

## **An interactive reading environment for online scholarly journals: The Open Journal Systems Reading Tools**

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### **Introduction**

Open Journal Systems (OJS) is the result of a major research and development effort carried out under the auspices of the Public Knowledge Project (PKP) founded in 1998 by John Willinsky. OJS was developed to facilitate greater access to scholarly research by providing an open source platform for the production and distribution of the main coin of the academic research process, the scholarly journal article. As a production system, OJS enables and supports work processes at every stage of the overall publication process: from initial submission to final publication. In support of PKP's central goal of increasing access to public knowledge, OJS is freely available, is locally installed and controlled, and is available in more than ten languages through the larger efforts of the world-wide OJS community.

From the system user's point of view, OJS supports activities for three primary roles: editors, authors, and readers. OJS management tools are based largely on the workflow found in typical journal publishing environments. Editors can easily set up the system to meet their local requirements and carry out editorial duties efficiently, e.g. accepting and tracking submissions, coordinating peer review, automatic notification of overdue reviews, template based responses for email communications to reviewers and authors. From the point of view of authors, they can upload files directly to the journal's OJS installation, enter metadata for OAI indexing (to enable resource discovery), track the submission process, accept reviews, and resubmit revised copies (Willinsky, 2005).

The third major role that OJS supports is that of the reader of the journal's published articles. As a web-based system delivering both HTML and Portable Document Format versions of articles, OJS provides to the reader all of the convenience and efficiencies of distributed electronic document systems, e.g. anytime/anywhere access, cut and paste, and search. But, carried along with this sense of convenience is the suspicion that once received by the reader at their computers they will still choose to read the article by first printing it out (Schilit, et al., 1999).

In an effort to further engage the reader at the interface, and to improve the overall reading environment, a set of Reading Tools were (and continue to be) developed and integrated into OJS. Building upon the exemplary models offered by Highwire Press, PubMed, and others the goal of the initial stages of tool development was to leverage existing online resources and to provide a functionality that would increase the general level of engagement with the materials "without adding significantly to the journal's cost or the editor's workload" (Willinsky, 2005). More recently, development efforts have focused on creating annotation and linking components as part of the general suite of Reading Tools with the goal of facilitating even more interaction with journal content. This article reviews the development, and specific purposes of the Reading Tools and outlines plans for future development.

## 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. Critical engagement is understood in this context as the interplay between information as encountered and the analysis and use of that information. 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). 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, Golovchinsky, and Price, 1998).

As noted by Schilit, et al. (1998), finding related resources and moving between them is an important aspect of active reading, but “[t]his activity of finding related materials while reading is often disconnected from the main activity. Typical information retrieval interfaces force users to suspend their reading activity to identify and then to retrieve related documents” [p. 251]. A major design focus in the development of Reading Tools is to keep focus on the article while at the same time enabling guided navigation to related materials that elaborate on the context of the article. As such, an attempt has been made to move from simple information retrieval toward information processing and elaboration of context.

## Reading Tool Components

The Reading Tools themselves are represented as a set of grouped links on the right-hand edge of the OJS journal HTML view. Figure 1 shows the Reading Tools in relation to a journal article presented with the default OJS stylesheet.

### *Structural Items*

The Reading Tools are divided into two major components. The first set, immediately under the author’s name in Figure 1, represents access to information and services that are more structural than topical or domain specific. “Abstract”, for example, provides the abstract in a separate window for those cases in which the abstract is not shown as part of the article itself. “Review policy” provides information about the journal’s policies for receiving and reviewing submissions, e.g. whether there is an open submission policy, whether the journal is peer-reviewed, and whether the journal is indexed by a database utility. Readers, for example, may wish to know whether the article is peer reviewed. “How to cite item” enables the export of basic citation data to popular bibliographic management software (e.g. EndNote, ProCite, and Reference Manager) and aids the reader in easily collecting citation data in the early stages of

information seeking. "Indexing metadata", includes fifteen descriptive elements (based on Dublin Core, see Willinsky, 2005, p. 515). This is useful to readers in providing additional information about the article, but also enables effective harvesting, and as a consequence maximizes resource discovery.

**Figure 1. HTML View of Journal Article and Associated Reading Tools**

The screenshot shows a web browser window displaying a journal article. The main content area on the left contains the following text:

Open Journal Systems Demonstration Journal, Vol 1, No 4 (2006)

HOME ABOUT USER HOME SEARCH CURRENT ARCHIVES

Home > Vol 1, No 4 (2006) > **Kopak**

## Functional Link Typing in Hypertext

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**ABSTRACT:** Though a fundamental component of hypertext, little research has been aimed at developing the link's ability to express specific qualities of the relationship that it establishes between nodes of information. A proposal is made for the development of a taxonomy of link types that describe the function (discursive quality) that characterize the formation of links. Furthermore, it is argued that the taxonomy should be empirically derived and not established *a priori*. A number of existing link typologies are reviewed, and it is suggested that there is sufficient breadth in these typologies to provide a test-bed of representative types for use in the empirical investigation.

Categories and Subject Descriptors:

H.5.4 Information Systems, [Information Interfaces and Presentation]

The sidebar on the right contains the following elements:

- OJSDJ Vol 1, No 4 (2006)
- TABLE OF CONTENTS
- Reading Tools
- Functional link t...  
Kopak
- Review policy
- About the author
- How to cite item
- Indexing metadata
- Print version
- Look up terms
- Notify colleague
- Email the author
- RELATED ITEMS
- Author's work
- Book searches
- e-Journals
- Related theory
- Related studies
- Pay-per-view
- Online forums
- Multimedia
- Teaching files
- Relevant portals
- Government policy
- Media reports
- Web search
- SEARCH JOURNAL
- All
- Search

Done

"Supplementary files" include downloadable supporting materials associated with the article such as research instruments and datasets or spreadsheets. "About the author", "Notify colleague", and "Email the author" are mechanisms for connecting readers and authors. As it suggests, "About the author" provides useful information about the author and informs the reader of competencies and areas of specialization. "Notify colleague" provides an email form with the title of the article in the subject line, while "Email the author" provides the same functionality but with the author's email address inserted. "Look up terms" enables the reader

to easily look for definitions of terms within the article itself. The reader can do so by either double-clicking on a term within the article text, or by engaging the link and entering keywords directly into the search table. Once initiated, the reader also has the ability to select from a number of open access dictionaries and encyclopedias in which to search for the definition.

### *Related Items*

The OJS administrative system organizes Reading Tools into 'Disciplines'. Within each discipline the Reading Tools breakdown into 'Related Items', where each related item is associated with specific 'Resources'. Journal managers and editors can create and modify Disciplines, Related items, and the Resources searched according to their requirements. Currently, Reading Tools offer Related Item sets for nineteen different domains, e.g. education, biology, business, economics.

As such, resources are generally *domain specific* and seek to accommodate the information needs of readers within a particular discipline. The categorization of resources is guided to enhance material mastery. Material mastery skills, as defined by Covi (1999) are developed and maintained through information use and reflect differences in disciplinary search strategies, disciplinary materials, and field integration.

Resources may also reflect other important differences that are not necessarily domain specific. For example, the National Library of Australia recently reported on their customization of OJS Reading Tools (Graham, 2007). The Infrastructure Group of the NLA reviewed the standard set of Reading Tools delivered with the OJS software and identified additional resources that focused more specifically on Australian interests.

Primarily, though, Related Items enable discovery of resources in the domain area (discipline) of the journal [1]. Table 1 provides examples of frequently used contexts (Related Item elements) found in many OJS journals. Although the elements are functionally equivalent across various domains, the specific resources that they lead to are domain specific. For example, "Related Studies" provides a functionally equivalent search, i.e. it will search databases, bibliographies etc., for studies related to the current article, but the resources searched are specific to the domain of the journal being used. In education the "Related Studies" context would include a search of the Education Resources Information Center (ERIC), while in a computer science journal it would search, for example, the HCI Bibliography.

Beyond this basic set of Related Items, the editors of journals may choose to add additional contexts to enable direct access to resources that are specific to the topical focus of the journal. For example, OJS provides a Related Item set for astrophysics. Using this set, the editor can add the specific context 'Astro Data' which provides access to data at the UK Astronomy Data Centre, and NASA's High Energy Astrophysics Science Archive Research Center (HEASARC). Editors can also create their own contexts, adding to them relevant resources to be searched.

**Table 1. Reading Tool Related Items and Examples of Context Elements**

Related Items	Description	Examples of Databases Searched
Definitions (Look up Terms)	Look up definitions of terms in the article. Enter terms to be searched by double clicking on term in article or by typing in. These resources have been selected because of their relevance and open accessibility.	<ul style="list-style-type: none"> <li>• Columbia Encyclopedia</li> <li>• Google Definition</li> <li>• Webster Online</li> </ul>
Author's work	Search other articles by the author in related databases.	<ul style="list-style-type: none"> <li>• BBC Learning</li> <li>• High Beam Research</li> <li>• RAND Research</li> </ul>
Government Policy	Search government information from official government sites.	<ul style="list-style-type: none"> <li>• Government of Canada</li> <li>• FirstGov (US)</li> <li>• Directgov (UK)</li> <li>• Europa</li> </ul>
Book	Search whole or partially available books that are freely readable over the Internet.	<ul style="list-style-type: none"> <li>• Google Print</li> <li>• Online Books Page</li> <li>• Books-On-Line</li> <li>• Universal Library</li> </ul>
Book reviews	Search online free book reviews.	<ul style="list-style-type: none"> <li>• H-Net Reviews</li> <li>• New York Review of Books</li> <li>• CM: Canadian Review of Materials</li> <li>• Leonardo Digital Book Reviews</li> </ul>
Dissertations	Search open access dissertations	<ul style="list-style-type: none"> <li>• CRL Foreign Doctoral Dissertation Databases</li> <li>• Dissertation.com</li> <li>• Networked Digital Library of Theses and Dissertations Union Catalog (NDLTD)</li> <li>• Scirus ETD Search</li> </ul>
Online forums	Search online meeting or discussion information	<ul style="list-style-type: none"> <li>• H-Net, Humanities &amp; Social Sciences Online</li> <li>• Liszt</li> <li>• MInd: the Meetings Index</li> </ul>
Quotations	Search open-access quotable quotes	<ul style="list-style-type: none"> <li>• Bartlett's Familiar Quotations</li> <li>• Quotations Page</li> </ul>

Pay-per-view	Search articles or book chapters available on the pay-per-view based service to individual scholars	<ul style="list-style-type: none"> <li>• Ingenta</li> <li>• Ebrary</li> <li>• Questia</li> <li>• Wiley InterScience Pay-per-view Service</li> </ul>
Related studies	Search research information from related resources	<ul style="list-style-type: none"> <li>• BBC Learning</li> <li>• High Beam Research</li> <li>• RAND Research</li> </ul>
Media Reports	Search major news websites or aggregate news websites for accessing news reports worldwide	<ul style="list-style-type: none"> <li>• Google News</li> <li>• Globe and Mail</li> <li>• People's Daily</li> <li>• National Public Radio</li> <li>• New York Times</li> <li>• The Japan Times Online</li> <li>• The Moscow Times</li> <li>• Washington Post</li> <li>• Newsdirectory</li> </ul>
Web search	Broaden searches by using major search engines	<ul style="list-style-type: none"> <li>• Google</li> <li>• Google Scholar</li> <li>• Clusty the Clustering Engine</li> <li>• Vivisimo</li> </ul>

### Annotation and Linking Tools

Annotation has been long recognized as a fundamental component of active reading strategies. Adler (1940), in writing about books, stated that writing in the margins, between lines, and in the back and front covers (a distinct form of annotation) are indispensable to reading. “[R]eading, if it is active, is thinking, and thinking tends to express itself in words, spoken or written. The marked book is usually the thought-through book” [p. 11].

Reading scholarly journal articles is also viewed as a highly directed and interactive activity (Adler et al., 1998; Bishop, 1998; Marshall et al., 1999; Kaplan & Chisik, 2005). Readers actively pursue meaning, carrying on a mental dialogue with the writer. Previous research on the annotation habits of students and professionals demonstrated that the readers’ annotations are also highly goal-oriented (Wolfe, 2000; Marshall et al., 1999; Marshall & Brush, 2004). Research also illustrates the importance of annotations in writing while reading, including discussion of use and form (Marshall & Shipman, 1997; Marshall, 1998), the influence of annotation on readers (O’Hara et al., 1998), and their role in scholarly communication (Furuta & Urbina, 2002).

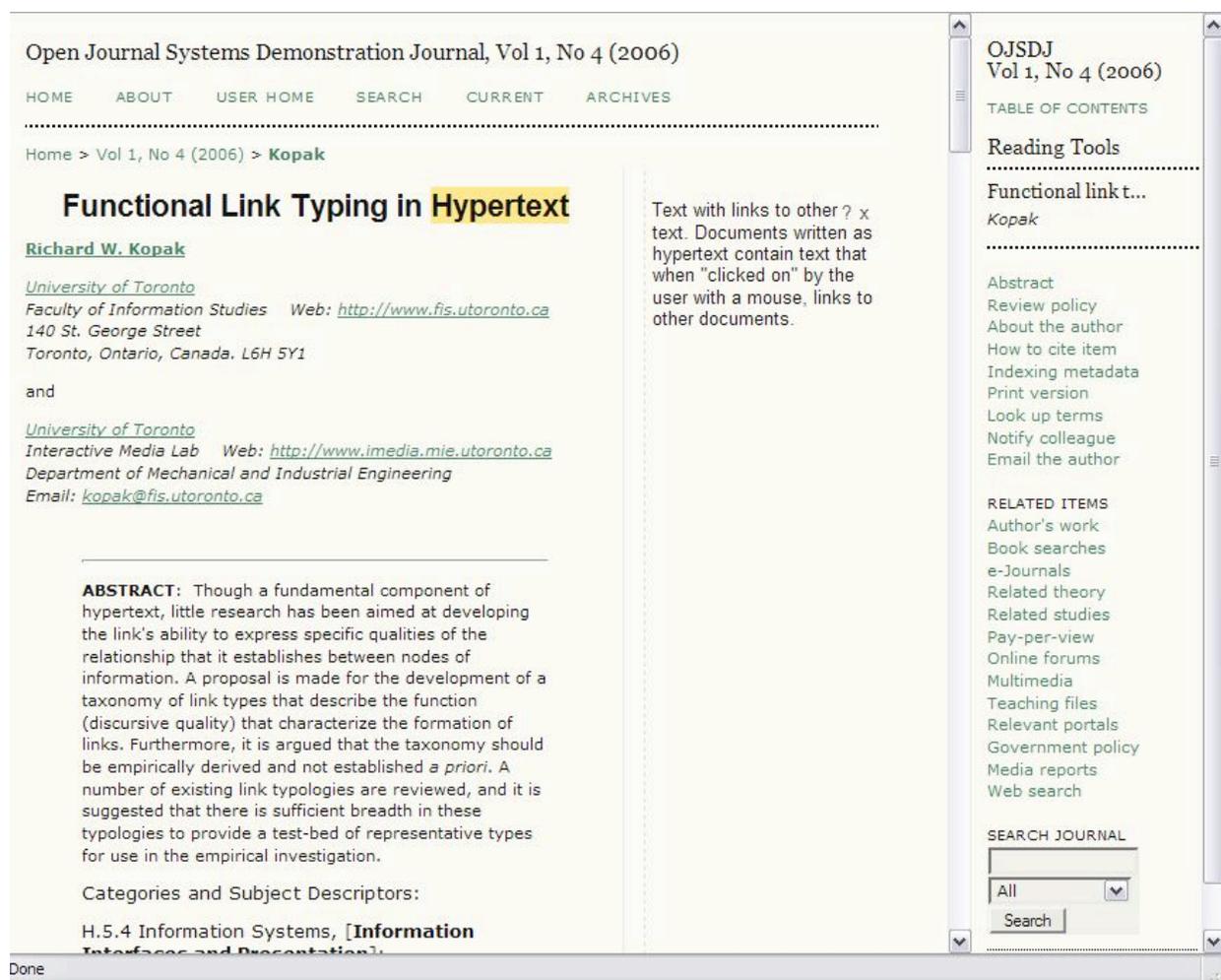
Schilit et al. (1998a) enumerate three specific advantages of the direct annotation of documents that reflect an active reading strategy:

- Convenience: Since annotations are directly integrated with the reading material, writers do not have to swap to a different tool to make statements about the content. Annotating the document in situ does not interrupt the flow of reading.

- Immersion in document context: Annotations contain more information because they occur within the “context” of a document (rather than as isolated information object).
- Visual search: Annotations stand out visually in a document, allowing readers to easily scan for them.

Toward the goal of further enabling an active reading strategy, we have created a prototype annotation and linking tool that is currently being testing with users (Kopak & Chiang, 2007). Figure 2. shows the annotation component in the context of an OJS HTML journal article.

**Figure 2. OJS with Annotation Tool**

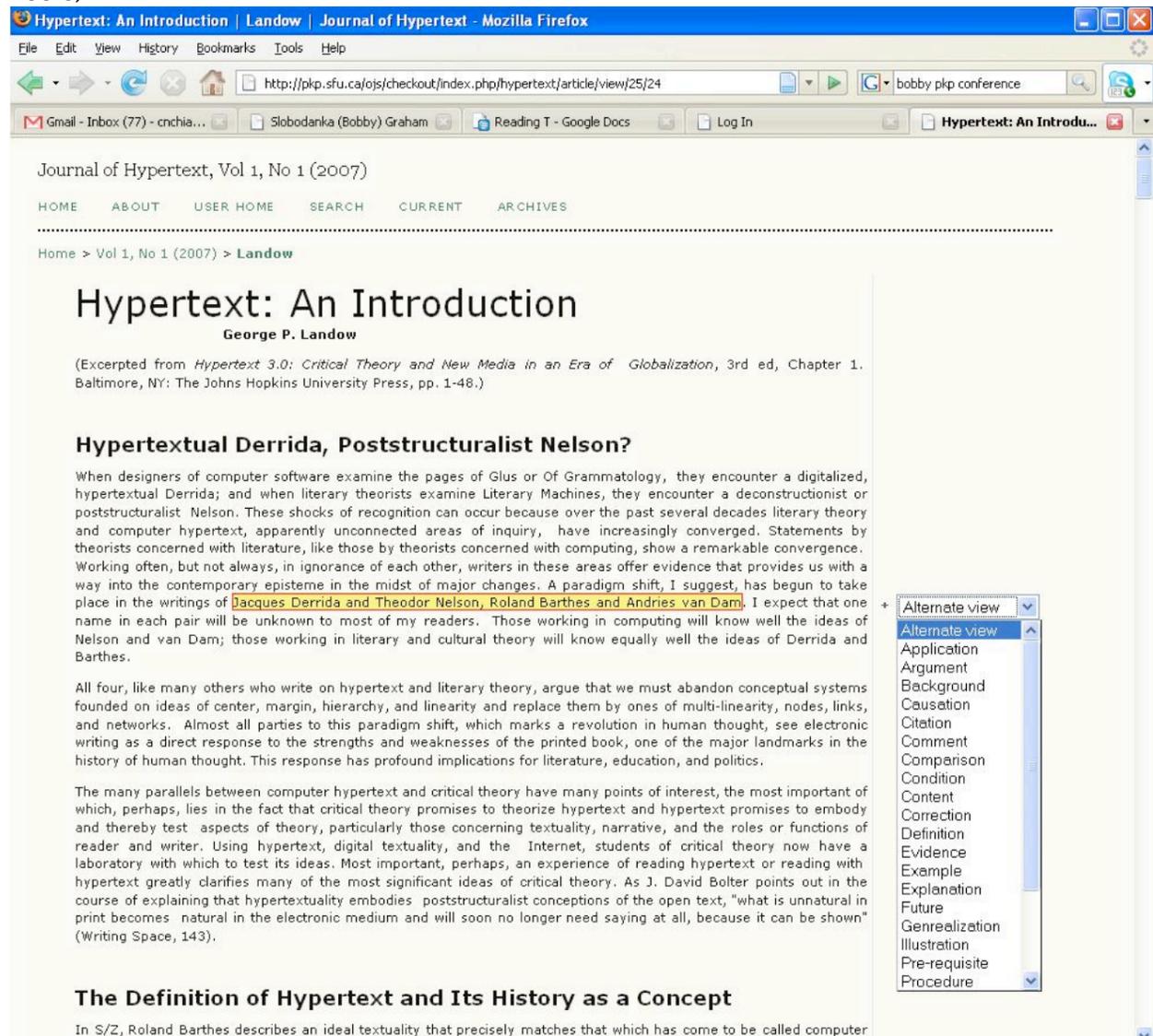


The annotation area is currently represented as marginalia. To create an annotation, the reader highlights the article text that will correspond to the annotation, and clicks on a vertical bar that activates a text box in the margin next to the area to be annotated. The Reader can then enter

free-form text, or cut and paste from other parts of the article, or other sources altogether. For example, a reader may want to look-up a definition of a term in the text using the existing “Look up Terms” facility, cut the desired definition that is returned, and paste the definition into the annotation space.

The linking component builds on previous research (Kopak, 1999; 2000; 2002) in which a set of link types was developed to describe the functional relationship between nodes of information identified within a text, or more importantly, between texts. A link type in this instance is a label that describes the nature of the relationship between the two nodes of information, e.g. ‘illustrates’, ‘defines’, ‘exemplifies’.

**Figure 3. OJS Journal Article with Link Type Pull Down Menu (no additional Reading Tools)**



In the existing prototype, a reader can highlight a word, phrase, sentence, etc. in a given article within an OJS installation and create a hypertext link to a paragraph in another journal article by first locating, then clicking on the corresponding paragraph at the target end of the link. A reader can also annotate the link via the feature described above, or select from the pre-existing set of link types arrayed in a pull-down menu in the annotation margin (see Figure 3).

The goal in developing the linking and typing tools is to instantiate a hypertext component into OJS that would take advantage of linking's ability to provide an additional form of annotation. If one of the functions of annotation is to provide a means to connect a related piece of information to a content segment in context, we can accomplish this as well by linking directly to an existing piece of information rather than creating a new one. Additionally, we sought to enable readers to add value to the link by attributing the functional nature of the relationship between the content segment and the linked item. We did so by enabling the easy application of link types characterizing these kinds of relationships, (i.e. the linked item defined, illustrated, compared, etc. the content segment). Furthermore, the linking tool enables leverage of the functional relationships to increase the level of coherence between text segments of journal articles being read and annotated within the system. Subsequently, readers become authors by creating functionally meaningful relationships between these fragments. Movement through the articles within the system can be recalled and retraced with navigation guided by the purpose and role that associated information has in facilitating comprehension.

### **Future Work**

User testing of the Reading Tools continues (Willinsky, 2004 ; Siemens, et al., 2006) and results are useful and encouraging in suggesting new ways of providing these kinds of resources to readers. PKP has also developed a Web-based XML service enabling easy conversion of submissions into a standard, well-structured layout format. In addition to simplifying work processes, XML offers the potential of an increased ability for readers to interact with journal documents at the interface. For example, a reader could select different views of an article depending on the stage of the information seeking process at which they find themselves, choosing perhaps to only display the abstract, conclusion, and bibliography in the early stages of the research process.

An important area for future development concerns the role of social interaction in an environment like that offered by OJS. The annotation prototype largely enables annotation and linking for personal use. We are currently carrying out a study that investigates the role of social input to content description and navigation via the annotation component. Specifically, the investigation seeks to identify the kinds of annotations that readers would and would not find useful in an environment where one could contribute their annotations (or a selection of them) to a public space.

Future possibilities for the linking component include investigation of the social construction of hypertexts. Interest here lies in the ability to construct navigable planes through an information space represented by a collection of journal articles provided in a system like OJS. Readers, for example, could choose to publish their links resulting from their interactions with a particular

OJS corpus. Commonly identified links would form the basis of a publicly available network of paths.

In every way, future research and development efforts around Reading Tools will continue to support the goal of providing a rich, interactive information environment for readers.

## Endnotes

[1] Choosing good sources is a powerful means of setting readers off in the right direction. It was important, therefore, to choose databases for Related Items searches based on specific criteria. Extant research does set out some criteria for selection of Internet resources (Zhang, 2001). Based on this research, eight essential selection criteria for resource evaluation were used to assess resources for the Reading Tools. Resources had to be easily accessible, of scholarly content, open access, of high credibility, maintain a significant collection size, be sustainable, facilitate material mastery, and provide diversity.

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