. There is also a major focus on plagiarism, and courses concerning this are offered in the library

## 6.11. Individual and subject differences and similarities

Most of the PhD students who were interviewed think that they work pretty much the same way as others in their field when it comes to information-seeking and information management. They think this varies from subject to subject and that it probably depends on the specific project. Some of the interviewees think it is specific for them to use Google as their main search tool.

Some of the interviewees told us that they think they are better at searching and managing information than colleagues. They are more well-informed about this and see themselves as more efficient.

There are many differences between subjects. However, it is difficult to see a common pattern which is particular to a certain subject discipline. But an example is the distribution of answers to the following question:

Table 4: “Have you received any help with how to use the university library services since you became a PhD student?”

For PhD students from Vienna there are no difference in the answers between disciplines (30-40% yes, 60-70% no), except for Media/communication where 20% answers yes, and 80% no. But in Copenhagen and Oslo the responses vary greatly between disciplines:

Subject (Percentage yes replies – Copenhagen)	Subject (Percentage yes replies – Oslo)
Engineering (20%)	Media/communication (40%)
Medicine (30%)	Natural Sciences (45%)
Natural Sciences (35%)	Psychology (50%)
Arts, Humanities and Philosophy (45%)	Engineering (50%)
Psychology (45%)	Social Sciences (55%)
Social Sciences (55%)	Medicine (60%)
Media/communication (55%)	Education (65%)
Law (65%)	Arts, Humanities and Philosophy (65%)
Education (70%)	Law (80%)

This shows which differences exist between subject disciplines but also point to university-related differences, which is the topic of the next section.

The survey also showed that there are subject specific differences when it comes to physical visits to the university library. Few PhD students visit the physical library very often. In Vienna, most PhD students visit the library a few times a month/week (the difference lies between soft/hard disciplines), in Copenhagen, most visit a few times a year, and in Oslo, most visit a few times a year/month (difference between soft/hard disciplines), apart from PhD students in law, who visit on a weekly basis. Please see the graphic (appendix A, graphs: au a5 f7 u (Vienna), dk a5 f7 u (Copenhagen), no a5 f7 u (Oslo)) or textual analysis (appendix B, question A5) of this particular question for more detailed description.

## 6.12. University specifics

We encountered university specifics at a number of questions. When asked if the University Library support their research enough, we found only few differences between disciplines but some between the universities - the Oslo PhD students generally give more positive answers, followed by Copenhagen students, while the Vienna mostly reply “to a certain extent”.

When asked where or from whom the PhD students received help with how to use the university library services, many Oslo students equally often replied they attended a seminar/course, whereas the Copenhagen students depending on discipline either attended a seminar/course or received help from a fellow student. Many students from Vienna also received help from fellow students and senior academics.

When asked about the use of the library’s online facilities, almost all students visit online a few times a week, regardless of university and discipline, whereas the use of the physical facilities is low in Copenhagen and Oslo.

In Vienna, 70-80% conduct most of their searches from home, in Copenhagen, 90% search from their place of work at the university, whereas in Oslo, most search in four locations: 1) from the place of work at the university, 2) from home, 3) from the place of work outside the university, and 4) at the university library; in a falling order.

Few PhD students visit the physical library very often. In Vienna, most PhD students visit the library a few times a month/week (difference between soft/hard disciplines), in Copenhagen, most visit a few times a year, and in Oslo, most visit a few times a year/month (difference between soft/hard disciplines), apart from PhD students in law, who visit on a weekly basis.

### **6.13. Summary**

PhD students may not necessarily have turned out to be indicators of any radical changes in the information behaviour of researchers. Rather and in keeping with the findings of other studies, they are - both as students and as researchers - individuals in specific contexts whose particular circumstances - the academic system they are part of, the services they can use, the research community they are beginning to belong to, their particular personal circumstances, their personal preferences - influence the information choices they take and the information behaviour they show. In doing so they can be seen as developing and expanding on information research practices earlier acquired and it can be argued that - should they stay within academia - the years spent on their PhD research may be formative for their later scholarly information behaviour. While the requirements they have concerning library and other information services may differ depending on internal factors and external circumstances, some trends emerge for a clear majority of PhD students - these concern the time pressure students feel, the strongly perceived need to have information resources immediately accessible, and available and a developing relationship with the information network (consisting both of information resources, publications and people) they are part of. Since academic libraries and their services are very much part of this information network, albeit not always a strongly visible one, and since PhD students are an important academic subgroup within the larger groups of students and of researchers, libraries should pay special attention to the needs and practices of PhD students when developing their services.

## 7. Recommendations

The survey and interviews has yielded rich information on the information behaviour and practices of PhD students and has raised certain issues for libraries. We have taken a look at the findings of the study and the issues we can see for libraries and have tried to formulate recommendations concerning possible actions to address them. Some of the recommendations will be resource heavy and may not be economically viable. However, we have put them forward to highlight (some of) the library services that we feel to be in need of increased or changed efforts in order to make sure that PhD students both use and appreciate library services.

### 7.1. Library resources

From the findings we see the need for:

- More journals subscriptions
- More e-books
- Databases containing pictures, charts, and graphs
- More discipline-specific dictionaries, including subject specific language dictionaries

### 7.2. Information and services

From the findings we see the need for:

- Help with proof reading for scientific journal papers
- The library providing an option for sharing and taking care of primary data

### 7.3. Information search workflow

Interviews revealed that the retrieval of references and information by PhD students seems to be very much integrated into the search workflow and availability or non-availability during that process may determine whether or not an information source is used at all. Furthermore, it is important to be or become aware of discipline differences. Even though many perceived discipline differences seem to be local differences rather than “pure” discipline differences, they still need to be taken into account. An important factor in the information search workflow that libraries need to consider is that a vast majority of PhD students work on their project at some place other than the library and on average few visit the physical library. Therefore remote electronic access to databases and electronic services are key.

With regard to the information search workflow that PhD students describe we recommend that libraries should

- Link document delivery and inter library loan services directly from search tools and databases (e.g. via SFX)
- Get local knowledge about the research workflow
- Offer personalised remote support for students working from home (Web 2.0)
- Offer personalised and local support (outside the library building). Librarians could e.g. participate in meetings with PhD candidates such as workplace meetings which include PhDs, PhD classes or special events for PhD students outside the library
- Give resources to maintain local knowledge about discipline specific needs; these seem to be specific to the discipline in the specific location and not necessarily be discipline specific across borders
- Tools should be intuitive to learn and easy to use

## 7.4. Access to information

Convenience, immediate availability of resources and easy access to information matter to PhD students. When books and journals are found in different locations and they have to travel around to find literature, sometimes PhD students choose other material instead

To ensure that library material will be used, we recommend that

- everything should be searchable from the same place, through the same search tool
- easy access to the resources the PhD students need should be an important factor in decisions concerning holdings management and library facility development
- inter library loans should be improved, especially with regard to costs (Vienna; interlibrary loans are already provided for free in Copenhagen and Oslo)
- a centralized access to books, journals and different disciplines should be provided as much as possible (so they only have to go to one place when they have to use the physical library at all)

## 7.5. Search tools

Google is the most used, very often for ease of use, the “one-stop” nature of Google rather than the cumbersome searches in subject databases which do not always provide access to full texts. Often the databases are not seen as functioning very well or being user friendly

We recommend the following

- The library catalogue and the library search tools should be made as intuitive to use as possible and include a wide array of editing options (e.g. save your search, links to other useful titles, smart tagging, lists of new books, and Table of Content for books in the catalogue) Any efforts in this direction already taking place should be supported further

- Improve existing search systems, for example by providing good keywords on material registered in the databases
- Information about what Google is and is not and how best to use Google. Do not insist on people using databases, but help them with understanding what Google does/does not cover and when databases might actually come in handy from the researcher's perspective.

## 7.6. Reference management tools

It seems that whether or not reference management tools are used during the PhD is established well before the students become PhD students. Reference management and use of the library catalogue are considered "tools of the trade" (i.e. you should have learnt them before becoming a PhD student) to be used if needed. However, there is also the widespread idea that you can manage without (and so many PhD students do, many not knowing though some suspecting that things could be handled more efficiently with the right knowledge).

- Reference management tools should be introduced to students well before master's level
- At the beginning of the PhD, information and courses should also be offered
- A "personalized", or at least discipline oriented information package (emergency kit) should be presented at the start of the PhD and should include information on reference management tools
- Librarians should be experts on reference management programs

## 7.7. Courses

Courses and help to undergraduates "pay off" also when some of them become postgraduates.

- Introduce courses to students well before they become masters students
- In depth and discipline specific help at the beginning of the PhD, both in information searching/search terms, and reference management
- Correlate and coordinate courses to PhD students with PhD schools/programmes (and give points) or make in collaboration with supervisors or any other body looking after the PhD students

Based on the findings of this study, course themes should include

- Help on structure and overview
- Tips and tricks, practical things
- Possibilities in the databases
- Advice on the publishing process
- Advice on Open Access
- Copyright
- Impact factor

Since PhD students, often work or have other obligations and have very specific information needs, they need

- More specialized and subject-oriented courses particularly geared towards their specific research situation rather than general courses
- Courses outside regular working hours (particularly in Vienna)
- Online alternatives to courses they need to attend personally at particular times
- To be able to learn in their own time, in their own speed and whenever the need arises even more than other students

## 7.8. Facilities

While the general trend in Copenhagen for undergraduate and graduate students (before PhD studies) is increased use of the physical library facilities, the PhD students of Copenhagen and Oslo only use the physical library facilities sparingly, probably due to the fact that they usually have their own offices at the university.

Most PhD students from Vienna work beside their PhD studies and since they do not have an office of their own at the university or at the university library, they would profit from facilities provided by the library:

Our recommendations include

- Space for PhD students in the library, working places, places for discussion etc.
- Access to library, seminars and teaching outside normal working hours
- Access to facilities such as basic kitchen facilities (drinking water, coffee machine, microwave, water boiler)

## 7.9. Marketing, branding, and PR

Last but not least, it turned out that many PhD students are not aware of services already provided or the library involvement in providing services or do not ask for or use library services that would support their research efforts. This means that marketing efforts concerning this (potential) group needs to be increased. Since the vast majority of PhD students work on their project somewhere other than the library and on average pay few visits the physical library, measures need to be taken to ensure that the library is made a recognizable resource in terms of its website and/or catalogue or any other online resources it offers. As most PhD students have either found help from a librarian or found the information from the library web page at some stage, both personal and online contact matter in this respect. In this international PhD students should be taken into account as an important subgroup. Since Ph.D. students are under a lot of time pressure and seek convenience in speed

Our recommendations include:

- The library's marketing activities should be user oriented; the information that is provided should not be centred on the library's perspective but on the needs of users.
- Optimizing the webpage, proper branding of library websites
- Better advertising for the services the library already has, including advertising about physical space available
- Marketing should highlight those areas of library services that correspond to PhD students' priorities concerning speed of access etc.
- The library should provide a “personalized”, or at least discipline oriented information package (emergency kit) at the start of the PhD
- Information should be aimed directly at researchers and their particular information needs rather than be general both to fulfil particular information needs, to ensure that researchers realize that the information is meant for them and not for the general public (since otherwise it might not catch their attention) and to underline the importance of researchers as a user group (since otherwise services might not be considered relevant)
- It should be taken into consideration that PhD students may prefer being informed in different ways, among them, the library information board, a newsletter directed especially at PhD students or at researchers in particular disciplines, the library website
- Communication should also be in English for international PhD students
- Offer book reviews, author portraits, suggest further reading etc (compare Amazon)
- Try to brand library services by making librarians come across as real people rather than yet another automated information retrieval system
- Book and journal acquisition suggestion should be more visible, it is a request from PhD students at all three institutions, yet already available at the involved libraries

## 7.10. Further knowledge based library development

Since our experience is that there is a lot to be learnt from asking questions of potential users about what services they really need, since we believe that libraries as user-centred service providers should base their decisions on evidence learnt from their users, we finally recommend that

- The libraries should continue to research user information behaviour
- Research should be extended to post-doc and more experienced researchers as well as undergraduate and graduate students to gain a more complete picture
- Depending on the questions the library wishes to find answers to other methods should be included in future research projects, like analysis of search logs etc. to include information that cannot be learnt with the help of surveys or interviews
- The libraries should continue to participate in international cooperation concerning user studies



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