

## **New Reading Environment:**

Online reading and sharing from the perspectives of reader as writer and writer as reader

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### **INTRODUCTION**

Scholars spend a large percentage of their time reading. While reading, they do background reading (textbooks), comprehensive reading (everything possible), continual reading (simultaneous and associative), and they "read around" a period or a person. Furthermore, scholars read books and related primary material closely—"for detail" and to become "immersed" in their area of inquiry (Brockman, Neumann, Palmer, & Tidline, 2001).

Reading and writing are "inextricably intertwined" (O'Hara, Smith, Newman, & Sellen, 1998). For example, annotating and highlighting while reading is a common activity in the printed environment (Olsen, 1994). When users are working with documents, the most frequent activities are reading and annotating (Blandford, Stelmaszewska, & Bryan-Kinns, 2001). As the new electronic books, articles, research reports are accessible to readers, the new electronic format of scholarly knowledge is redefining scholars' reading, writing, and thinking altogether.

Furthermore, in the digital environment the role of annotation may easily be assigned via system features to affect the annotation process. Annotations may start primarily as personal records of reading and interpretation, and later become a means of transmitting and sharing ideas in order to improve collaborative work practices so that they serve as shared records of work and opinion within specific communities or the larger public (Constantopoulos, Doerr, Theodoridou, & Tzobanakis, 2004; Agosti & Ferro, 2005a).

### **ONLINE READING AND WRITING**

In the early stage of literature research, scholars may read many resources, either in part or as a whole, from authors' personal websites, to institutional or publishers' websites. In addition, while reading they may start to search keywords or names, and to find all links to the related texts (whether articles, books, or transcripts from a video) by "googling" through the Internet (Calise & De Rosa, 2008). Their online reading behaviour includes viewing and scanning, keyword spotting, one-time reading, non-linear reading, and reading more selectively (Liu, 2005; Rowlands, Nicholas, Jamali, & Huntington, 2007; Nicholas, Huntington, Jamali, Rowlands, & Fieldhouse, 2008a, 2008b).

The digital contents can be opened up in a way that is conducive to the characteristic bouncing and power browsing form of information seeking behavior much favored by the digital consumer (Nicholas et al., 2008b). Nicholas, et al. (2008a) pointed out that paragraphs and sentences are now the unit of consumption—something which will appeal to the readers in digital environment, especially students, who prefer bite size

chunks of information. A major survey of scholarly e-book usage and perceptions conducted in the United Kingdom (Nicholas, et al., 2008c) showed that online reading is still preferred by a majority of users (across ages from 17 to 65+), though the number is less with the relative decline in online reading with age. Furthermore, in the survey, it is also found that most academics dip in and out of several chapters when they read online.

Brush, Barger, Gupta, and Cadiz (2001) pointed out that the computer industry now realizes that the majority of people read and annotate daily, but do not create new documents. The most common activity is not writing new documents but reading, followed closely by annotating, then collaborating, and finally authoring. Marshall (1998) pointed out that the functions of annotations, in their many forms, frequently bridge reading and writing, and she regarded annotation as a multi-faceted event with various characteristics.

Some research showed that annotation on paper is smoothly integrated with reading, since writers do not have to swap to a different tool to make statements about the content, whereas online annotation is distracting (O'Hara & Sellen, 1997); however, later research by Schraefel, Zhu, Modjeska, Wigdor, and Zhao (2002) demonstrated that annotating the document in situ does not interrupt the flow of reading, minimizing "forced divided attention." Other research (Miles, 2004) indicated that annotations are always situated within or beside the text, and stand out visually in a document, allowing readers to easily scan for them. In addition, annotations aid understanding, memorization, and later retrieval (Schilit, Golovchinsky, & Price, 1998), and help readers make documents "their own" (Golovchinsky, Price, & Schilit, 1999).

## **ACTIVE READING**

Active Reading is the combination of reading with critical thinking. Past studies (Adler & van Doren, 1972; Olsen, 1994) indicated that active reading is not only reading *per se*, but also underlining, highlighting and scribbling comments. For example, Chi, Gumbrecht, and Hong (2007) found that the eye trace depicts a sequential reading behavior when reading a clean copy, i.e. in general reading people tend to read linearly. On the other hand, when reading highlighted text, empirical studies showed that people tend to be attracted to read the highlighted area. Chi, Hong, Gumbrecht, and Card (2005) introduced conceptual highlighting, where both keywords and sentences that are conceptually related to a set of search keywords are highlighted, to indicate possible areas for the user to pay attention. Based on the theory of information scent to direct users to the most relevant regions on the page, Chi et al. (2007) developed the ScentHighlights to provide a technique that not only highlights keywords, but also highlights sentences if they contain conceptual keywords that are highly relevant to the topics expressed by search keywords. For the purpose of skimming, the ScentHighlights technique provides a way to automatically highlight potentially relevant sentences and passages in electronic text using conceptual modeling.

Recent research has shown that active reading is highly goal-oriented (Kopak & Chiang, 2009; Wolfe, 2000; Marshall, Price, Golovchinsky, & Schilit, 1999; Marshall & Brush, 2004), gives rise to a "critical engagement", and also involves chaining, chasing, and finding related material (Schilit et al., 1998). Critical engagement is understood in this context as the interplay between information as encountered and the analysis and use

of that information (Kopak & Chiang, 2009, p. 115). Typically, critical engagement involves aspects of meaning making and comprehension and can be signified by recognition of nuance in information presented, the ability to draw important distinctions between competing perspectives and positions, and the ability to examine and interpret evidence, cause and effect, and so on (Monroe, 2003; Salvo, 2002).

Active reading recently re-emerged in HCI studies of reading devices and interfaces. Active reading in most cases (Schilit et al., 1998; Kopak & Chiang, 2009) is the key concept justifying the integration of reader's tools in screen-based reading interfaces designed for scholars. While some of these devices and interfaces eventually proved unsuccessful, the researchers nevertheless succeeded in building on Adler's work (1940) by refining and augmenting the concept of active reading. An ideal online scholarly reading and social environment is anticipated to give readers an environment and tools with which to promote their academic reputation, manage their research and transform reading into knowledge; and allows for relationships between readers, researchers, authors and even editorial staff to be identified and nourished via linking and especially the linking of annotations with comments etc. (Kopak and Chiang, 2008; Siemens, Leitch, Blake, Armstrong, & Willinsky, 2009).

In this paper it is recognized that reading is a complex process and that readers may be fully engaged and intellectually "active" when they are not making physical notations as well as disengaged when they are making notations. For the purpose of this paper, however, the use of the phrase "active reading" will refer to reading that is accompanied by observable activity in the form of annotation.

Annotation takes up to 48% of a reader's writing during a reading session (Adler, Gujar, Harrison, O'Hara, & Sellen, 1998). Past studies showed that note-taking is an integral part of reading. Taking notes can benefit learning by the integration of further context with the original context (Glover, Xu, & Hardaker, 2007). When the reader adds annotations, he/she becomes a writer (Desmontils, 2004). Annotations enable the writer to build his/her document (connecting parts, moving information, ...). Scholars produce extensive marginal notes, annotating photocopies or personal copies or attaching adhesive notes to a text. Each scholar has his or her own way of integrating handwriting and computer work. Most scholars use word processing programs to some degree for digesting or transcribing notes and for sketching out preliminary ideas in conjunction with reading (Brockmann et al, 2001).

## **OJS READING TOOLS**

An important initiative within OJS is the development of a set of Reading Tools with the purpose of enhancing the online reading experience and improving the level of critical engagement with the content of the journal articles published within the system. Furthermore, critical engagement is viewed as a product of an "active reading" strategy that, in its ideal form, integrates the critical, interpretive, and creative aspects of information use. Stated differently, active reading "is the combination of reading with critical thinking and learning, and is a fundamental part of education and knowledge work" (Schilit et al., 1998).

In 2006, the PKP project carried out a comparison study to explore the reading tools supported in seven major journal hosting sites including OJS. In 2009, we revisited the sites and noticed that there are some new the features in addition to the 2006 findings.

Figure 1 shows the results of comparing the features supported across those seven major journal hosting sites. Axis Y shows the frequency of the features found across 7 journal sites' reading tools; the items on axis X are the features identified and their grouped categories. The grouped categories indicate what kind of functions may support reading an article online. The first thing one would notice is that, among the "Viewing Options of This Article", it is common to support Abstract and PDF format. Few sites support very specific content such as Figures Only or Tutorial Materials, as well as Pre-publication History for viewing article versions.

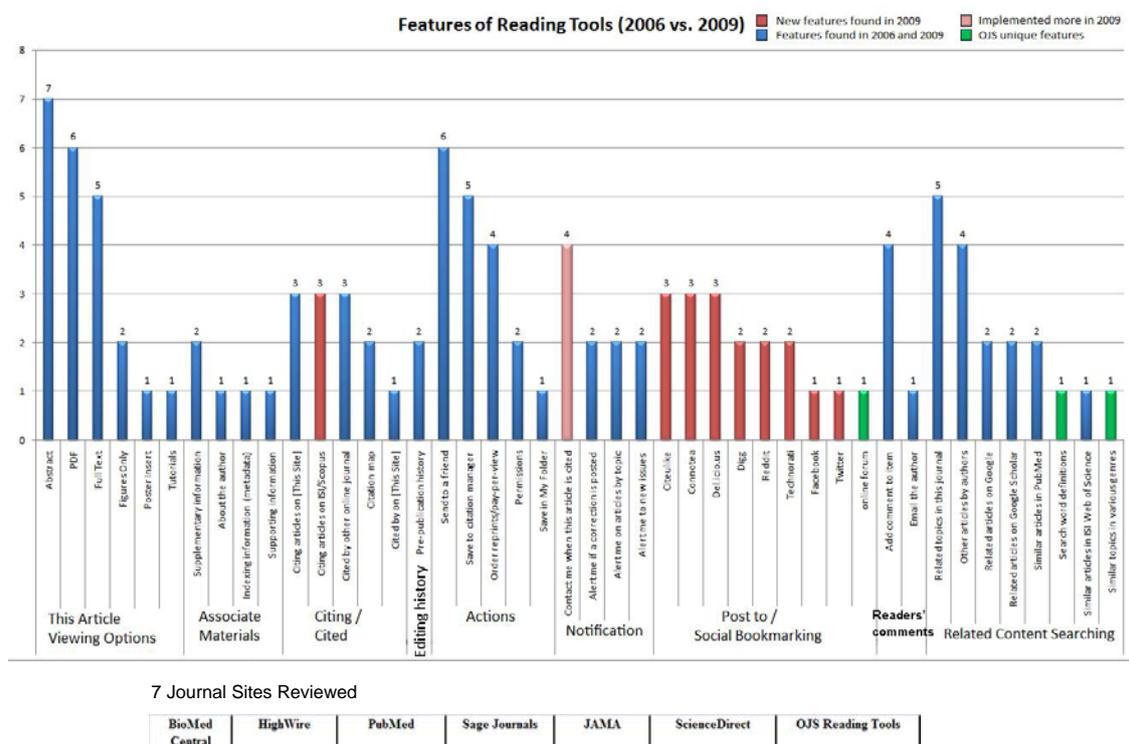


Figure 1 Comparison of the features of reading tools provided by major journal sites

Web 2.0 technologies have enabled sophisticated methods of annotation and content sharing by users. The technology allows to incorporate user-supplied content, pre-filter the content to ensure relevance, and supply Just-In-Time-Information-Retrieval awareness tools for information interaction.

## ANNOTATING ONLINE – READING, WRITING, and SHARING

In 2008, a proposal for OJS/OMP<sup>1</sup> annotation system was drafted, 22+ annotation tools were reviewed. Various annotation forms and features were identified in the review. As a result, the forms and features were transformed into the Design Categories and Attributes and the Recommendations for Design. In Figure 2, the frequency of Y axis indicates that the number of features found across those 22 annotation tools, and the X axis shows the forms and their grouped features: Highlight, Linking, Note-making, Social Component, Combine Other Tools, and Workspace. However, the evidence showed some forms do not reflect user-centric design as we found in our user studies.

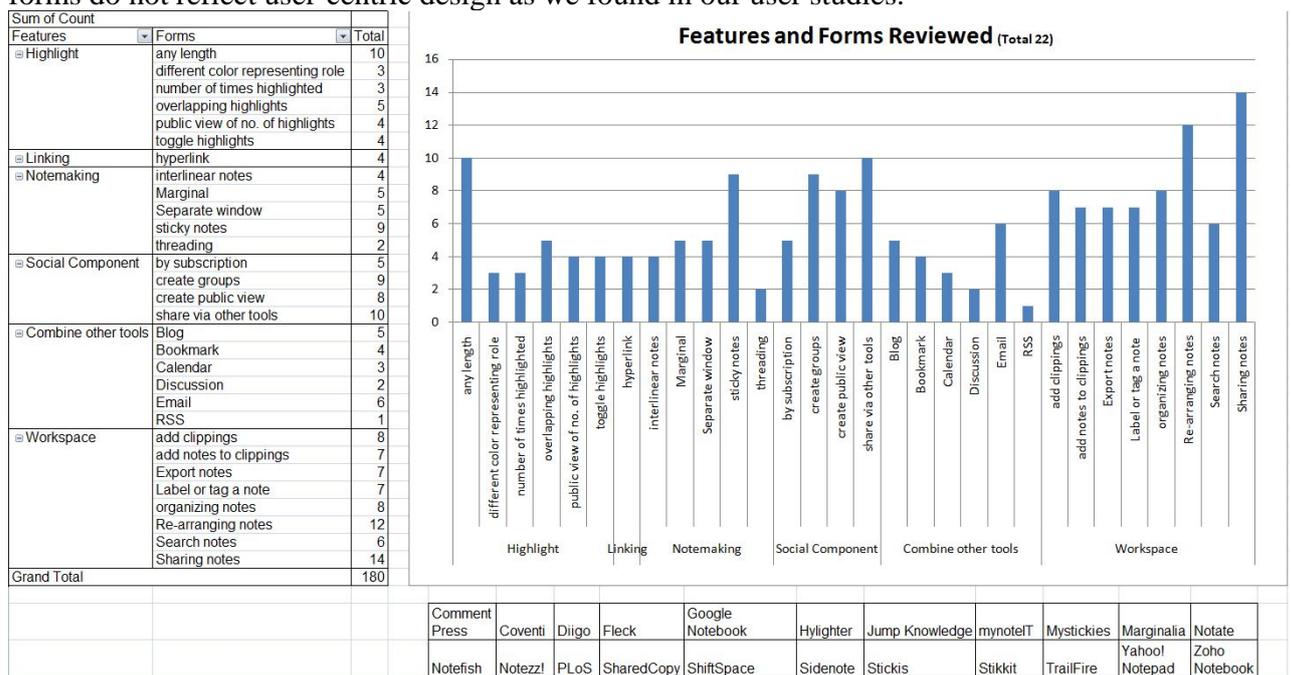


Figure 2 Comparison of 22 Annotation Tools -- annotation features and forms reviewed

For example, Highlight and Note-making are common features in online annotation tools. For some tools Highlighting Any Length still has room for improvements. Few tools support Toggle Highlights, which is a highly preferred function in our user studies. The visual presentation of aggregation such as the number of highlights (private or public) and overlapping highlights are poorly supported. The multi-color highlighting is supported for differentiating roles (their, our, mine), but not for topical themes as this is a practice in religious studies.

Workspace is highly preferred in Chiang's user studies (2010). While reading, people would like to be able to clip, add notes to clip, label notes, organize note, re-arrange notes, search notes, export notes, and share notes. Some tools support these expectations, but still have room for improvements.

<sup>1</sup> PKP has developed free, open source software for the management, publishing, and indexing of journals and conferences. Open Journal Systems (OJS) and Open Monograph Press (OMP) increase access to knowledge, improve management, and reduce publishing costs. <http://pkp.sfu.ca/> Accessed Oct. 4, 2011.

Social components are enabled by the reader's invitations to create groups or public view, but there are a few tools which use other tools for sharing annotations. Other tools combined with the annotation systems include Blog, bookmarking, calendar, discussion, email, and RSS to share with others. With a social annotation support mechanism, shared annotations might help communities locate points of consensus or controversy (Wolfe & Neuwirth, 2001). However, computer aggregation mechanism is not found in these tools reviewed, the mechanism such as Social Navigation Support technique is only found in some research-purposed annotation tools (Dourish & Chalmers, 1994; Wexelblat & Mayes, 1999; Kurhila, Miettinen, Nokelainen, & Tirri, 2002).

From the review of existing annotation tools, Chiang (2010) found that people create annotations online for communication (annotation role). The role indicates the intended audience (private, work group, and larger public) for the annotation, and provides an opportunity to investigate the functions of annotation in its social setting. For example, multiple color highlighting is commonly applied to different topical schemes for personal annotation, but is used to differentiate the ownership of annotations when sharing. Because of the potential of sharing annotations with others, the reasons people consider annotations for personal use include personal interest, potential confusion to readers, uncertainty about interpretation, and the need to update notes before sharing. Some annotations are created for an intended audience indicating a communication dimension of online annotation functions. For sharing annotations with others, people consider the annotations should be an appropriate interpretation, helpful to others, they would like to know other's reflection, annotations are useful to a task, or there is a designated audience to share with. The dilemma is, on the one hand people want to see others' annotations, especially annotations from those considered as "experts" (e.g., teachers, famous authors, etc.); on the other hand, people tend not to share annotations that are not clear or not helpful to others. There appears to be evidence that annotation functions and forms not only vary by role, but also have different characteristics in sharing.

## **ANNOTATION ONLINE – READER AS WRITER vs. WRITER AS READER**

Bizzell (1982, cited in Amitay, 2001, p.38) found that when people write, they employ not only their knowledge about the medium and its audience, but also their experience as online reader. While reading a document, the reader is scribbling some comments or highlighting a group of words, which helps the reader to build his document perception, his mental representation of its content. In a shared environment, the reader needs to have the control of choosing among annotation writers and a visual cue of the distinctions of annotation when comparing annotations.

Bringay, Barry, and Charlet (2004) discussed how the annotations facilitate annotation writers' reading and carry further interpretations of documents. Annotation writers use the annotations to incorporate their knowledge as they process the information contained in the document. According to Bringay et al., annotations used to facilitate reading allow the addition of information relative to the annotation writer's original point of view on the document. The reader becomes the writer.

Bringay et al. (2004) pointed out that the reader uses annotation to appropriate the document, and to rewrite it according to the wished use while reading along the text. From this perspective, the reader becomes the author of his reading. Goldman, Saul, and Cote (1995) suggested that while readers could use the conventional paragraph structure to facilitate the reading process, interpretation of the content requires the interaction between the information in the text and the readers' prior knowledge. These findings suggested that people look for familiar patterns in the writing to increase the effectiveness of looking for the important bits of information in the text.

Chiang's study (2010) showed ease of use is constantly an issue to authors when annotating online, and usefulness of annotation is also a major concern to readers. When designing for reading technology, Marshall (1997) suggested annotation should interrupt reading as little as possible. When annotating online the reader and author roles are converged, where the reader becomes an author writing annotations and the author becomes a reader using the annotations at the same time. When the reader-author reads electronic documents, he/she suffers from many difficulties. The reader is often disorientated by too many requests (e.g., buttons, links), which overload his memory. Bringay et al. (2004) reported that after an interruption, critical text information must be reconstructed in order to successfully continue the development of the memory of where the readers are in the text. On the other hand, the reader-author must be able to add knowledge resulting from his inspiration of the moment. The possibility of writing during the reading determines the type of the reading. Collecting, combining, and rewriting modify the strategies used during the reading of the documents.

## **CONCLUDING REMARKS**

An implication of these findings is today's annotation systems still have a long way to mature to become a comprehensive tool to support online writing while reading. Providing Web users with electronic annotation tools has received attention in both academia and industry (Wolfe, 2002; Rau, Chen, & Chin, 2004). However, many annotation tools have been either in prototype form or with smaller scale functions, and as a consequence, users have not become accustomed to seeing annotated information in digital libraries, and have not begun to think of new, creative uses for annotations.

Web annotation tools allow readers to annotate on hypertexts, to organize and present annotations, to build up knowledge structures, to browse annotations previously made by others, to share annotations with other users, and to interact with other users. Hence, the use of online annotations needs to consider the reader-author perspectives, and the acceptance of an annotation tool is also affected by the satisfaction of the reading-writing technology supported. The potential of sharing annotations in a digital environment may cause the users to reflect not only the text but also on the use of the text, as new ways to respond to materials, respond to read, and respond to have their readings shaped by the thoughts of others.

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