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ABSTRACT

This paper reports the findings from a field study of legal research in a first-tier law school and on the resulting redesign of XLibris, a next-generation e-book. The report first characterizes a work setting in which an e-book was expected to be a useful interface for reading and otherwise using a mix of physical and digital library materials, and it explores what kinds of reading-related functionality would bring value to this setting. It describes important aspects of legal research in a heterogeneous information environment, including mobility, reading, annotation, link following and writing practices, and the general implications for design. The paper then discusses how their work with a user community and an evolving e-book prototype allowed them to examine tandem issues of usability and utility, and to redesign an existing e-book user interface to suit the needs of law students. The study moves away from the notion of a stand-alone reading device and toward the concept of a document laptop, a platform that would provide wireless access to information resources, as well as support a fuller spectrum of reading-related activities. (Contains 18 references.) (Author/AEF)

Designing e-Books for Legal Research

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ABSTRACT

In this paper we report the findings from a field study of legal research in a first-tier law school and on the resulting redesign of XLibris, a next-generation e-book. We first characterize a work setting in which we expected an e-book to be a useful interface for reading and otherwise using a mix of physical and digital library materials, and explore what kinds of reading-related functionality would bring value to this setting. We do this by describing important aspects of legal research in a heterogeneous information environment, including mobility, reading, annotation, link following and writing practices, and their general implications for design. We then discuss how our work with a user community and an evolving e-book prototype allowed us to examine tandem issues of usability and utility, and to redesign an existing e-book user interface to suit the needs of law students. The study caused us to move away from the notion of a stand-alone reading device and toward the concept of a document laptop, a platform that would provide wireless access to information resources, as well as support a fuller spectrum of reading-related activities.

Keywords

e-books, information appliances, field study, physical and digital information resources, legal education, legal research, digital libraries.

1 INTRODUCTION

Dynabook, Alan Kay's imagined dynamic electronic medium [9], is often cited as an inspiration for current work on electronic books. Now we have real products (e.g., RCA's REB1100), tablet computers for reading. We wanted to explore the future of such devices as interfaces to today's heterogeneous libraries, and to understand how they could support research activities typical among knowledge workers who use such information resources. We used XLibris [15], analytic reading software running on a pen tablet computer, as an example of an e-book, and legal research as a discipline in which analytic reading software could bring value.

When we began our study, we conceived of ideal e-books as stand-alone reading devices that would be based on a paper document metaphor, would use pen interaction and freeform digital ink, and would support research activities by using readers' annotations as indications of their interests [16]. Indeed, XLibris (shown in Figure 1) was just such a working prototype, a good foil for our investigation of the kinds of "beyond paper" functionality an e-book could bring to bear on legal research.

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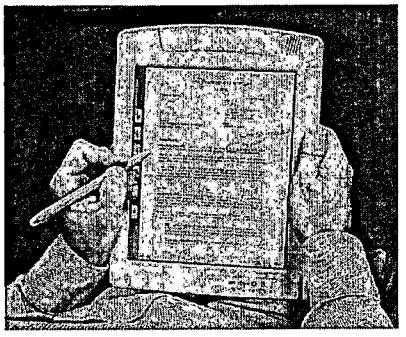

Figure 1. Our prototype e-book at the outset of the study: the XLibris analytic reading software running on a Fujitsu pen tablet computer.

We chose legal education for our study for several reasons. Early discussions with our research colleagues suggested that attorneys read and mark up documents from diverse sources, from physical as well as digital collections [4]. Furthermore, attorneys' reading is purposeful: they use such documents in subsequent work activities, including writing and collaboration [1]. These practices have their roots in legal education.

By studying legal education, we wanted to do more than characterize current practice; we also wanted to evaluate existing designs and to generate new design insights about both the usability and utility of XLibris. What would an e-book for legal research actually do for its users? We started by observing how paper and online resources are used in legal research; how law students read, annotate, organize, and use their materials; and the role of legal research and reading in a larger scope of activities like writing and collaboration. We then worked with this potential user community to evaluate the effectiveness of XLibris. Our hope is that insights that we gathered from our study of legal research, reading, writing, and collaboration would be more generally applicable in other educational and research settings, as well as in legal work.

In the following sections, we describe the study, our observations and the broad implications for design. We conclude with the details of the redesign that emerged from our observations.

2 STUDY DESCRIPTION

Our field study focused on an annual Moot Court competition at a first-tier law school. Moot Court is the venue in which students practice advocacy as they argue hypothetical cases. Controversial issues—cases heard in appellate-level courts that suggest

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unresolved points of law—typically form the basis for Moot Court problems. We chose Moot Court for our field study because it is characterized by one of the major legal digital library providers as the closest experience a law student has to preparing for and engaging in real courtroom advocacy.

The students start their research from a Transcript of Record that lays out the facts of the case and cites relevant prior cases. From their research, they retrieve, print, read, and annotate cases, and consult secondary materials such as law journals. The materials they collect are organized and used to produce a brief, a document of constrained length that presents a position on the legal issues; these materials form the basis for the oral arguments as well.

Our study took place over three months, from the distribution of the transcript of record to the final competition. We interviewed and observed the two faculty members who organized the competition, and nine second- and third-year students who participated in the Moot Court competition. The interviews were open-ended and semi-structured; we observed the students and faculty interacting with online resources, meeting to coordinate writing and research tasks, and attending classes. Interviews and observations took place where the participants normally worked, in settings like the law library, shared on-campus offices, and dorm rooms. We audio-recorded and transcribed interviews, photographed salient aspects of the work settings, and took field notes of our observations.

After the competition ended, we collected the students' and faculty members' documents—source materials they had drawn on for their research and the briefs they wrote for the competition. We analyzed these documents to understand patterns of annotation.

To assist us in the design process, interviews concluded with a demonstration of the evolving XLibris prototype. We used documents drawn from the Moot Court research in the demonstration; these familiar documents made the system more transparent and more compelling to the law students. The students used the device briefly, commented on specific design elements and functionality, and reflected more generally on how it might be useful in their work.

3 RESULTS

We divide our findings into two parts: a characterization of current practice and its implications for the design of an information appliance for obtaining, reading, annotating, and organizing digital materials in the legal domain; and design insights about the existing technology, XLibris. This way, the characterization and insights are not constrained by limitations of existing technology, yet the technology can grow and be shaped by the field study.

To set the stage, we first discuss work settings and mobility. We then discuss legal research, the traditional province of online legal information services and law publishers. Reading, organizing, and annotating documents form a core set of topics when we talk about working with legal documents. Finally, we examine reading-related practices, writing and collaboration.

Our XLibris-related findings are related to the usability and utility of the device itself, in addition to more general reactions that the demonstration provoked. We then use these findings about legal work and the prototype as a basis for the redesign.

3.1 Work settings and mobility

The law students worked in a variety of settings, each of which offered them access to unique local resources. Settings included the law library, especially work areas such as the computer/printer room and carrels; shared offices, mostly associated with the law reviews published at the law school; dorm rooms and homes; classrooms; other law libraries and other on-campus libraries; and *ad hoc*, unpredictable work sites, especially those used while traveling.

Important localized physical resources at these settings included computers (shared and personal) that provided access to services and applications, network connections, printers (in particular, the free printers in the law library; these are supplied by Lexis and Westlaw legal information services), paper books and journals (in personal collections or at the library), knowledgeable people (e.g. faculty, Lexis and Westlaw representatives, librarians, peers), comfortable, quiet places to read and write, places to store materials across uses, and places to spread out materials during a work session.

Distributed local resources give rise to an increased need for mobile work habits. Thus, like other students and an increasing number of professionals, law students may work in many places on any given day, carrying materials with them in heavy backpacks. For example, even if the students do legal research from their home computers, they frequently re-retrieve materials at the law library so they may be printed without cost.

This resource-centered mobility also causes the students' documents to be decentralized. When the documents are electronic, they are not necessarily stored on a server, but rather stored on computers' local disks or transported on floppy disks (which affects the way the students share files as well). Paper documents may be kept at various locations—for example, on-campus lockers, dorm rooms, library carrels—or taken along in the students' backpacks.

From settings and mobility to design

What are the design consequences of the students' current patterns of resource-centered mobility? Mobility may mean many things: a student may move from a desk to a nearby comfortable chair to read a case; a student consulting a legal treatise in the library may go to a different floor to re-retrieve a case and print it; or a student may be traveling, and use another university's law library. For these mobile work situations, a portable reading device can form the bridge between paper resources and electronic ones; the hardware may be brought to where associated resources are available. This physical/digital bridge function, coupled with the variability of network access in the various work settings, underscores the importance of *wireless* access and the need to consider how materials get on and off the device, a finding that confirms Jones et al.'s study [8].

Our observations also echo those of Elliott [5], who interviewed judges about their use of online legal resources. She reports that having Lexis terminals in chambers was not convenient, as it forced the judge "to excuse himself in the middle of a trial, go to his chambers, dial into Lexis/Nexis, print out a citation, and take it back to the bench to read."

The variability of settings also suggests that the ability to keep materials in place across sessions cannot be taken for granted; for example, shared tables or workspaces in the law library (besides personal carrels) must be cleared off. Thus our design should take

advantage of the computer's ability to readily support casual, persistent layouts of many documents in a workspace.

3.2 Legal research

Legal research is the process of gathering the materials together *to meet the needs of the task at hand.* As Sutton [17] points out, criteria of whether a given item is relevant are based on use, not on abstract notions of topicality or on a set of rules governing relevance judgment. Legal research might involve consulting books or law review articles in the law library, grabbing last semester's textbook off a bookshelf, searching an online service, pursuing specific case citations, or other strategies for amassing relevant background material for brief writing and oral advocacy.

Students began their Moot Court research by identifying a key case or cases from the Transcript of Record. Is this artificial? Not really; subsequent conversations with attorneys and the reflections of the students themselves showed that much legal research starts with some knowledge of an important case or cases in an area. If this information is not available, research is often initiated by consulting a treatise (an encyclopedic reference that summarizes the issues and case law in a specific area) or a law review article. Students used expressions like finding a "launching pad," "raid[ing] the cases," or "looking for a thread to pull." One student described her experience doing research in the books as a summer associate:

> "The first firm I worked at was very pro-books... I was pretty much taught to look in Witkin first... It's a California law treatise. ...it'll give you case citations, and then you can narrow your search that way. Once you have a case on point, or a case kind of on point, you can Key Cite it or something."

Once the students got started on their research, they continued to use citations as points of departure. They used citations in two different ways. First, citations are obvious links to precedent. If a student sees the same citation over and over again, referenced from multiple cases, it may well be valuable for current work. Students kept lists of cases to look for next or annotated case printouts with proposed follow-up citations. As we saw in an earlier study [12], these potentially interesting references may not be pursued, given limitations of time and attention.

Second, they evaluated citations, not just by looking at them, but by investigating if they are still "good law"—whether, for example, they have been overturned—and whether they are sufficiently authoritative. In US law the authority of a precedent is intimately tied to its currency, to the court in which it was decided, and to whether or not it is a good fact match to the current case. Reverse citation facilities such as Lexis's Shepards or Westlaw's Key Cite are typically used to determine whether a case is still good law. Both services provide annotated "back links" to, and metadata for, the cases that have cited the case in question. Thus this activity also amounted to link following.

Does this tendency to follow and evaluate explicit citations mean that the students do not perform full text searches? They describe searching in a few situations, although it seems to be of secondary importance if a starting point—a key case, a treatise, or even a comprehensive law review article—is at hand. Full-text search is used to identify a key case at the outset if none is available, to check breadth and coverage if there is time, and to look for very recent cases, as Shepards links may lag court decisions by as much as six months [2].

Important resources for legal research continue to be a mix of physical and digital materials; paper books still play an important role in legal research, but they are used in concert with online legal services. These materials may be maintained institutionally (such as treatises, law books, and journals available through the law library) or they may be part of a student's personal collection of books and files.

The scope of these resources creates a rhythm of paper and electronic research that is seamless to the students. Though the alternation between print and electronic forms may seem inefficient, it is a very fast and effective way for the students to pull together the collection of materials that they actually want to read. Thus a treatise, a paper book, may lead to a specific case citation; this case may then be retrieved directly from an online service, printed, read, and marked-up. Students may type in case citations from this printout to pursue them further. Later, they may retype portions of the case to use as quotes in their written briefs or as notes that will contribute to their writing. Alternatively, once an electronic version of a case is located, research may remain electronic – the student may choose to Shepardize the case or follow some embedded links to precedent cases.

The students print not only to read, but also to perform triage [13] to sort through the cases themselves, or through long lists of potentially interesting cases that they have generated by performing a search or by Shepardizing a case. In fact, several of the students saved Shepards or Key Cite lists with their case printouts, and some of these lists were annotated as part of their triage.

From legal research to design

We observed four trends in the students' legal research: The continued importance and authority of books; research strategies that are link-based rather than search based; the advantage of electronic resources for case evaluation; and alternating use of print and electronic resources.

These trends suggest a set of design consequences for a legal e-book. First, there is a need to support hypertext links. Much legal research involves pursuing explicit citations. Furthermore, citations accrete influence; citations that are seen by the researcher many times are likely to be pursued. Second, we must consider the role of paper in the use of such a device; paper resources and paper practices will persist even given the availability of e-books and electronic services. Finally, there is significant potential value to "waving a wand over a case citation," quickly consulting reverse citations to check the validity of the case being read. This last design consequence highlights the importance of good metadata, and the associated benefits of making the metadata readily available to guide on-the-spot research decisions (for example, "Should I follow this link?" or "Is this case still good law?").

These trends also suggest that digital libraries co-exist with more traditional resources, and must accommodate work in this hybrid environment. Ignoring this reality in the design of interfaces to digital libraries may reduce their usefulness in the real world.

3.3 Reading and annotation

To frame a discussion of reading and annotation, it is important to examine first the form of the materials; the form necessarily shapes and constrains any subsequent activities like the ability to mark on documents or carry them around.

For the most part, the participants in our study read printed documents, with the notable exception of cases they retrieved and skimmed while they were writing. Working with documents on paper allowed the students to read opportunistically, carrying materials around and finding places to read that were relatively free from distractions. We noted that the students and faculty members often printed more than they read.

Do readers then read once, and move on? Not necessarily. Legal practice demands re-reading. A first read may be a scan or a quick skim to see if the material is even relevant, or to get a general idea of what is covered. Subsequent readings may be careful: students reported reading documents they were using in Moot Court front-to-back. Or they may involve skipping to the relevant sections of the document: students reported skipping a case's dissent, or using the headnotes (human-authored indices to the specific points of law covered in a case) to navigate into the body of a case. Re-reading during writing may be very quick, just to remind the student of what is in the materials, or to find a particular passage of interest.

When readers read for a specific activity like writing a legal brief, they are likely to mark on the documents they are reading. Annotation is a prevailing practice, although some readers annotated far more than others and one did not annotate at all.

Re-annotation is also common, concomitant with the kind of re-reading we describe above. If a student is apt to make long, extensive annotations on the first round, he or she may cull them during subsequent readings, either by marking them again, or by using emphasis marks like asterisks to set them off from the original markings (e.g. Figure 2). For example, one student said:

> "You're supposed to use the highlighting to tell you to go back and read it. But sometimes I highlight as I read, and so I have to go back and mark things so that I remember to definitely go back to that. So that's two iterations I guess."

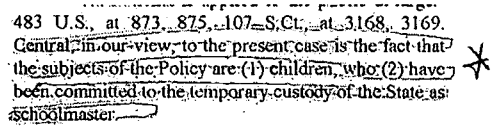
483 U.S., at 873, 875, 107 S.Ct., at 3168, 3169. Central, in our view, to the present case is the fact that the subjects of the Policy are (1) children, who (2) have been committed to the temporary custody of the State as schoolmaster.

Figure 2. A reader's asterisk. The reader plans to revisit material associated with this mark.

It is notable that the students can articulate their own marking strategies. Many annotators are unaccustomed (and sometimes unable) to explaining their annotation practices [12]. However the law students had reflected on their own annotation practices and those of their peers. For example, one student said of her own marking strategy:

> "Usually with the cases, I try to write 'facts,' 'issue...' I'll write 'issue' next to the issue. It replaces briefing. Book briefing [an outlining technique] is just kind of just writing the issue, then you've got your facts and your holding...Some people do the holding in blue and they'll do the issue in pink. I don't do that."

This reflection helps demonstrate the importance of the practice to many of the students. As we have seen in other settings, the students' annotation strategies may vary in ways that are related to the form of the materials. For example, books sometimes receive different treatment than printouts because they are regarded as long term references.

Annotations may also reflect disciplinary practices [11]. As we demonstrated in the quote above, for the law students annotating carries over from the case analysis techniques they learn in class. These techniques give students a way of looking at legal decisions in terms of, for example, issues (what points of law are addressed) and holdings (what the decision's import is). Students sometimes use annotations to identify such aspects of a case, and will even revise them as they continue to read the materials. Such structured interpretation leads to a greater use of annotation tactics like color-coding than may be found in other disciplines.

In spite of the well-developed disciplinary marking strategies that the students exhibit and are able to discuss, these strategies are neither fixed over time nor consistent. They change throughout and beyond schooling as the reader becomes more efficient and comfortable with legal work and unnecessary or unworkable complexities (multi-color coding schemes) are discarded. Sometimes the exigencies of the situation dictate a change in strategy (for example, a favorite pen is left at home). Finally, annotations are crucially tied to situational factors. For example, a lawyer reported that she annotates the same case differently for different uses. The students confirm this. Annotations they make in class that capture what the professor is saying are considered more important than (and are readily distinguishable from) marks the students have made in their own readings of the material. As Wolfe pointed out in her study of how students value the annotations of experts, the source of the interpretation is very important [18].

From reading and annotation to design

Reading is a difficult activity to support; it is hard to improve on paper and pen. We began our study with the assumption that freeform ink annotations are important to analytic readers. This assumption held as we worked with law students. What are further design implications of these reading and annotation practices?

First, re-reading seems like a good target for computational support; readers are already inventing strategies to help themselves read. They skip, scan, or skim through the documents using their own marks or the properties of the documents themselves.

Furthermore, annotations vary in importance and usefulness; the marks readers make on documents have different functions and different degrees of value. Yet annotations are a fundamental technique for signaling what is important in a document. They help readers re-read the material (focusing on the most pertinent and useful portions of a longer document), and they guide readers' future use of source materials in associated activities like writing. Techniques may be applied to find particular kinds of annotations (e.g. see Figure 2) or to use collective marks across different annotations [12].

3.4 Organizing

The documents that students gathered to use in the Moot Court competition are organized in different ways, particular to how they will be used. When research begins, documents may be organized by the court that heard the case, by the date of the case, or simply in a stack.

Once the students began writing their briefs, they tended to move more toward a writing-based organization, creating categories like "pro" cases (cases that support the student's side of the argument), "con" cases (cases that present counterarguments), and cases with matching facts. Cases with a close fact match are particularly interesting, in that they must in some way be addressed. Upon

encountering a "con" case very similar to the Moot Court problem, one student wrote, "Deal with this!" on top of the document. These writing-based organizations were frequently implemented as piles on the floor and desktop: fluid organizations that could be rapidly accessed and changed. Naturally if the student worked in multiple venues, this organization could not be preserved across sessions; the student needed recreate it each time, in each place.

One student described the shift from research to writing this way:

> "I find for me I like to print them out. It's sort of like the old way of using index cards. If I print them out, I can staple it and then I can throw them in different piles, and then the piles can change. And then when I'm writing, I look at the pile. I bring it up to here, and then I start writing based on those cases. And that I know in my mind: this is argument 1; this is argument 2; this is argument 3."

This tendency toward activity-based organizational strategies suggests that there is no canonical way of organizing materials. Documents are organized and re-organized to meet the needs of the task at hand and to reflect the student's understanding. It was difficult to ascertain whether the collection's structure would become more uniform after the task ended, as the students did not keep Moot Court documents that they felt they could re-retrieve. Most acknowledged this would change when they became practitioners, and indeed subsequent conversations with practicing attorneys revealed that files within a firm or office may have a standard structure to facilitate sharing.

From organization to design

The design implications of these organizational strategies are threefold: First, it would be advantageous to provide readers with a way of organizing materials across sessions. Many work settings demand that loosely organized documents (e.g., piles on the floor) be picked up and put away, disrupting the organization. Second, as Mander et al. also observed, the difference between organizing materials for research and writing, as well as the difference between transient and archival structures, points to need for multiple ways to organize documents [10]. Finally, the notebooks offer evidence that there is a perceived advantage to keeping documents "in one place." Moving from physical systems of organizing documents to electronic tools may be perceived as a disadvantage however, since computer screens offer far less space and flexibility for spreading out and manipulating working papers. On the other hand, the capability to switch among multiple ways of organizing information on the computer should accommodate not only different working situations, but different cognitive styles as well.

3.5 Writing

The written brief is a key element of the Moot Court competition and indeed of certain kinds of legal work. One prevailing strategy for brief-writing was to outline the important parts of the argument and find the right quotation—a passage or key statement of a rule of law that has come out of a precedent—to illustrate or support the argument. This strategy entails finding the quotation, either from the student's annotations, or simply from memory; transcribing the relevant quote; correctly citing the case, conformant with the prescribed citation form. One student said:

> "I looked at the cases, and looked at the different modes of analysis that the opinions used and there seemed to be two types of tests. One, the Lee v. Weisman analysis, and the other one is the Lemon analysis, which is a three step test, a three prong test. So I kind of used that to structure my outline, and then tried to plug in cases and quotes that I could use for each part of the test."

The students often reported that they would like to perform a word search to re-locate the quotes that they have already read (and potentially annotated) when they are writing. One student gave the following account:

> "after having read through all these various cases, I remember a citation to Brown vs. Board of Education, in which they used a quotation about education being the most important function of government. I couldn't off the top of my head remember which case it was in, or where in that particular case it was located. So essentially what that involved is me going through every single case looking through all my annotations to find this one quotation that I remember having read."

The mechanics of legal writing also involves creating the citation form that conforms to legal practice; each authority that is cited must be in the "blue book" form; "that bringer of much grief, the Uniform System of Citation." [2]

Additional research is also provoked by writing: the students find they need to fill in holes, or to check the authority of a particular case. This interleaved research is different from the student's initial reading. When research is spurred by writing, the student may check the new materials quickly, without printing them. One student said:

> "In the course of writing my brief or paper or whatnot, if there's something I need to look up, a citation or a particular case that's referenced, and I don't want to go to the library to do it or print it out, then I'll do it here, and just kind of flip back and forth between my word processor and Westlaw. Just to transcribe what I need."

As we noted earlier, organizing materials to support the writing process is different than organizing them during the earlier phases of research. The students cite the importance of having several key cases to hand, and arraying them on the floor or tabletop in piles for ready access as they are writing their briefs.

From writing to design

What is the key design insight we can take away from the law students and their writing? What seems clear is that they switch back and forth between activities; these switches may be frequent and fluid. They look for new sources to fill in holes in their arguments. They search for quotes in familiar materials as well. Our initial concept of a dedicated reading appliance may not be the best way of addressing this fluid shift in activities. In other words, a *document laptop* may be more appropriate than a dedicated reader. We discuss this notion further in our accounts of the students' reactions to the XLibris prototype.

4 XLIBRIS REDESIGN

Our interviews and observations of the law students suggested several directions of redesign for XLibris. We redesigned the XLibris interface in terms of functionality and also in terms of appearance; the latter flowed from the need to convey the former. Broadly-speaking, our redesign focused on navigation, link-following, and re-visiting previously-read documents; on retrieval, on annotation, and on managing, organizing and categorizing documents.

4.1 Navigation

Our observations of the students' link following and navigation among gathered documents caused us to re-examine navigation controls. The initial design was based loosely on the Web model of navigation: a "previous" button and a "next" button moved the reader back and forward through the document views. Unlike the Web model, backtracking did not prune branches, but kept all visited documents in the same queue. The intent was to compensate for known deficiencies of the Web browsing model (see [3] for a discussion of alternatives), but the result was equally confusing. The crux of the problem was that the same controls were used for different purposes—short-term exploratory backtracking ("Where does this link go? Oh, no, that wasn't it.") and managing or reading several documents simultaneously. We saw both kinds of activity in our observations: quick skimming of documents (perhaps the destination of a citation link), and working with multiple documents.

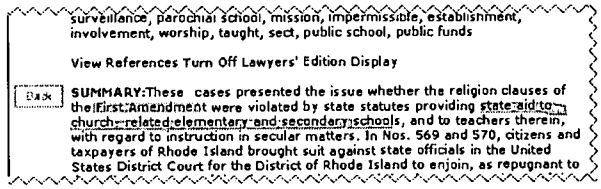

Figure 3. A fragment of a page: a link target is identified by the placement of the "Back" button

In the redesign, we split the two: backtracking from a link traversal was accomplished by a dynamically-added "Back" button, positioned near the target of the link (Figure 3); multi-document use was accommodated by providing a overlaid semi-transparent menu of recent views, from which the reader could select at random (Figure 4). Each item in the menu corresponds to a different document or a specific view (e.g., workspace, clippings, etc.). Changes to the views and documents are reflected in these thumbnail representations. Thus readers can switch easily among the recently-used views and documents without resorting to more elaborate navigation. Additional evaluation is required to know whether this menu should contain only document views, or other organizational views (see below) as well.

4.2 Retrieval

The original XLibris design included a way of launching queries based on freeform digital ink annotations of the underlying text [6]. Because the students tended to follow citations and use Shepards rather than running queries to find useful documents; search was more typically used to find documents that had already been read. Thus we replaced the experimental feature with a keyword search dialog that worked over the documents already loaded into XLibris. A simple ranking algorithm that preferred passages with many different keywords over those with just a few was used to order matching passages.

To handle the kind of reference-following the students preferred, we added the ability to traverse standard http references to Web-based materials. This capacity to load documents into XLibris incrementally changed the flavor interaction from a purely reading-oriented to a hybrid of reading and browsing. Again the effect was to reduce the cost, cognitive and temporal, of transitions between the various activities that make up document-centered research.

4.3 Annotation

The original XLibris "Clippings" view showed the reader only the annotated portions of documents, thereby allowing her to revisit those passages easily. Furthermore, the list could be filtered by color. While this design supported some forms of re-retrieval, it could not accommodate some of the students' practice.

We saw many examples of reviewing and re-annotating previously-read and marked passages (see Figure 2 and the accompanying discussion). A student would read a document and mark it up; subsequently she would review the annotations and identify the more important ones with additional marks. In XLibris, this required many steps: to place a second mark on a passage shown in the Clippings view, a reader had to navigate to the page containing that passage, mark on it, and then move back to the Clippings view, an awkward and distracting operation. We redesigned this interface by allowing readers to mark on the clippings directly, without moving to the containing page; a separate button was provided for moving to the document. The Clippings view and the document view were coordinated: marks made on one view were available in the other. Thus clippings became miniature windows onto parts of documents of particular interest to the reader.

Another shortcoming we identified in the Clippings view was its automatic nature: the view would update when a new mark was added or an old one erased. This made it difficult to collect ideas and references in a persistent manner. We therefore added a new view that was modeled after a yellow legal note pad. Readers could clip passages from the Clippings view to the notebook; once there, they could position and resize the views as desired. Passages pasted into the notebook behaved similarly to the Clippings view: marks made on them affected the document, and vice versa.

This interface (Figure 5) was designed to accommodate the transitions from retrieval to organization to writing: passages found while reading could be clipped and organized thematically in the notebook view, and then could be copied through the system clipboard to the word processing program of choice. Both the text and the image could be pasted in; the canonical "blue book" citation for the source would be included automatically.

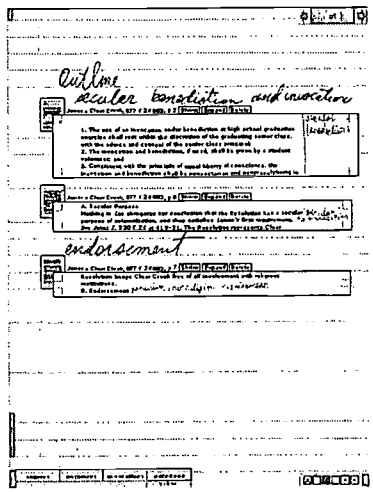

Figure 5. A notebook page with three clipped passages

4.4 Organization

We observed various approaches to organizing documents, reflecting differences in cognitive style and activity. The original design included an overview of document thumbnails which the user could drag to form rudimentary piles. If more documents were added to the workspace, a new page of thumbnails was added to the overview. The reader could not add new pages manually, and it was not possible to group documents thematically by moving them to different pages, similar to student notebooks.

Our redesign accommodated these observations: we provided a way to add blank pages to the workspace and to drag documents between those pages. This allowed readers to organize documents thematically: one worksheet for pro cases, another for con, for example. This ability to move objects between worksheets also applied to the notebook view: the reader could now move relevant clippings to appropriate pages, further increasing XLibris's capability to organize information.

We also allowed readers to mark directly on the workspace pages to label them. Finally, we added a sortable metadata list view that allows readers to group documents by such aspects as court and date, a feature useful in the initial triage stage. Of course other metadata could be used for other kinds of documents.

5 REACTIONS TO THE XLIBRIS PROTOTYPE

At the close of each semi-structured interview we demonstrated XLibris to gauge general reactions to reading on an e-book, and to better match the design to legal research. Early demonstrations were of the original system; later demonstrations showed the redesigned XLibris. The demonstrations were hands-on; the students and faculty members held the device, marking on documents, turning pages, and trying out other features. Because XLibris had Moot Court documents, the students were able to see familiar content in the system. They readily engaged with the prototype, reading, turning pages and marking. We explained why we were showing them the prototype, and elicited as much discussion from them about it as possible.

Reactions were generally positive: students would start reading and annotating right away, using the paper document metaphor in the way we expected. They confirmed the desirability of a mobile device. They did, however, have some important questions about the relationship between XLibris (and e-books) and the technologies they currently use for reading and research.

First, they wanted to understand the relationship between XLibris, paper, and books. Many of them asked if they could print the documents displayed on XLibris. They were not always sure why they would want to print them, but they were certain that this capability was necessary. On the flip side, many of them told us that they still used "the books" for some of their research, and expressed skepticism about the ultimate utility of XLibris in book-oriented research. After demonstrating to us how difficult he found online statutes to use, one student explained that:

> "I have a difficult time one just coming up with [keywords] ... Then when you do get something, it's not what you're looking for. I think it's because ... there's a geography to statutes that you don't have with cases ... that lend themselves to having hardcopy, simply because of the way it's broken down into various titles, and you can easily go to where you need to go."

Second, they asked about how XLibris would interact with their PCs. The questions centered on how other activities would interleave with reading on the device. How would the results of their online research get onto the device? Would they be able to cut and paste quotes from the documents in XLibris to the one they were writing in Microsoft Word? In short, they were acutely aware of the overhead an e-book might add to their current work.

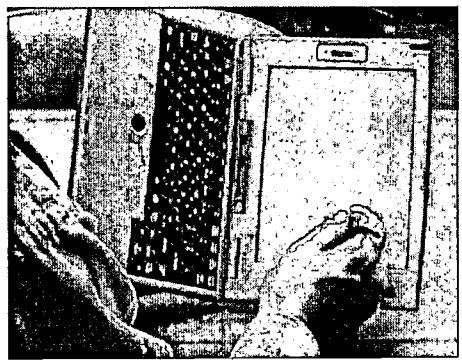

Figure 6. Example configuration of a document laptop, a Fujitsu Lifebook B-Series pen mini-notebook, rotated to display a document in portrait mode.

Finally, they wondered about the relationship between XLibris and their laptops. Many of them had already expressed frustration with their laptops, complaining about their weight, bulk, and durability. Now we were introducing a second computer-like device. One student confided that she would not want to carry both. Others asked if they could perform normal computer work on the pen tablet computer, for example, getting their email, or using a word processor with a keyboard.

The implications of these questions are far reaching. Again, the concept of a document laptop (Figure 6) seems to win out over that of a large dedicated e-book. Reading is interleaved with other activities. This observation leads us to emphasize the ability to read more effectively on existing hardware, and take advantage of its form factor. Transitions into and out of XLibris—e.g., pasting quotes from sources into a word processor—are easier if the reading and writing applications are on the same computer. Recent trends toward lighter hardware and wireless peripherals

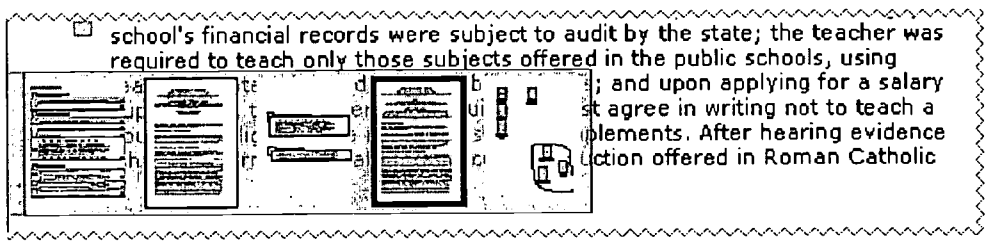

Figure 4. Semi-transparent overlay showing several recent views (1,3,5) and documents (2,4)

may make it easier to combine the advantages of the tablet and laptop form factors in the same device.

6 CONCLUSION

Surely the shift from e-book to document laptop represents the greatest sea-change in our thinking about legal work. When we began this study, we assumed we would be introducing a dedicated reading device. Now we believe that the advantages afforded by such a device are offset by the need to interleave other activities with reading.

We are less likely to think of reading devices as peripherals tethered to a stationary PC. Reading is so opportunistic, and paper is such a flexible medium, that it seems inappropriate to tie legal work to a place and time. Wireless access to materials may be just the "in" that makes a document laptop a useful and desirable piece of technology.

Our observations of legal research left us with two important insights. First, we cannot underestimate the importance of the notion of a starting place, one that might easily be a paper treatise. Second, we saw that link following is at least as important as the ability to perform broad queries. A document representation that includes links and functionality that implements link traversal now seems essential.

Through our observations, we came away with three compelling scenarios for using a document laptop to perform legal research: (1) immediate access to current legal materials; (2) the ability to re-retrieve familiar materials; and (3) the ability to suspend and resume interrupted work that involves many documents.

Reading and annotation were the original terms of engagement for XLibris. It would seem like there is little more to be said about these two areas. Yet we have seen new styles of working with annotations (e.g. outlining styles that use short points amplified by extracted quotations), and are investigating different reading phenomena (e.g. re-reading).

We also found opportunities to revisit issues of navigation within and among documents, and to explore additional ways of managing and organizing documents and passages.

In short, the field study produced exciting insights and possibilities for e-books. It also introduced new questions and issues about how a document appliance-turned-laptop will function in legal work, and provided additional evidence for the hybrid nature of document collections. Future designs of information appliances, e-books, and other interfaces to digital libraries must consider the simultaneous use of paper and digital documents and the fluid transitions between them.

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