Implementing New Knowledge Environments: Building Upon Research Foundations to Understand Books and Reading in the Digital Age

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ABSTRACT
In this paper, we present an overview of the first year work and plans for the second year work of the INKE (Implementing New Knowledge Environments) research group, a large international, interdisciplinary research team studying reading and texts, both digital and printed, as part of a seven-year project. The INKE team is comprised of researchers and stakeholders at the forefronts of fields relating to textual studies, user experience, interface design, and information management. We aim to contribute to the development of new digital information and knowledge environments that build on past textual practices. We discuss our research questions, methods, aims and research objectives, the rationale behind our work and its expected significance – specifically as it pertains to our first year goals of laying a research foundation for this endeavour – and the concrete steps to be undertaken in our second year of the project.

Categories and Subject Descriptors
H. Information Systems; H.5 INFORMATION INTERFACES AND PRESENTATION (e.g., HCI) (I.7); H.5.2 User Interfaces (D.2.2, H.1.2, I.3.6); H.1.2 User/Machine Systems; Human information processing

General Terms
Design, Human Factors, Theory.

Keywords
Text, Interface, Prototype, Reading, Book.

1. INTRODUCTION

This paper presents an overview of the first year, foundational work and plans for the second year work of the INKE (Implementing New Knowledge Environments) research group, a large international, interdisciplinary research team (35 researchers from 20 different institutions) working on a seven-year project. We have come together to study different elements of reading and texts, both digital and printed. This paper follows the project overview presented at the BooksOnline '08 workshop in Napa [1], which discusses our larger mandate, and the overview of first year work presented at the BooksOnline '09 workshop in Corfu [2]; discussion of our long term research objectives are available in Siemens, et al. [3]

The INKE research group is developing a new digital information/knowledge environment that builds on past textual practices, having already articulated a foundation for identifying the characteristics of digital interfaces that respond to the expectations and needs of a broad constituency of professional, personal, and lay readers. Ultimately, our work will provide functional reading interface prototypes that have the potential to transform the way we engage with the digital materials that comprise our personal and professional reading.

This work is accomplished through the interaction of four core groups: Textual Studies, User Experience, Interface Design, and Information Management. The interaction and ongoing collaboration between these groups is crucial to the success of the environment. The Textual Studies (TS) team researches and responds to the need for understanding further what components of existing textual artifacts are essential to represent in new digital objects and reading devices; the User Experience (UX) team identifies characteristics of user engagement with print and digital artifacts and environments both current and future; the Interface Design (ID) team focuses on extending continuous reading and scholarship involving digital environments through interface; and, through iterative processes involving all research groups, the Information Management (IM) team researches and builds prototypical methods for storing, retrieving, and navigating information more efficiently than in the past, while drawing on dynamically integrated collections of supporting materials.
2. RESEARCH FOUNDATIONS: YEAR 1

The research foundations of Year 1 have laid the theoretical, methodological, conceptual and infrastructural groundwork necessary for building prototypes in the subsequent phases of our work over the next six years.

2.1 Textual Studies (TS): Documenting Architectures of the Book

The TS team has begun identification and documentation of the features of past textual forms and practices necessary for providing the vocabulary and theoretical framework for implementing new knowledge environments. Approaching the underlying research question, “how has reading changed since the rise of digital media, and how can the history of textual practices inform the future,” the TS team combines book history’s interest in books as primary mediators of human relationships [4], and in the book as “the text” on a human scale; bibliography’s focus on print material as physical, machine-produced vehicles of abstract texts [5]; and literary theory’s sensitivity to the complexities of form, content, and materiality in all linguistic mediation [6].

During Year 1, TS worked to establish a textual features knowledge-base, Architectures of the Book (or ArchBook), which provides a history of textual production. This online resource will provide the most comprehensive online reference for the history of the book, but will also promote research on the future of the book through its focus on the information architecture of texts. It will act as a resource for all members of our team and, further, will be available to all those working in areas it touches on. The work of the TS team provides a necessary complement to INKE’s core activity of prototyping, by developing an ongoing modeling process that informs INKE’s work at the levels of theory, history, and code.

2.2 User Experience (UX): User Requirements Gathering

The guiding question for the UX team is "how has our experience of information changed since the rise of digital technologies and the Internet?" As part of their study of the complex process of engaging with materials in print and digital environments, deriving requirements for and testing, prototypes developed by the research team, the UX team has conducted studies with individuals engaging with humanities artifacts in a variety of contexts. These artifacts have included different types of content: text, sound or images; they are complex in structure, and may contain annotations. For example, Humanists read in different ways depending on the formal properties of the text and the object of the reading enterprise [7]. They are also affected by feelings about physical environments [8]. Any study of individuals engaging with such materials should therefore take into account the complexity of the enterprise and employ multiple methodologies. The UX team continues to survey current literature on reading, HCI and user behavior and develop and implement user requirement studies.

2.3 Interface Design (ID): Modeling ‘Chaining’ in Professional Reading Practice

The ID team’s focus for year 1 follows the guiding research question “what new features can we design to improve digital information environments and their interfaces, based on our knowledge of user needs, behaviours, and cultural contexts?” The ID team has been studying the interrelations between research papers published by different disciplines, largely through the act of “chaining” citation structures on existing bodies of work, and to design an application that appropriately tracks and models this behaviour. Called the “Paper Drill,” the origin of this concept is in UX team research into the reading practices of academics who follow citations as part of their professional reading.

The functional goal is to allow a user to choose a representative paper in a field they don't know very well, then have the system find the citations in that paper, collect those papers, find the citations in them, and so on down to the third level, then produce a report that lists the most commonly cited papers in the set – thus providing a snapshot of an area from the perspective of the seed paper.
2.4 Information Management (IM): Developing Test-bed Corpora, Data-stores, and Analytical Facilitators

To answer the question, "how can we better design, or process, the data that underlies and serves the needs of those using digital information environments," the IM team researches and implements pragmatic solutions and optimal combinations of the best of several knowledge management strategies for the INKE team's work: the speed and power of the search engine; deep textual-analysis methods used by the scholarly community; consistently encoded corpora in specific knowledge domains; and detailed user-recorded results provided by the social networking.

The IM team is working to develop the informational underpinnings for four prototypical digital reading environments; in year 1, IM investigated and implemented test-beds of corpus technologies necessary to build primary and secondary corpora pertinent to our reading environments, in English and French, through our research partnerships and stakeholder networks.

3. RESEARCH OBJECTIVES IN YEAR 2

Collaborative efforts among all teams continue in earnest in Year 2 as each group addresses the guiding question for their research area. The work of the Information Management (IM) team is crucial to the forward progress of all other teams, as IM shores up test-bed implementations of corpora (working with ID) and begins to model the electronic scholarly edition (working with TS, UX, and ID).

3.1 Test-Bed Implementations

The focus of IM in Year 2 is operating "below the API," to complete test-bed implementations of corpus technologies that allow us, in turn, to build primary and secondary corpora, stores (corpora + CMS), and incorporate analytical facilitators pertinent to the backend of our four reading environments targeted for research in future INKE years. This work falls "below the API" in two ways: first, subsequent to the selection of the initial test-bed software layer (Fedora), IM will create processes and procedures for ingesting, associating, storing, indexing, and recovering assets of multiple digital file types ingested via the API provided by working partners such as Synergies, ProQuest, and Oxford Text Archive; second, IM will collaborate with ID to ensure the underlying data store itself can facilitate the creation of its own API. After this initial work, the INKE IM team will expose an API to its own researchers, to facilitate user connection to these locally stored assets in the INKE repository. The INKE API, when developed, will be RESTful and produce JSON and XML output formats.

3.2 Modeling the Electronic Scholarly Edition

The need to creating a means for representing and interacting with the "social edition" of a text has its roots in the rise of the social theory of text as put forth by Jerome McGann and D. F. McKenzie in the 1980s. See Siemens, et al [9] for a detailed explanation of the ways in which "the social theory of text rejected the notion of individual literary authority in favor of a model where social processes of production disperse that authority" and the relevance of such theories to the creation of the socially-informed and enabled electronic scholarly edition as part of the INKE research project.

The model for the electronic scholarly edition will be one of the most visible outcomes of Year 2 work among INKE researchers. The IM team will work with all other teams (TS, UX, ID) to facilitate the creation of a framework that takes into consideration the answers to pertinent questions: first, the TS team will provide guidance as to the social elements of the traditional codex that must be preserved; second, the UX team will provide guidance as to the social elements of the reading process that must be considered.

4. CONCLUSION

This paper has presented an overview of the guiding research question and outcomes of Year 1 of the INKE project, and provides some examples of the ongoing collaborative efforts in Year 2 of this project. The four core teams, in addition to those researchers involved with overall administration and management, are following the integrated and detailed research plan set forth at the beginning of this project; this documented internal governance and reporting outlines a working relationship and processes that allow us to work toward common goals. These goals include making significant contributions to the field of ebooks and online reading, which we look forward to discussing in more detail in future.

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