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Bridging the Mire between E-Research and E-Publishing for Multimedia Digital Scholarship in the Humanities and Social Sciences: An Australian Case Study

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Abstract

Digital media developments confront the humanities and social sciences with major challenges in exploiting multimedia rich data sets. A critical need is demonstrated to bridge the divide between the building of multimedia digital repositories, and the publishing of research outcomes that exploit the interactive potential of digital media. Software that melds the steps in digital research and publishing, now disparate environments, into a single sequence of integrated procedures can provide a critical innovation for the transformation of digital research and publishing from a quasi-craft-like and demanding set of skills, into a transparent and user-directed flow process. Humanities and social science (HSS) researchers who use multimedia data could be working more collaboratively, creatively and with far more international impact. The HSS have not yet exploited the interactive and collaborative potential offered by interactive computer technologies, and the expansion of digital repositories. Digital publishing has opened opportunities to incorporate both interactivity and multimedia into scholarly publishing, permitting new modes of visualization and creating ever mutable texts. Open Source software, can offer an internationally significant break-through in research definition, data collection and management, and interactive publishing, leading to a major paradigm shift in eHumanities and eSocialScience. The article proposes a framework for bridging the gap, overcoming the silo problem and building an interactive multimedia research environment (m.i.r.e.).

Keywords

Digital data chain; Open repositories; Humanities and social sciences; Scholarly e-publishing; Semantic web; Multimedia; Interactivity; Australia

Introduction

"Many who work in the humanities and social sciences (HSS) have come to recognize that the knowledge practices in these disciplines are on the edge of some fundamental changes . . . the online world is a new cultural commonwealth (yet there are major constraints including) unsatisfactory tools, incomplete resources, and inadequate access" ([ACLS](#)-American Council of Learned Societies, 2006).

So argues a recent report by the *American Council of Learned Societies' Commission on Cyberinfrastructure for Humanities and Social Sciences*. The report argues that such constraints inhibit creativity and innovation as integral dimensions of the process of research and scholarship.

The situation in the USA has parallels in Australia. Australia has its own particular set of challenges in data creation, remote resource access, multimedia data creation, online collaboration, and digital scholarship, and emerging issues in scholarly publishing created by the new government funding model for research, known as the *Research Quality Framework*. Many scholars who experiment with publishing using digital media are still working within an individually-forged craft solution. Yet the scholarly community has indicated in the ACLS report and elsewhere ([AEHRN](#) - Australian e-Humanities Research Network, 2004) that they want to graduate to a more transparent user-friendly process that allows for the creation, dissemination and re-interpretation of knowledge in digital forms.

However there is not yet an integrated research, data collection and digital publishing software package for the humanities and social sciences, which can bridge the divide between the development and maintenance of rich data archives, and the interactive potential of digital publishing. This lacuna has been the driver behind the concept of a *multimedia interactive research environment (MIRE)*, currently under development at the University of Technology Sydney.

This article analyses the current situation for HSS digital researchers, then identifies the key problem in relation to the use of ICT, and proposes a systematic approach to its resolution. A model is then articulated based on the "normal" work-flow for an HSS research project, identifying in basic form the value that digital capacity can generate for each stage of the process. Conclusions focus on the specific benefits of such a process for HSS research and scholarly publication.

ICTs and the situation of HSS researchers

The development of digital information and communication technologies (ICTs) has transformed the opportunities for innovation in research in humanities and social science research. These opportunities can be summarised as:

- a. building multimedia data banks and digital repositories drawing on resources of collecting institutions such as art galleries, museums, libraries and archives as well as the collections made by researchers;
- b. integrating such collections through the development and application of common identification and access standards;
- c. facilitating the creation of data archives generated by researchers from original fieldwork;
- d. facilitating the creative analysis and interpretation of data through the use of sophisticated search, analysis and commentary software;
- e. enabling the publishing of information and analyses to wide audiences in innovative and mutable formats;
- f. supporting the interaction of audiences with information, thereby contributing to the growth and use of knowledge.

While these opportunities are clearly identifiable, significant constraints also exist. These constraints include:

- a. difficulties in defining research problems in ways that can utilize semantic web technologies to search and order data;

- b. very different "ideologies" underpinning institutional collection policies, in which archival, curatorial and research priorities may have distinctly differentiated characteristics, often resulting in different metadata policies and formats for data preservation and access thus exacerbating problems in collection integration and interoperability;
- c. individual researchers and groups needing high level craft skills to build multimedia data sets for research;
- d. data analysis software that does not handle multimedia sources well, nor can it be integrated into publishing software;
- e. severe difficulties in "mobilising" multimedia data in scholarly forms for use in academically legitimate publishing contexts;
- f. minimal interactive opportunities for audiences or users of data, when they access it in online publications.

When we bring these two groups of features together we can see that this uncomfortable current research/publishing nexus could be addressed through a strategy that:

- a. systematically identifies the steps in "ideal type" research sequences, from articulation of a research idea, through data collection and organization, to (final) publication of research outcomes;
- b. synthesizes current initiatives in each element of the sequence to offer best-practice pathways;
- c. identifies "mission critical" innovation to enhance the opportunities and reduce the constraints;
- d. develops prototypes of software solutions that allow the building of digital data chains flowing from initial research idea, to interactive digital outcome.

The building of digital culture repositories has been flagged as a priority for the UK (Arts and Humanities Data Service AHDS, ESRC National Centre for e-Social Science NCESS) ([Heery & Anderson, 2005](#)), Europe (European e-culture), and North America (The National Initiative for a Networked Cultural Heritage NINCH) and has been initiated in Australia (Pandora, Digital Theses, Arrow) ([AAH - The Australian Academy of the Humanities, 2005](#)). Yet the quality and accessibility of the data has not been matched by a sophisticated research environment, one that can integrate research questions, data collection, data coding, data mining and multimedia publishing.

The key problem

In effect the critical problem appears to be a "silo" effect, generated by different disciplinary definitions of research and publishing, and the different institutional loci and power in relation to the different elements of the research/publication nexus. Despite the growth of web-based publishing most online projects fall into two categories - on the one hand primarily text based articles published in online journals with limited interactivity or digital media use, and on the other carefully crafted projects requiring high levels of creative skill working with web building programs and ancillary software. The first of these categories is framed by parameters to do with traditional academic publishing, structures of peer review, and bureaucratic institutional processes for authorising and certifying the creation of knowledge. The second category tends to be perceived as "art", and allocated to the realm of non-science, segregated from academic recognition and devalued in the competitive environment of academic publication. Thus the capacity of digital technologies is rendered marginal in the first case, while the opportunity to innovate in academe is heavily restricted in the second.

We can deduce from a recent scan of the key issues ([AAH - The Australian Academy of the Humanities, 2005](#)) that many of the problems derive from a failure to articulate a

coherent model of research as an interactive and iterative process of creativity. That scan posited such critical issues as how to:

- a. harvest and curate data in a systematic and coherent format;
- b. "way-find" in existing and emerging scholarly publishing (through searching using semantic web technologies);
- c. re-process existing data and resources to mobilize materials hidden by the sheer mass of data stored;
- d. build collaborative research tools and environments across time and space;
- e. facilitate the transformation of research resources into digital formats;
- f. liberate scholarly processes through innovation in publishing, such as that begun by DSpace ([Tansley et al., 2005](#));
- g. enable wider societal use of research outcomes and participation in the creation of knowledge.

Innovatory projects - in the fields of history, sociology, social geography and cultural studies - ([Dower & Miyagawa, 2004](#); [Jakubowicz, 2005](#)) tend to be led by scholars well-established in their careers, with strong traditional records of scholarship, with an interest in a broad range of media as data sources for their research, and with a record of creative expression in their pre-digital work. That is, they utilized digital technologies to enable a richer data set to be exploited more fully and in keeping with the qualities of those data (video, sound, manuscript facsimiles, animated maps etc.)

Scoping of the field produces the following propositions about research/publishing innovation:

- a. current technologies associated with digital research and publishing require a significant investment of time by the researcher/s over that required for traditional methodologies and publishing forms;
- b. the "craft" features of these technologies do not require scholars to master all the skill sets, but do require them to understand the multiple work processes, and build teams in which the sets are present;
- c. most publishing outlets (such as academic journals) with online editions are reluctant to publish non-traditional forms of scholarly research (such as nonlinear digital projects) as journal status is a valuable commodity, and high status journals do not need (or want) to innovate: the demand by scholars to be published acts as a means of determining quality of article through "blind" peer review;
- d. peer reviewers operate within their own frames of experience and expertise; there are few reviewers available with the expertise and confidence to assess innovatory forms of publishing;
- e. young scholars with the skill sets needed to innovate are advised by mentors to concentrate on traditional high status outlets (journals, books) to build their profile for tenure attainment;
- f. it is likely therefore that only a limited number of established scholars (usually with tenure) will gravitate towards such projects.

In order to facilitate innovation it is therefore necessary to have a research and publishing environment that:

- a. allows the development of traditional research that meets scholarly criteria for rigour, and includes both quantitative and qualitative methods;
- b. interfaces with existing applications used by researchers in a range of HSS fields;
- c. provides both simple and more complex strategies of use, depending on the subject's skill and time investment;

- d. optimizes access to existing data through online linkage, while enabling the development of original data resources;
- e. manages digital resource rights;
- f. provides a powerful search and organize capacity (as exemplified by mSpace, an Open Source database/semantic web multimedia multiscreen search and association environment described at <http://www.mspace.fm>) ([Gibbins, Harris, & Schraefel, 2003](#));
- g. allows visualization of concepts and their relationships ([Zhang, Mostafa, & Tripathy, 2002](#)).
- h. keeps the data "alive" and potentially manipulable for end-users;
- i. bridges from the data into a range of publishing formats;
- j. supports interactive feedback, annotation and engagement by audiences;
- k. can be re-purposed for different audiences as appropriate.

The Humanities and Social Sciences are characterized by their engagement with the diversity of human experience, and through their disciplinary histories, the creation of knowledge about that diversity. Technologies have evolved to enable the richness to be plumbed ([Woodbury, Docherty, & Szeto, 2004](#)); current research demonstrates the intense interest and investment in the discovery and collation of that data, particularly in multimedia forms, its interpretation and communication. Yet the vast majority of scholarly publishing, even that which draws on such sources, either does not or cannot fully use them.

Modeling a solution to the integration of research and publishing

The report of the Australian e-Humanities research network to the Australian Research Council in reference to humanities computing makes great play, and rightly so, of the tremendous value of public investment in both archives and publishing ([AEHRN - Australian e-Humanities Research Network, 2004](#)). Yet only passing reference is made to the interaction between the two, as though this were a minor technical issue. However careful assessment of the literature and preliminary scoping research demonstrates that this relationship is now being identified as a central challenge - one addressed in the UK AHRC survey of ICT in research in the humanities ([ILRT- Institute for Learning and Research Technology, 2006](#)). The Australian report also noted: With modest leverage and the application of imaginative open source solutions, they [Australian humanities researchers] have built substantial humanities research resources adapted to Australian conditions. It is notable however that much work in digital resource creation has been individualistic, small-scale, and essentially hand-crafted. ([AEHRN - Australian e-Humanities Research Network, 2004](#)).

Examples of such work can be found through the e-Humanities research database (<http://www.acl.arts.usyd.edu.au/aehrn/>). In order to move beyond these limitations, we need to understand the process through which scholars in a range of the humanities and social sciences develop and undertake research, then explore this process through a work-flow model, and then design software that will facilitate this process. The work-flow has various segments, each with its own "problem" focus. Drawing on insights from selected work styles of traditional/experienced, digital/innovative and neophyte researchers, the project will select a limited number of "typical" orientations/ personas from a limited range of disciplines. Classical research approaches usually categorize these elements as follows:

- a. specification of research fields
- b. definition of research problem
- c. data collection and tools
- d. data processing

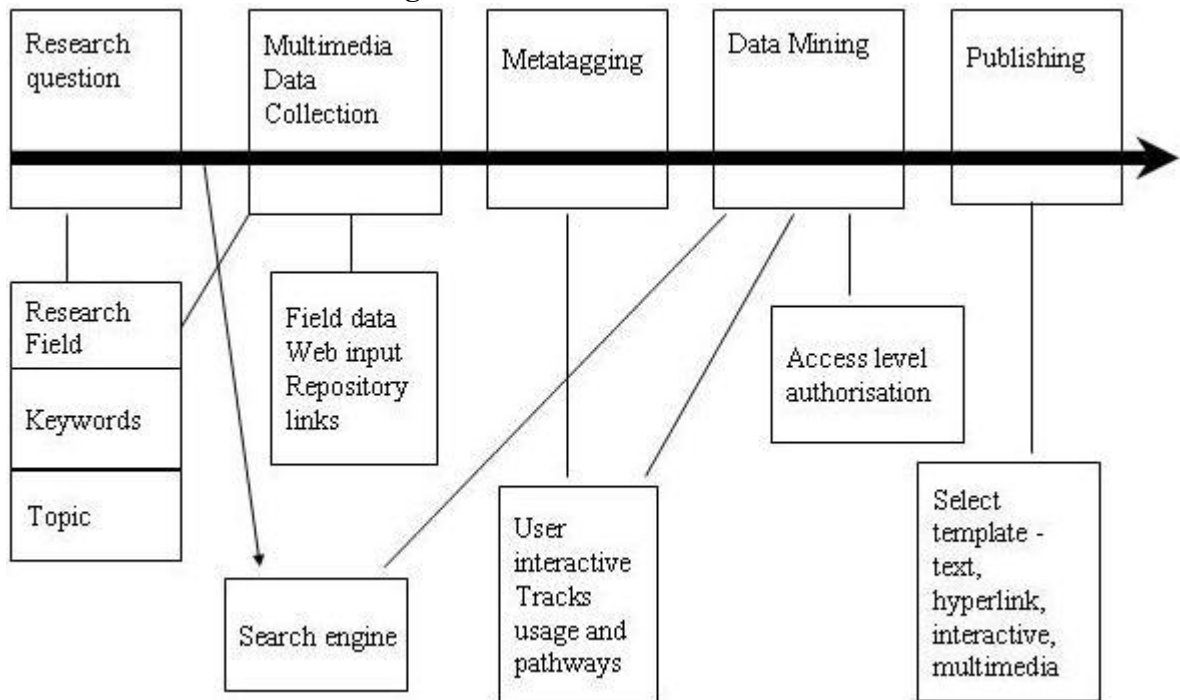
- e. data analysis/ hypothesis testing
- f. exposition of findings
- g. preparation for publication
- h. publication
- i. feedback and revision

These dimensions can be re-classified in a group of issues under discussion in the wider computing in the arts community. We can ask what the implications are of challenges such as:

- a. The lifecycle of e-research and its implications for infrastructure resources
- b. The recognition of non-traditional research output within the "reward" system of government research resource allocation (the new RQF in Australia)
- c. The improvement of research collaboration and the avoidance of duplication
- d. The development of metadata standards to facilitate the use of semantic web applications
- e. The problem of customizable and reliable web-based publishing formats.

If we bring these challenges together it is possible to model a simple flow chart of the steps involved in a digital research and publishing project. The project named as MIRE - in reference to the murky terrain as well as an acronym for the key elements of interactivity, multimedia data and research - can be stepped out conceptually as is done in Diagram 1. The work-flow models in skeletal form the movement through time of a research project.

Diagram 1: The MIRE Work-flow



The MIRE environment creates a work space where a researcher or group of researchers can create a project. The project would begin by requiring the researchers to specify a broad research topic, either for individuals or for members of designated research team. The topic has associated metadata, including the research fields and links to the websites of the researchers. Then as the research data is generated (in multimedia forms) they build a digital repository of research materials (using programs such as Portfolio), which is tagged to reflect the research framework, while applying Dublin Core and Text Encoding Initiative templates, as well as more elaborate coding. As the project repository expands, it can be searched to build inductive theoretical concepts that can be formed into research

questions - or indeed initial research questions can (and usually would) drive the development of the research materials in the DB. The repository grows in iterative cycles, as the search pathways are attached to the DB items. As the research process intensifies the researcher or research team would build commentaries and hypotheses around the data, which would remain attached for future researchers (and become part of the repository) should they wish to explore them.

The research pathways would be mapped visually, showing what materials were most useful in responding to specific questions, and the way in which different data items are conceptually related to each other. As the researchers begin to "write" their research results for publication, they would be able to choose one or more of a number of templates, that would produce "texts" suitable for publication in specific environments - online journals (such as the [Electronic Journal of Sociology](#)) or emerging e-journals and e-print solutions that incorporate peer review, more creative environments such as [Vectors: Journal of Culture and Technology](#) in a Dynamic Vernacular ([Jakubowicz, 2005](#)), web projects (e.g., American Historical Review ([Rozenzweig, 2006](#))) or in preparation for e-books (e.g., <http://www.nightkitchen.com>). The publication would have embedded links to the digital repository used for the research, enabling readers to comment directly on research items, link in to full versions of original documents etc. held in other digital repositories, and view a range of materials (e.g., excerpts of video interviews on a common theme) that underpin the research.

Conclusions

There is widespread recognition in the academy, government and the broad society of the potential value of ICT in the creation and dissemination of knowledge - and that knowledge societies will be the focal point for economic growth and social development in the future. The MIRE project identifies a fundamental problem in digital-research: that there exists a gulf between a) the collection, collation, manipulation and preservation of data and information, and b) the transformation of information into knowledge through the application of human creativity and its dissemination through new global information networks. The MIRE project will seek to develop a prototype of an application that is centred on the researchers (rather than the archivist or publisher), that maps the researchers' work processes, and provides them with tools that smooth the flow of their primary tasks - the creation and dissemination of knowledge. It will also document the process of research and development and provide models for software development based on user interaction. In conjunction with colleagues elsewhere in the software development community, the MIRE project has the potential to shift the paradigms of research in the humanities and social sciences, and enable literally tens of thousands of scholars to enter the digital world and thereby make their work more collaborative, more informed by other knowledge, and more accessible to colleagues and the wider community.

The MIRE project has the potential to produce a major transformation in the use of ICT by Humanities and Social Science scholars, particularly for those working with multimedia as their primary research materials. The ACLS report proposes that developments should facilitate collaboration, support experimentation, be sustainable, facilitate interoperability and be accessible as a public good ([ACLS](#) -American Council of Learned Societies, 2006). MIRE reflects the intent of this perspective, by enabling scholars to open a project workspace that responds to their needs as scholars, and that provides them with a range of tools. These tools will facilitate collaboration, the use of rich media, access to open repositories, an international engagement, and creative publishing, through building an interactive e-community of interest that offers fast, efficient and ongoing dissemination of research findings and scholarship.

By taking the scholar/researcher as the focus (rather than the archivist or publisher), and involving users in the development of solutions to problems that they identify, the project builds on research about the priorities of researchers, in order to create an environment that they will want to use, and that can significantly enhance their reach and impact ([Jakubowicz & Leung, 2006](#)).

While there are many institutional factors that inhibit creative methodological innovation in the research/outcomes pathway, we argue that two clusters of components are the most challenging - the legitimacy of the technology, and the accessibility of technology. Yet we know little about to what extent these factors figure in real-world innovation, or more particularly, how important and in which ways do each of them influence individual and organisational choices for change. We argue that it is the combination of legitimacy and accessibility that forges the toughest barrier, and it is therefore critical that both be addressed in any solution. Legitimacy refers to peer acceptance of innovatory methodologies and outcomes, and especially how the academic/ governmental reward system will interpret and value such innovation. Accessibility refers to the strictly technical side of the process, the skill sets and wherewithal required to produce something that others will recognise as "good". Together they serve to meld a new form of relationship among researchers, and between researchers and their various audiences. For if a legitimate and accessible process was to emerge, then a far more flexible, interactive and responsive research space would be created.

The benefits of developing and implementing such a concept are considerable - overcoming bottlenecks in the creation and dissemination of knowledge, opening up new pathways to collaboration, enabling research to be integrated directly into teaching, and involving the users of research in timely and effective feedback to researchers on the value of the research.

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