Understanding academic reading in the context of information-seeking

Abstract
Reading is an integral part of the information-seeking process, yet it is rarely considered in information-seeking research. We explored relationships between academic reading and information-seeking using a sample of graduate students and an online questionnaire. We found that all information-seeking stages and all academic tasks were characterised by a combination of ‘deep’ and ‘surface’ reading and a use of both print and electronic resources. Contrary to previous studies that linked digital media to ‘surface’ reading (e.g., skimming, searching for keywords), our participants reported a high number of ‘deep’ reading tactics (e.g., annotating, connecting text to prior knowledge) while using digital resources. Our findings indicate a shift in academic work culture and point to the need to further examine the influences of the information-seeking process and information resources on reading. Future work should also focus on the effects of reading styles and media on retention, academic task completion and learning.

Keywords: information-seeking; human information behaviour; reading; information resources; graduate students

Purpose: A study examined reading strategies in relation to information-seeking stages, tasks, and reading media in an academic setting. Understanding reading practices and needs in the context of information-seeking can refine our understanding of user choices and preferences for information sources (e.g. textbooks, articles, multimedia content) and media (e.g. print and digital tools used for reading). It can also help to examine the changes in reading practices brought about by digital devices and content.

Design/methodology/approach: The data were collected via an online survey from a sample of graduate students over the course of two months. The data were analyzed using descriptive statistics.

Findings (mandatory): We found that all information-seeking stages and all academic tasks were characterized by a combination of ‘deep’ and ‘surface’ reading and a use of both print and electronic resources. Contrary to previous studies that linked digital media to ‘surface’ reading (e.g., skimming, searching for keywords), our participants reported a high number of ‘deep’ reading tactics (e.g., annotating, connecting text to prior knowledge) while using digital resources.

Research limitations/implications: The study relied on a convenience sample of library and information science students, so some findings can be attributed to the sample’s demographics and academic demands. The findings imply that at all stages of information-seeking for all academic tasks, graduate students were engaged in both deep and surface reading using both print and electronic resources.

Practical implications: The findings show that students read print and digital texts, suggesting that it might be premature for academic libraries to part with their print collections. Understanding relationships between academic task, information-seeking, and reading can aid students in choosing the right reading resources for their academic tasks; educators in assigning appropriate materials for course projects; libraries in providing appropriate resources to their readers, and information retrieval system designers in offering useful features for different reading needs and styles.

Social implications: Our findings indicate a shift in academic work culture and reliance on digital texts for deep and surface reading.

Originality/value: The study produced preliminary support for the development of a unified information-seeking and reading model.
1 Introduction

Reading is an integral part of the information-seeking process and is connected to one’s social role, task, and choice of reading medium (Leckie, Pettigrew, & Sylvain 1996; Jabr, 2013). While prior research produced influential models of information-seeking behaviour and separate models of reading practices, we are not aware of any efforts to explicitly integrate reading into an information-seeking model. Understanding reading practices and needs in the context of information-seeking can refine our understanding of user choices and preferences for information sources (e.g. textbooks, articles, multimedia content) and media (e.g. print and digital tools used for reading). It can also help to examine the changes in reading practices brought about by digital devices and content.

This article reports on a pilot study that examined reading in relation to information-seeking stages, tasks, and reading media in an academic setting. The study provides preliminary support for the development of a unified information-seeking and reading model.

2 Relevant literature

2.1 Information-seeking

At its broadest level, information-seeking is a ‘process in which humans purposefully engage in order to change their state of knowledge’ (Marchionini, 1995). It is a way of making sense of a problematic situation (Dervin, 1983; Dervin & Nilan, 1986) and is influenced by a specific context in which information-seeking activities occur (e.g., Wilson, 1981; Wilson & Walsh, 1996; Savolainen, 1995).

Several models represent information-seeking as a linear process involving certain stages or activities. Kuhlthau (1991) proposed five distinct stages of an information-seeking process, tied closely to cognitive and affective states, while Ellis (1989) suggested four categories of activities that define the information-seeking process. The intersection of these stages and activities of the information-seeking process is illustrated by Wilson (1999) in Figure 1 below.

![Figure 1. Intersection of Kuhlthau’s stages and Ellis’ activities models, proposed by Wilson (1999)](image)

While Kuhlthau’s five-stage model suggests a linear progression, Foster’s (2004; 2006) synthesis of several models posits a non-linear process of information-seeking. Foster’s approach is centred on three primary information behaviours that inform one another: orientation, opening, and consolidating (Figure 2).
Overall, despite slight differences in terminology, there are many similarities between information-seeking models. For example, several models include the ‘initiation’ stage of an information search (Ellis, 1989; Kuhlthau, 1991), and describe specific tactics associated with this stage (e.g., figuring out the topic or changing the scope of the topic (Bates, 2002; Kuhlthau, 1991; Marchionini & White, 2007).

In designing our study, we mapped the information-seeking tactics and terminology proposed in previous information-seeking models into three broad information-seeking stages: 1) initiation and formulation, 2) exploration, and 3) extraction and finishing. Table 1 below lists specific tactics associated with each stage of the information-seeking process.

<table>
<thead>
<tr>
<th>Information-seeking stage</th>
<th>INFORMATION-SEEKING TACTIC</th>
<th>Kuhlthau</th>
<th>Foster</th>
<th>Ellis</th>
<th>Bates</th>
<th>Marchionini and White</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIATION &amp; FORMULATION</td>
<td>Figuring out the topic</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Narrowing or expanding the scope of the topic</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>EXPLORATION</td>
<td>Identifying and selecting information resources</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Searching for keywords or finding specific facts</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Browsing or exploring a source(s) to see what I find and learn</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitoring specific sources to keep up-to-date on a topic</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Tracking down sources based on footnotes or citations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>EXTRACTION/FINISHING</td>
<td>Pulling relevant information from a resource(s)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verifying the accuracy of information</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Synthesising information</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Finishing the assignment (e.g., presentation, paper, project, etc.)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Mapping of study’s information-seeking themes to various information-seeking models
In instances when information is sought in recorded sources, information-seeking tactics involve specific reading styles and strategies. However, there is not sufficient literature about the relationships between information-seeking and reading.

2.2 Academic Reading

Reading is broadly defined as the process of constructing meaning from a text (Barrett, 2005; Coiro, 2007). This process involves a series of cognitive reading strategies to effectively locate, comprehend, synthesize, and communicate information (Barrett, 2005). The literature identifies two main reading styles, deep and surface, which are characterised by certain processes and expressed through particular reading strategies (Holschuh, 2000; Hubbard & Simpson, 2003; Roberts & Roberts, 2008).

Reading strategies are defined as deliberate actions or behaviours readers engage in when comprehending what was read (Hubbard & Simpson, 2003; Liu, 2010). Reading strategies help readers select, organise, connect, and evaluate information. They largely depend on information-seeking goals, user beliefs, attitudes, and tasks (Coiro, 2007; Roberts & Roberts, 2008; Chan Lin, 2013; Hock & Mellard, 2011; White, Chen & Forsyth, 2010). Reading was also found to be influenced by text difficulty (Bilal, 2013) as well as individual and cultural differences (Rayner et al., 2009).

Deep reading, also referred to as ‘reading to learn’ and ‘careful reading,’ is reading with the goal of long-term retention of the material and for comprehension at a level that can be ‘perspective-transforming’ (Roberts & Roberts, 2008). For example, a student who is engaged in deep reading will seek to connect readings beyond the need to prepare for a quiz, will try to relate it to other information or apply gained knowledge at a later date (Adler et al., 1998). The process of deep reading is rooted in semantic memory or the process of connecting new information--facts, ideas, concepts, or perspectives--to previous knowledge (Roberts & Roberts, 2008). Specific strategies associated with deep reading usually include:

- Taking notes on main ideas (Holschuh, 2000; Hubbard & Simpson, 2003).
- Connecting text to previous knowledge, personal experiences, or emotions (Holschuh, 2000; Roberts & Roberts, 2008).
- Highlighting or annotating key information (Holschuh, 2000; Hubbard & Simpson, 2003).
- Asking or predicting questions while reading (Holschuh, 2000; Hubbard & Simpson, 2003).

These strategies help integrate information meaningfully, eliminate compartmentalised knowledge, facilitate long-term learning and retention (Holschuh, 2000), develop critical thinking skills, and effectively engage a reader (Roberts & Roberts, 2008). Previous researchers linked deep reading to print media that supports navigation, creates a sense of control, and provides tactile experiences better than digital media (Noyes & Garland, 2003).

Surface reading seeks task-completion over retention or comprehension (Holschuh, 2000). The process of surface reading often takes the form of rapid reading, requires minimal effort, and relies heavily on memorisation and rote learning. Some researchers further divide surface reading into three sub-categories: skimming, scanning, and browsing (Adler et al., 1998; Liu, 2010). Skimming is the most commonly cited form of surface reading; it is defined as reading in order to gain a grasp of the content’s essence or reading to establish a rough idea of content (Adler et al., 1998; Liu, 2010). Scanning, also referred to as search-reading or reading to answer questions, is defined by the search for a particular piece of information, such as date or definition (Adler et al., 1998; Liu, 2010). Both skimming and scanning are characterised by speed, rapid movement within a text, and the dismissal of irrelevant portions of information (Liu, 2010). Scanning is generally more goal-oriented and task dependent and can range from simple answer selection to complex problem-solving (Adler et al., 1998). Browsing is the least structured type of surface reading. When browsing, the goal or goals are not well defined, movement within a text is random, and large portions of information are skipped over (Adler et al., 1998; Liu, 2010). The following strategies signify surface reading in one or more of its forms:

- Rote memorisation (Holschuh, 2000; Hubbard & Simpson, 2003; Roberts & Roberts, 2008)
- Reading only section headings, titles, key words, definitions, or other emphasised text (Holschuh, 2000; Hubbard & Simpson, 2003; Roberts & Roberts, 2008)
- Reading only summarised material (Holschuh, 2000; Hubbard & Simpson, 2003)
- Skipping unfamiliar words and concepts (Holschuh, 2000)
• Skimming text without focusing on understanding before moving on (Holschuh, 2000; Hubbard & Simpson, 2003)

Surface reading is appropriate for some tasks, such as memorisation of key terms, document selection, or in conjunction with deep reading. However, surface reading does not encourage elaborative thinking and information integration (Holschuh, 2000) and is not appropriate for tasks involving analysis, synthesis, and evaluation of information (Roberts & Roberts, 2008). Previous research often links surface reading strategies to digital texts that are better suited to enable scanning, searching for keywords, and other surface reading strategies (Liu, 2005).

Academic reading takes a range of forms depending on a reader’s purpose (Adler et al., 1998). It is usually associated with a particular task or a goal (Daniel, 2013; Roberts & Roberts, 2008) and is deeply enmeshed with writing and other activities including note-taking, annotation, and form-filling (Adler et al., 1998).

Overall, while we found a number of studies on reading styles and strategies, none of them focused on reading as a stage in an information-seeking process. The presented study aimed to address this gap.

3 Methods
In order to understand the connection between information-seeking and reading, we developed an exploratory study using an online questionnaire as a primary data collection tool. The questionnaire method was chosen in order to collect data from a large number of participants in a short period of time and in a manner that was relatively burdenless for participants (Krathwohl, 2009). Use of an online questionnaire also allowed our participants to describe their information seeking and reading experiences as they unfolded in real time.

The study relied on a convenience sample of 34 students recruited through the mailing list of a master's degree program in library and information science. The data were collected over a period of two months during an academic semester. Students were encouraged to make multiple entries in the questionnaire, resulting in the total of 44 entries (an average of 1.3 survey entry per participant). In a single entry, participants could report multiple academic tasks and associated information-seeking and reading activities, resulting in the total of 126 reported academic tasks.

Prior to developing the questionnaire, we ran an open-ended online survey that was distributed to the same student population to determine the type of academic tasks and information resources they engage with in their academic work. We used the qualitative findings from the initial survey as well as the reviewed above literature on the information-seeking stages and reading styles to develop eighteen questionnaire items around six main research questions:

1. What academic task (e.g., course assignments) do student participants engage in?
2. What information-seeking tactics do participants employ during the initiation/formulation, exploration, and extraction/finishing phases of working on their academic tasks?
3. What surface or deep reading strategies do participants use while engaging in information-seeking?
4. What reading content and media do participants use for their academic task?
5. What is participants’ satisfaction with features that support document-based interactions on the chosen media (e.g., annotation, highlighting, note-taking, printing)?
6. What are the participants’ demographics?

Most of the questionnaire items allowed participants to choose multiple responses. For example, while participants could describe only one academic task at a time, they could choose multiple information-seeking and reading strategies associated with the task. A complete list of the survey items is available in Appendix A.

Since most of the data collected through the questionnaire were nominal, descriptive statistics was used to summarize patterns that emerged from it.

The study was approved by the Institute’s Institutional Review Board (IRB).

4 Results

4.1 Academic tasks
Participants were asked to identify their current academic tasks from a list of eleven options with an option to include additional non-listed tasks. Out of the 126 total academic tasks mentioned by the study participants, the most commonly reported was preparing a research paper (45) followed by short writing...
(35), class reading (26), and preparing a presentation/design project (20). Other tasks received few
mentions and are not reported here.

All highly-reported academic tasks were associated with a more frequent use of electronic media
in comparison to print. Database articles were the most frequently reported sources of information for all
academic tasks. Presentation and design projects were associated with the highest relative frequency of
reading, including the highest number of deep reading tactics (Table 2).

4.2 Information-seeking stages
A total of 127 information-seeking tactics were reported in relation to the four frequently reported
academic tasks mentioned in section 4.1. A large number of information-seeking tactics were associated
with exploration and extraction/finishing stages and included: a) pulling relevant information from a
resource(s) (22); b) identifying and selecting information resources (20); c) browsing or exploring a
resource(s) ‘to see what I find and learn’ (15); d) finishing an assignment (13); e) narrowing or expanding
the scope of the topic (13); and f) synthesising information (13). The least frequently reported tactics
included: figuring out the topic (9); tracking down resources based on footnotes and citations (9);
searching for keywords or finding specific facts (8); monitoring specific resources to keep up-to-date on a
topic (3); and verifying the accuracy of information (2).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Academic task*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Research paper (45)</td>
</tr>
<tr>
<td>Reading</td>
<td>Deep reading</td>
</tr>
<tr>
<td></td>
<td>Surface reading</td>
</tr>
<tr>
<td>Information-seeking stage</td>
<td>Initiation/formulation</td>
</tr>
<tr>
<td></td>
<td>Exploration</td>
</tr>
<tr>
<td></td>
<td>Extraction/finishing</td>
</tr>
<tr>
<td>Source</td>
<td>Articles</td>
</tr>
<tr>
<td></td>
<td>Textbook/monograph</td>
</tr>
<tr>
<td></td>
<td>Blogs/news</td>
</tr>
<tr>
<td></td>
<td>Text-editing software</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Medium</td>
<td>Digital</td>
</tr>
<tr>
<td></td>
<td>Print</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Table 2. Types of reading, information-seeking stage, source and medium associated with academic
tasks

*Number and ratio of each variable per academic task

The frequency of information-seeking tactics varied slightly depending on the type of academic task in
which a participant was engaged. For example, a greater percentage of participants who were writing an
essay or short-writing assignment noted that they were synthesising and finishing the assignment (48%),
compared to those who were writing a lengthier research paper (30%).

Both deep and surface reading strategies were present across all information-seeking stages and
academic tasks (Table 2). Overall, deep reading was reported more frequently than surface reading. Data
suggest that most instances of deep and surface readings occurred during the exploration stage (Table
3).
<table>
<thead>
<tr>
<th>Exploration</th>
<th>Deep</th>
<th>Surface</th>
<th>Deep</th>
<th>Surface</th>
<th>Deep</th>
<th>Surface</th>
<th>Deep</th>
<th>Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30%</td>
<td>19%</td>
<td>34%</td>
<td>11%</td>
<td>21%</td>
<td>23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extraction/finishing</td>
<td>Deep</td>
<td>13%</td>
<td>22%</td>
<td>27%</td>
<td>22%</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9%</td>
<td>19%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Relationship between task, information-seeking stage, and reading strategy

### 4.3 Reading strategies

All 126 reported academic tasks were associated with reading. The majority of reading strategies were connected to digital resources (88) and were associated with deep reading (50).

The three most commonly reported reading strategies included connecting a text to previous readings and knowledge (26), revisiting significant parts of the text (23), and thinking of questions (18). These behaviours frequently co-occurred with other deep reading strategies, such as thinking of questions and predicting upcoming themes/arguments; in four separate instances students indicated co-occurrence of three or more of these behaviours. Deep reading behaviours were associated with highlighting, note-taking and annotating (29), behaviours indicative of deep reading in a mixed media environment.

<table>
<thead>
<tr>
<th></th>
<th>Research paper</th>
<th>Short writing</th>
<th>Presentation/design</th>
<th>Class reading</th>
<th>All tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Deep reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print</td>
<td>16</td>
<td>7</td>
<td>23</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Digital</td>
<td>42</td>
<td>19</td>
<td>31</td>
<td>11</td>
<td>50</td>
</tr>
<tr>
<td>Surface reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print</td>
<td>11</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Digital</td>
<td>31</td>
<td>14</td>
<td>34</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>45</td>
<td>100</td>
<td>35</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4. Relationship between academic task, reading style, and medium

Surface reading strategies, such as skimming (20) and fact-checking (18), were reported in conjunction with deep reading strategies. Only one student reported using a surface reading strategy in isolation in the context of verifying the accuracy of previously found information.

### 4.4 Reading content: source, medium, satisfaction

The most frequently reported information sources used for academic tasks included scholarly journal articles from electronic databases and search engines (71). Textbooks and monographs (4), blogs and news sources (3), and text-editing software (3) were used less frequently (Table 2). More than two-thirds of participants reported using digital media for information-seeking and reading (Table 2).

On average, participants reported higher levels of satisfaction with the features of digital media than print (the average satisfaction score for digital was .50 compared to print score of .34, where dissatisfaction corresponded to -1.00, neutral = 0, and satisfied = 1.00). The most satisfying features of digital media included the ability to work with multiple documents simultaneously and make notes. Some of the least satisfying features associated with digital media were the abilities to share comments and make bookmarks. Some of the most satisfying features of print media were the abilities to make notes in-text and make copies while the least satisfying features included the abilities to search and share a document.

### 5 Discussion and conclusion

Due to the study limitations, such as use of a convenience sample of library and information science students, some findings can be attributed to the sample’s demographics and academic demands. For example, the findings pertaining to the types and frequency of academic tasks or information-seeking stages could not be generalizable beyond the study sample. While our findings pertaining to the reading styles and media could also be influenced by the sample’s demographics, they are supported by prior research and have broader implications.

The findings suggest that at all stages of information-seeking for all academic tasks, graduate students were engaged in both deep and surface reading using both print and electronic resources. No particular information-seeking stage or an academic task was characterised by exclusive use of print or
digital resources. The fact that students are using various types of information resources to satisfy their academic needs is supported in prior literature (Liu, 2006) and suggests that it might be premature for academic libraries to part with their print collections (Kacherki & Thombre, 2010).

Our findings also indicate that students used a combination of deep and surface reading strategies while working on their academic projects, suggesting that all academic tasks require various degrees of deep and surface reading. Overall, participants reported more instances of deep reading, which could be attributed to the characteristics of the sample (e.g., graduate students may be more engaged with reading material than undergraduates), or could generally characterise academic reading (compared to recreational reading, for example).

Variations in the distribution of reading strategies across academic tasks and information-seeking stages suggest an additional dimension—reading—that can be incorporated into existing information-seeking models (Table 1). Following previous work, we propose a model (Figure 3) that reiterates aspects of the high-level information-seeking models where task determines information-seeking stages and information-seeking tactics which, in turn, influence the choice of information content and media used for the task (Wilson, 1999). If information-seeking involves textual information, reading becomes an integral part of the process (Figure 3). Our study identified unique reading patterns associated with different information-seeking stages and tasks, but the study data were insufficient to run statistical tests to confirm causal relationships between academic task types, information-seeking stages, reading styles and information resources. Future work will examine whether specific deep or surface reading styles and corresponding reading strategies (e.g., skimming, predicting) depend on information-seeking stage and tactic (e.g., figuring out topic) as well as the available and/or chosen information resource, and, in turn, influence subsequent information-seeking tactics and information resource selection. For example, our study found that exploration stage was associated with both deep and surface reading, but at this stage reading styles varied by the type of project the student was working on. Future work will examine whether academic task, particular information seeking tactic (e.g. monitoring), and/or a type of an information resource have the strongest influence on reading styles. We also plan to examine the extent to which reading styles influence information-seeking tactics and information resource selection. For example, deep reading associated with the exploration stage might result in increased uncertainty that warrants return to the initiation stage, while surface reading might result in a satisfaction of an information need and lead to the next stage of extraction/finishing. We also want to expand the model by incorporating information seekers’ cognitive and emotional states and other characteristics that might affect their reading. For example, it would be interesting to examine whether a tired student be less likely to engage in deep reading, even when his academic task calls for it, or whether an unhappy student be more likely to engage into deep reading to gain more information and change her present state. Future plans also include testing the model by investigating information-seeking and reading behaviours of students in different countries and academic disciplines.

While there is not sufficient evidence in prior studies to support the link between the type of reading and information-seeking stage, there is extensive literature on the relationships between reading and the type of information resource and the reading medium. Previous literature suggests that readers often apply surface reading strategies (e.g., browsing, scanning, and searching for keywords) while interacting with digital texts (Liu, 2005). Digital media features, such as limited navigation, sense of control, and tactile experiences, were also found to negatively affect comprehension, learning, and reader satisfaction (Noyes & Garland, 2003) and might be undesirable for the tasks requiring deep reading. In light of these findings, it is somewhat surprising that our participants reported high frequencies of deep reading associated with digital resources and media. Furthermore, our participants were usually satisfied with using digital resources for deep reading. These findings suggest that LIS students use digital resources more frequently than print resources due to the convenience, availability, and other features of digital resources (Catalano, 2013; Lopatovska et al., 2014). Increased comfort and even satisfaction with using digital text for academic tasks, compared to the earlier studies, might also be explained by the technological advancements made over the last ten years (e.g., higher DPI, glare control, availability of PDF readers that save annotations, browsers that reformat text to make it more ‘book-like’, etc.). Lastly, increased acceptance of digital resources might signal an adjustment of student attitudes and work habits toward digital resources (Jabr, 2013) and an increased comfort with digital texts for ‘careful’ reading and long-term learning (Holschuh, 2000).
Information-seeking is a complex process that involves multiple behavioural, cognitive and emotional dimensions. Very often, researchers focus on the stage of acquiring information and pay less attention to how this information is processed and used. Our study took a step toward advancing our understanding of an important link between academic tasks, information-seeking actions, reading strategies and associated sentiment. Such understanding can help a) students in choosing the right reading resources for their academic tasks; b) educators in assigning appropriate materials for course projects; c) libraries in providing appropriate resources to their readers, and d) information retrieval system designers in offering useful features for different reading needs and styles. While our study focused on the the influences of the information-seeking process and resources on reading, it is also important to extend this research and examine the impact of reading on task completion and learning. Future work needs to validate students’ adoption of and satisfaction with digital texts in their academic pursuits as well as examine the effect of reading media on information retention and learning outcomes.

6 References


Appendix A. Copy of an online structured diary

1. In the past 24 hours, I spent most of my time working on the following course assignment [please choose one]:
   - Reading for class (from textbook or other assigned material)
   - Research paper
   - Essay or other short writing assignment
   - Brief report
   - Test prep
   - Presentation
   - Lab report
   - Creative writing
   - Problem sets
   - Design project
   - Studio project
   - Other (please specify)

2. For this course assignment, I am currently [check all that apply]:
   - Figuring out the topic
   - Narrowing or expanding the scope of the topic
   - Identifying and selecting information resources
   - Searching for keywords or finding specific facts
   - Browsing or exploring a resource(s) to see what I find and learn
   - Monitoring specific resources to keep up-to-date on a topic
   - Tracking down resources based on footnotes and citations
   - Pulling relevant information from a resource(s)
   - Verifying the accuracy of information
   - Synthesising information
   - Finishing the assignment (e.g., presentation, paper, project, etc.)
   - Other (please specify)

3. Is it an individual or group assignment?
   - Individual
   - Group

4. For this assignment, I have been primarily using [choose one]:
   - Textbook
   - Monograph
- Scholarly journal articles
- Newspaper articles
- Search engine
- Library database
- Social media
- Blog posts
- Personal notes
- MS Office or other text-editing software
- Other (please specify)

5. When I access the resource chosen above, I primarily use:

- Print
- Digital

6. When I read this material, I [please check all that apply]:

- Connect this text to previous readings and knowledge
- Predict upcoming themes/arguments
- Think of questions
- Quickly skim all of the material at once
- Re-read to memorise information or definitions
- Look for specific facts, such as dates or names
- Revisit significant parts of the text
- Read continuously without revisiting previous text
- Read only section headings, titles, summaries and emphasised text
- Skip large portions of the text
- Skip over unfamiliar words
- Other (please specify)

7. If you use the following features when working with this material, please indicate your level of satisfaction [please check all that apply]:

<table>
<thead>
<tr>
<th>Annotate</th>
<th>Satisfied</th>
<th>Neutral</th>
<th>Dissatisfied</th>
<th>Don't use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annotate Satisfied</td>
<td>Annotate Neutral</td>
<td>Annotate Dissatisfied</td>
<td>Annotate Don't use</td>
<td></td>
</tr>
<tr>
<td>Feature</td>
<td>Satisfied</td>
<td>Neutral</td>
<td>Dissatisfied</td>
<td>Don't use</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------</td>
<td>---------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Bookmark</strong></td>
<td>bookmark</td>
<td>bookmark neutral</td>
<td>bookmark dissatisfied</td>
<td>bookmark don't use</td>
</tr>
<tr>
<td><strong>Highlight</strong></td>
<td>highlight satisfied</td>
<td>highlight neutral</td>
<td>highlight dissatisfied</td>
<td>highlight don't use</td>
</tr>
<tr>
<td><strong>Take notes</strong></td>
<td>take notes satisfied</td>
<td>take notes neutral</td>
<td>take notes dissatisfied</td>
<td>take notes don't use</td>
</tr>
<tr>
<td><strong>Share documents</strong></td>
<td>share documents satisfied</td>
<td>share documents neutral</td>
<td>share documents dissatisfied</td>
<td>share documents don't use</td>
</tr>
<tr>
<td><strong>Share comments</strong></td>
<td>share comments satisfied</td>
<td>share comments neutral</td>
<td>share comments dissatisfied</td>
<td>share comments don't use</td>
</tr>
<tr>
<td><strong>View other people's annotations/comments</strong></td>
<td>view other people's annotations/comments satisfied</td>
<td>view other people's annotations/comments neutral</td>
<td>view other people's annotations/comments dissatisfied</td>
<td>view other people's annotations/comments don't use</td>
</tr>
<tr>
<td><strong>Examine multiple documents at a time</strong></td>
<td>examine multiple documents at a time satisfied</td>
<td>examine multiple documents at a time neutral</td>
<td>examine multiple documents at a time dissatisfied</td>
<td>examine multiple documents at a time don't use</td>
</tr>
<tr>
<td><strong>Use interactive features</strong></td>
<td>use interactive features satisfied</td>
<td>use interactive features neutral</td>
<td>use interactive features dissatisfied</td>
<td>use interactive features don't use</td>
</tr>
<tr>
<td><strong>Make copies or duplicate files</strong></td>
<td>make copies or duplicate files satisfied</td>
<td>make copies or duplicate files neutral</td>
<td>make copies or duplicate files dissatisfied</td>
<td>make copies or duplicate files don't use</td>
</tr>
<tr>
<td><strong>Print</strong></td>
<td>print satisfied</td>
<td>print neutral</td>
<td>print dissatisfied</td>
<td>print don't use</td>
</tr>
<tr>
<td><strong>Search text</strong></td>
<td>search text satisfied</td>
<td>search text neutral</td>
<td>search text dissatisfied</td>
<td>search text don't use</td>
</tr>
</tbody>
</table>

**Other (please specify)**

8. How often do you download (or use) e-books from your academic library?

- More than 5 times/semester
- Less than 5 times/semester
- Never
9. I usually learn about availability of e-books in my academic library collection through the following [choose all that apply]:
   - Professor
   - Librarian
   - Classmates
   - Catalogue search
   - Library website
   - Other (please specify)

10. Are you satisfied with your library’s provision of e-books?
   - Satisfied
   - Neutral
   - Dissatisfied
   - Do not use

11. Is there anything that you would like to share regarding the provision of electronic materials by your school’s library?

12. Which of the following devices do you own and/or use for academic reading [please check all that apply]:

<table>
<thead>
<tr>
<th>Device</th>
<th>Own</th>
<th>Do not Own</th>
<th>Use for academic reading</th>
<th>Do not use for academic reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laptop</td>
<td>Laptop Own</td>
<td>Laptop Do not Own</td>
<td>Laptop Use for academic reading</td>
<td>Laptop Do not use for academic reading</td>
</tr>
<tr>
<td>Desktop</td>
<td>Desktop Own</td>
<td>Desktop Do not Own</td>
<td>Desktop Use for academic reading</td>
<td>Desktop Do not use for academic reading</td>
</tr>
<tr>
<td>E-reader</td>
<td>E-reader Own</td>
<td>E-reader Do not Own</td>
<td>E-reader Use for academic reading</td>
<td>E-reader Do not use for academic reading</td>
</tr>
<tr>
<td>Tablet</td>
<td>Tablet Own</td>
<td>Tablet Do not Own</td>
<td>Tablet Use for academic reading</td>
<td>Tablet Do not use for academic reading</td>
</tr>
<tr>
<td>Mobile phone</td>
<td>Mobile phone Own</td>
<td>Mobile phone Do</td>
<td>Mobile phone Use</td>
<td>Mobile phone Do</td>
</tr>
</tbody>
</table>
13. How much time do you spend commuting to campus?

- Less than thirty minutes
- Up to one hour
- Up to two hours
- Three hours or more

14. Do you work on course assignments during your commute/on the go?

- Never
- Sometimes
- Often

15. Academic major/discipline:

16. Please select an academic year/rank:

- Freshman
- Sophomore
- Junior
- Senior
- Master’s Candidate
- Doctoral Candidate
- Other (please specify)

17. Please select a gender:

- Female
- Male