SmartFox: the Scholar's Browser for Digital Collections

Overview

The web browser has become the primary means for accessing information, documents, and artifacts from libraries and museums around the country and the world, thanks in large part to the tremendous commitment these institutions have made to bringing their collections online (as either simple citations or complete text and images). Unfortunately for scholars, while tens of millions of dollars have been spent to create digital resources, far less funding and effort has been allocated for the development of tools to facilitate the use of these resources. The browser remains merely a passive window allowing one to view, but not easily collect, annotate, or manipulate these objects. Moreover, from the user's perspective individual library and museum collections remain just that—separate websites with distinct designs and different ways of displaying their information, making traditional scholarly practices of bringing together and studying objects of interest from across these collections unnecessarily difficult.

SmartFox, a set of tools incorporated into popular, open, and free web software, will address these major problems by creating a web browser that is "smarter" in two key ways. First, one tool will enable the browser to intelligently sense when its user is viewing a digital library or museum object; this will allow the browser to ***capture*** *information from the page automatically, such as the creator, title, date of creation, and copyright information. Second, another tool will store and* ***organize*** *this information, as well as full copies of items and web pages (not just their citation information) if so desired by the user and permitted by the institution's site, allowing the user to sort, annotate, search, and manipulate these individualized collections created for scholarly purposes. Critically, all of this will occur within the web browser itself, not in a separate, standalone application; the web browser will be used not just to discover information, but also to collect, organize, and analyze scholarly materials.*

1. Assessment of Needs

The Opportunity: The recent news of Google's alliance with major research libraries to digitize more than 15 million books for searching and displaying on the web has created a splash in the world of libraries and museums. But the project represents more of an evolution than a revolution, placing a (vastly) larger number of texts that researchers want, in the place they want them—in a window on their personal computer. The much-anticipated announcement probably only confirmed what most people already knew: the web browser, which emerged barely more than a decade ago as a modest new way to access information on the Internet, has become the premier platform for accessing and researching collections in libraries and museums and for scholarly work in general.

It hasn't taken Google's largess (or commercial interests) to prod libraries and museums to take steps onto the web. Even before the web emerged as a popular medium, these institutions began working diligently—and often at great expense—to transfer or translate not only their electronic catalogs but also significant portions of their holdings in books, periodicals, newspapers, manuscripts, photographs, paintings, films, recordings, and artifacts onto their websites. Tens of millions of dollars have been spent to provide broadly democratic access to library and museum holdings. The seemingly impossible dream of a digital "Xanadu" in which a large portion of human knowledge is available to everyone at all times now seems much less fanciful than it once appeared.

The Problem: While libraries, museums, and commercial vendors have made enormous strides in

putting the world's cultural heritage at the fingertips of scholars, they have done relatively little to enable researchers to seamlessly incorporate those materials into their scholarly work. In effect, the availability of online scholarly resources has vastly outpaced the availability of scholarly digital tools. In the real world, scholars do not simply read, look, and listen; they actively take notes, they make photocopies and take photographs, and draw connections among objects housed in different collections. For such users, the library and museum collections are means to an end, whether education or the production of new knowledge, rather than ends in and of themselves. (*See Appendix A for references*.)

These scholarly practices, however, are not well reflected by many (if not most) library and museum websites. Most of these institutions have spent a significant amount of money on their sites, offering search capabilities and digital resources that dramatically extend the reach of individual researchers. Unfortunately, once users find the objects for which they are looking, the utility of library and museum websites drops considerably; researchers must crib together ad hoc systems to capture, organize, and annotate their findings.

We can do better. We don't expect a researcher to leave her pencil and notebook outside the library, forcing her to put down her book and run outside every time she wants to jot down a note; she is able to take notes in the library, at the site of her research materials. The same should be true of libraries and museums in their digital format—a researcher should be able to create and annotate her unique personal collections from within the common denominator across all such sites: the browser itself. And tools to do this should be available for free, and open to further improvement by the library and museum community, in the best interests of this community and its scholarly clients.

What has been done so far: A few libraries and museums have been exploring ways to offer their online visitors this sort of sophisticated experience. Some institutions have developed highly focused tools that enable enhanced interaction with digital objects, such as the Portland Art Museum's Image Zoom Tool or the Bookbag Tool used to store references in the Making of America digital library at the University of Michigan. Other institutions have created more general web applications, such as the Metropolitan Museum of Art's "My Met" service or the personalized portal sites offered by some university libraries, which allow users to create and save their own personal and customizable collections of digital resources.

These efforts are laudable, but limited. One problem is that only the most well-funded libraries and museums have the resources to build or maintain such customized software. Moreover, given the security issues and server complexities of running this sort of interactive software, even large museums and libraries with ample technical staff may not wish to program and install such systems. Even worse, those libraries and museums that *are* able to build more sophisticated functionality into their websites produce a bewildering array of tools and interfaces, a digital Tower of Babel that requires users to learn a different interface for each system, mastering new commands and protocols for each site they visit. These server-side applications generally require visitors to set up accounts and passwords that can be difficult to remember (e.g., "My Met," which also requires personal contact information that users may be loath to reveal). This is like requiring an art student to use a different kind of sketchbook and pencil at each museum she visits, or a researcher to use a unique note-taking system at each library archive. Most online researchers prefer to stick with their own ad hoc bookmarking and note-taking systems, limiting as those might be.

On the user's end, most note-taking and scholarly organizational tools are standalone applications such as EndNote, into which a scholar must laboriously cut and paste everything but basic catalog information when doing research using a library or museum website (and even basic catalog information can only be acquired using a library database connection that many scholars are unable to set up). One promising tool under development that avoids the cut-and-paste syndrome is the University of California, Berkeley Interactive University's "Scholar's Box," but even this still operates outside of the browser as a separate client application. Within the browser itself, built-in functionality such as the ability to bookmark and organize URLs into folders comprises an extremely weak version of the kind of organization that a program like EndNote allows.

What is needed: Over the past year, we have participated in a number of national meetings—including the Digital Library Federation "Scholars Panel" in June 2004; the "Humanities Computing Summit" organized by the University of Illinois, Urbana-Champaign, and the National Center for Supercomputer Applications in August 2004; several meetings of the ACLS Commission on Cyberinfrastructure for the Humanities and Social Sciences; and the Digital Library Federation's 2004 Fall Forum—in which scholars in the humanities and social sciences have called repeatedly for more effective and sophisticated tools for using online resources. In the fall of 2004, we organized a meeting of the Washington, DC Area Technology and Humanities Forum on "Digital Tools for the Humanities: What's Being Developed? What is Needed?" It attracted about seventy-five Washington area scholars, librarians, and curators, who echoed the same plea for improved tools for the serious researcher that has been voiced in recent reports from the California Digital Library and the University of California, Berkeley's Center for Studies in Higher Education.

Recognizing the growing interest in digital tools for scholars in the humanities and social sciences, we decided to create an open forum for developers working on digital tools. As part of our Echo (Exploring and Collecting History Online) project funded by the Sloan Foundation, we built and launched our Tools Center, a collaborative guide to the range of research tools currently available and under development. It has met an enthusiastic response, and within six weeks of its launch already comprised nearly eighty entries.

Through the Echo project, the Center for History and New Media (CHNM) has also established itself in the past few years as a developer of scholarly information tools, and in 2004 received a second wave of funding from Sloan to continue this work. To date, more than 2,500 researchers, teachers and students use our server-based Web Scrapbook and Survey Builder applications to collect and organize historical materials, and our Scribe bibliographic reference manager and note-taking tool has been downloaded more than 6,000 times. (Scribe provides some of the same functionality as EndNote but is free and more directed at serious scholars; it contains information management features that we will include in SmartFox.) Our Syllabus Finder has been used more than 300,000 times since 2003. The enthusiastic response to these very preliminary (and modestly funded) tools as well as the multiple pleas at recent conferences and forums indicates a great hunger among scholars for sophisticated yet practical tools for using and managing digital materials more effectively.

2. National Impact and Intended Results

What we will do: We would like to offer an alternate paradigm for the sophisticated digital museum/library experience. Rather than adjusting to the idiosyncratic options offered by individual institutions (if such tools are offered at all), we believe that users need at their disposal a set of

common tools that work across all museum and library websites, and the best way to offer such tools is to build them into the one common denominator of every online museum and library experience: the web browser itself.

Outside the specific realm of digital libraries and museums, new browser technologies that have arisen in the last few years have enabled the browser to be more than a passive window onto the Internet. Browser toolbars from Yahoo and Google have become very popular, providing one-click access to resources and added functionality. Amazon.com's A9 toolbar enables users to take notes on web pages. More recently, the open source Firefox browser has upgraded the venerable Netscape browser code, creating an extensible architecture that allows developers to easily add toolbars, extensions, specialized searches, and other advanced functionality.

These technologies present for the first time the possibility of a rich researcher's experience without the technical—or economic—burden on libraries and museums. Instead of complicated and expensive server technology tailored at great expense to each library or museum and hosted on their web server, the new browser technologies offer a *client-side*, or end-user solution to the management and manipulation of electronic records and objects that is smoothly integrated into the browser itself, rather than a separate standalone application. In short, it has become possible to provide researchers themselves with a highly functional browser that does everything—and more—that high-end, interactive library and museum website tools offer, at a far lower cost and without the stress on the technical systems or staff of these institutions.

We therefore propose to build a free and open source package of browser tools for libraries and museums—what we are calling SmartFox: the Scholar's Browser for Digital Collections—that will allow scholars to easily ***capture*** *and* ***organize*** *digital resources and enable the rich use of library and museum web collections at no additional cost in dollars or (perhaps more importantly) in secondary technical costs related to their web servers*. The set of extensions that will comprise SmartFox will be freely downloadable and installable on any of the major open source browsers related to the increasingly popular Firefox web browser: Firefox, Mozilla, and the latest versions of Netscape and the AOL browser (all based on the Firefox software). These extensions will enable users, with a single click, to capture a citation to a book, journal article, archival document, or museum object and store it in their browser. Researchers will then be able to take notes on the reference, link that reference to others, and organize both the metadata and annotations—all right in the browser window—in ways that will greatly enhance the usefulness of, and the great investment of time and money in, the electronic collections of museums and libraries. All of the information the enhanced browser gathers and the researcher creates will be stored on the client's computer, not the institution's server (unlike commercial products like Amazon's toolbar), and will be fully searchable. The web browser, the premier platform for research now and in the future, will achieve the kind of functionality that the users of libraries and museums would expect in an age of exponentially increasing digitization of their holdings.

We believe that SmartFox will have a profound national impact on libraries and museums and on the work of scholars. For libraries and museums, it will relieve the need to build personal collection tools for their users. Even more important, it will greatly leverage the substantial investment they have already made in digitizing collection materials, insuring that these collections will be used more extensively, carefully, and with full respect for rights. At the same time, it will allow scholars to seamlessly capture, organize, and annotate digital materials from diverse, heterogeneous sources

and enable better provenance and rights tracking of these materials. Students, as apprentice scholars, will learn good citation practices through their use of SmartFox. In sum, SmartFox will simultaneously improve library and museum services (with no cost to the institutions) and enhance the quality of scholarly research. And although SmartFox will be developed in particular collaboration with faculty and libraries in the Commonwealth of Virginia, we see a national audience benefiting from the resource.

3. Project Design and Evaluation

Extending the Browser with the Scholar in Mind: With nearly 20 million downloads in the first three months of its 1.0 release, the Firefox web browser has emerged as a serious competitor to the dominance of Microsoft's Internet Explorer, which has not been upgraded in years and is rapidly losing market share to Firefox. This market shift has been encouraged by the insecurities inherent in the aging Internet Explorer and the advanced features of Firefox. But Firefox is not just an technologists' browser or an idealistic open source movement—it is rapidly gaining adherents in business and home offices, as well as in the world of libraries, museums, and academia. Walt Mossberg, the influential technology columnist of the *Wall Street Journal* suggested in September 2004 "dumping Microsoft's Internet Explorer Web browser" for Firefox, and concluded in his year-end column that "Firefox is my current choice of a Windows Web browser. It is to IE in 2004 what IE was to Netscape in 1996—the upstart that does a better job."

An open source descendant of Netscape, Firefox offers developers a truly cross-platform starting point from which to build new functionality into the browser window through extensions (using JavaScript) and new interfaces (using the XML-based XUL language). For our purposes, Firefox's extensibility and flexibility make it an ideal foundation; SmartFox itself will exist as a general package of Firefox extensions, easily downloadable and installable from a central repository as well as from the sites of individual libraries and museums that choose to promote it. Moreover, we will offer a "branded" version of Firefox with SmartFox extensions already installed, which will essentially function as a standalone digital research application.

Major components: SmartFox will offer two sets of enhancements that will simply, though significantly, augment the capabilities of the familiar web browser. (*See Appendix B for two sample use cases and illustrations*.)

- The **capture** tool will allow the researcher to seamlessly collect both digital objects and all available metadata. When a user loads a web page, a small icon at the bottom of the page will appear if any digital library or museum objects are detected (much like the Firefox icon that indicates an available RSS feed). Clicking this icon will highlight each object that can be "collected," and subsequently clicking on a given object will save it into the user's personal collection. SmartFox will download a pointer to the object along with its relevant Dublin Core metadata, and may also save a copy of the object itself, depending on user preferences and the permissions associated with it. If there are no recognizable library or museum objects on the page, the researcher will be able to save the entire page as an object.

- The **organize** tool will enable researchers to organize, search, and annotate the digital materials and metadata they have collected. It will place a free and enhanced version of a tool like EndNote (or CHNM's own Scribe) directly within the browser. Once records are stored locally (as XML files on the user's hard drive), scholars will be able to search them, annotate

them, tag them with user-defined categories and keywords, and browse their collection. When the resources are used in writing, the scholar will be able to automatically generate proper footnote or bibliographic citations. The open architecture of this system also allows for the development of additional features, either by the original development team or by the user community as a whole. Moreover, the choice to store local records in a standardized and open XML format allows for the integration of SmartFox with other applications; we expect that future extensions, for example, will enable users to publish and share annotated bibliographies via the web (as collaborative web filtering software like del.icio.us does).

Autodiscovery and "Translators:" To be truly useful to scholars, SmartFox must be able to recognize discrete digital objects, from MARC catalog records to digitized versions of physical objects in digital libraries and idiosyncratic museum exhibits. To make this work, we will implement object discovery using an open plugin architecture, enabling users to install the discovery filters they need now for specific collections or catalog standards, while leaving open the ability to connect with future standards and technologies as they become available.

On one level, the application will be able to link up with server-based XML autodiscovery standards that are beginning to proliferate within the library community. Groups of developers (like the subscribers to Dan Chudnov's GCS-PCS listserv, for example) are currently exploring ways to embed metadata either within or alongside HTML display pages, and SmartFox's open architecture will allow us to design plugins that will tell SmartFox how to recognize embedded or associated XML, leveraging the work of these pioneers as they develop standardized practices. We intend to build plugins for the most important of these standards as they emerge—for example, an Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) plugin that will function like a client version of the University of Michigan's server-based OAIster, automatically acquiring metadata belonging to digital objects that adhere to the OAI-PMH XML schema.

Unfortunately, widespread XML autodiscovery is still a ways off—even the five million records available through OAI-PMH represent a tiny fraction of the universe of library and museum records —and will still raise the server-side issues discussed earlier in this proposal. As inelegant as it is, pulling information out of the raw HTML ("screen-scraping") is still the only way to extract metadata from many pages. With that in mind, both developers and users also will be able to create "translators" for unique page formats, small files that will indicate the ways that objects and their associated metadata are tagged and formatted within the HTML of specific sites. By creating a translator for its specific site—a simple process of creating a short XML file that most institutions with existing web-accessible collections will only need to do once—a digital content institution will be able to offer this additional usability without having to edit its pages or adopt new standards, and could automatically populate metadata (for example, creation information) across a given collection. Translators also will incorporate rights and permissions management, so that an institution can specify the copyright status of its holdings and telegraph the allowable uses of downloaded objects to the end user through the SmartFox system. By the same token, a user who found herself using a particular digital resource could also develop her own translator (rather than having to manually enter metadata over and over), sharing it with the community of users via a central translator repository. For the researcher, the automatic capture and organization of metadata is not only a huge time savings, it also fosters accurate citation, which is the heart of good scholarship. As part of this project, we plan to create translators for the most important resources to scholars, both on our own as well as in collaboration with some libraries and museums:

- Major digital archives such as the Library of Congress' American Memory, the University of Michigan and Cornell University's Making of America, and the California Digital Library;
- University library systems using major cataloging software systems, including Voyager, Aleph, Sirsi, and VTLS;
- Public catalogs like the Library of Congress' online catalog and OCLC's WorldCat;
- Gated online collections including ARTstor, JSTOR, Dissertation Abstracts, Lexis/Nexis, InfoTrac, Project MUSE, the History Cooperative, and ProQuest;
- Museum websites like those of the National Gallery of Art and the National Museum of American History's History Wired;
- Private resources like Amazon.com and popular media sites like washingtonpost.com, nytimes.com, and Yahoo! News' AP news feeds;
- Standard online genres including blog posts and wiki pages;
- A generic translator, which will attempt to save standard metadata on a web page itself should it be unrecognizable by any other translator (much like Andy Powell's Dublin Core generator).

Finally, SmartFox also will include a manual input form for use by scholars to enter metadata for interviews, essays, and other materials they create themselves, along with the ability to easily generate rights permissions for such objects.

Evaluation: Throughout the development stages we will work closely with a local advisory board of experts in the field of digital libraries, library science, and museums, to ensure the most interoperable, most compatible with existing protocols, and most useful tool. (*See list under 4.)*.

While this group will provide the advice of leading figures in the world of museums and libraries, we also need to ensure that SmartFox meets the needs of scholars. As practicing historians, we are intimately attuned to the needs of scholarly researchers, and this personal investment substantially informs the design of the tools we build. As users ourselves, we particularly recognize the importance of user testing, and envision several waves of user surveys/focus groups. First, before beginning development we will discuss SmartFox with local groups of researchers across the humanities and social sciences at our home institution (GMU) to help pin down the specific feature set that will be most useful to practicing researchers, making sure that it aligns with their needs and practices.

In the next stage of testing, we will make use of our alliance with VIVA, the Virtual Library of Virginia, which represents all libraries of the thirty-nine state-assisted colleges and universities as well as thirty of Virginia's independent (private non-profit) colleges and universities—a heterogeneous collection of institutions ranging from major research universities to small liberal arts colleges to rural community colleges. (*See VIVA organizational profile for more information*.) During the first round of local beta testing, we will undertake a series of surveys and short interviews with individual users at schools affiliated with VIVA that will help us to refine the application. We also will use our "Doing Digital History" summer workshops for younger scholars in the history of science, technology, and industry (co-sponsored by the American Historical Association) as another focus group for discussing SmartFox features. Finally, we will return to larger focus groups six months after the full roll out, in order to assess its utility to the scholarly community, and outline future directions for development. Once released to the public, as with most online applications, download statistics will offer a rough measure of the success of SmartFox.

Work Plan:

Fall 2005:	Initial user survey/focus group at GMU; design SmartFox architecture (capture tool and translators, organization tool and XML storage formats);
Winter 2005/6:	Development of capture and annotation tools, and integration of these tools with the Firefox browser;
Spring 2006:	Initial field testing of capture tool (with pre-defined content and GMU library translators)**;** development of additional translators; beta testing of organization tool with GMU faculty in various disciplines;
Summer 2006:	Broader beta roll out to VIVA schools, including both capture and organization tools; focus groups/user survey assessment of beta with VIVA faculty and with Doing Digital History workshop participants;
Fall 2006:	Redesign based on preliminary assessment result;
Winter 2006/7:	Launch of translator clearinghouse; launch of download site; upload to Mozilla directory;
Spring 2007:	Outreach and dissemination: site visits, conference presentations, press;
Summer 2007:	Follow-up focus groups and creation of road map for future improvements.

4. Budget, Personnel, and Management Plan

Budget: The total cost of *SmartFox* is $378,104. Of this amount, $128,684 or 34.03% is non-federal cost share from GMU. The remaining amount of $249,420 we are requesting from IMLS. This contribution will pay for non-permanent project staff at CHNM, research assistants, advisory committee honoraria, software, travel, and evaluation and dissemination costs. All IMLS funds will go to CHNM, which has a long track record of managing federal grant money and doing cost-efficient, high-quality digital projects.

Personnel: (*See Personnel Resumes for CVs and Appendix C for biographies*.)

Roy Rosenzweig (Principal Investigator) will chair the advisory committee and oversee the grant, as a whole; he will have particular responsibility for scholarly input.

Josh Greenberg and *Dan Cohen* will serve as co-directors of the project. Both have backgrounds that combine PhDs in the humanities and social sciences with experience in software development. That unusual combination of talents allows them to take the lead on designing, building, and testing SmartFox.

Programming assistant: While Cohen and Greenberg will design the overall SmartFox system and program some of its critical pieces (including the initial set of translators), the programming assistant will work on additional translators with GMU, VIVA, and other library and museum institutions under their guidance. The programming assistant also will implement some secondary features, and provide technical support to the early users of SmartFox.

Library/Museum/Scholar Outreach Coordinator: The coordinator will work closely with the SmartFox collaborators—especially faculty and librarians at the VIVA schools but also the members of our advisory board—in their ongoing deployment and use of SmartFox, and reach out to a much broader circle of libraries and museums that wish to adopt and promote the tool in the second year of the grant.

Local Advisory Board: Abby Smith (Council on Library and Information Resources; CLIR): Clifford Lynch (Coalition for Networked Information; CNI); David Seaman (Digital Library Federation; DLF); Martha Anderson (Library of Congress); Matthew MacArthur (Smithsonian National Museum of American History); Wally Grotophorst (George Mason University Library); Kathy Perry (VIVA). (*See Appendix C for biographies of advisory board members and Appendix D for letters of commitment.)*

Management Plan: CHNM's extensive experience in digital projects equips us to manage the planning, development, and dissemination of SmartFox. In addition to more than a dozen major website projects, we have created a suite of digital tools for historians and humanists that have been widely adopted by scholars and students. And we have at least three related projects currently underway: a grant from NEH to develop digital tools for teachers and students as part of their EDSITEment Portal for digital humanities projects; a collection management system for the National Museum of American Jewish History; and a conference management system for the American Studies Association.

The day-to-day work of the project will be overseen by Josh Greenberg and will proceed by way of weekly production team meetings, periodic consultations with local advisory committee, and frequent communication via email, blog, instant message and conference call. Open communication among the managers, coordinators and staff will ensure that we integrate the comments of the advisory committee into production, and that we meet all of our project deadlines. This system will result in project staffing that makes the best use of personnel expertise, while emphasizing communication and flexibility at every stage of the project.

5. Dissemination

SmartFox will be distributed first to faculty and librarians at VIVA affiliates—a system with more than 300,000 students—for beta testing facilitated by those in charge of its library technical systems, including John Duke, Senior Associate University Librarian, Virginia Commonwealth; Mack Lundy, Systems Manager, William & Mary; Curtis Carr, Director of Library Systems, Virginia Tech; Jim Campbell, Director of Library Technology Services, University of Virginia; and Mary Ann Chappell, Head of Systems, James Madison University. These tests will be organized by our outreach coordinator. Once the initial version software is ready for wider release, we will host a download of the compiled SmartFox extensions on our site, as well as the source code (for developers who would prefer to view the open source). The software will also be added to CHNM's popular suite of tools, which currently receives more than 400,000 visitors per year, and will be featured on our website, which gets more than 8 million visitors per year. In addition, links from library and museum websites will direct the visitor directly to information and a free download of SmartFox.

To introduce SmartFox to the scholarly community, we will work with organizations like the American Historical Association, the American Political Science Association, American Studies Association, and our library and museum partners. Here, we will be aided by the fact that so many major scholarly and library associations are concentrated in our immediate area (Washington, DC) and that our advisory board includes leaders in the museum and library communities. For example, we will take advantage of presentation opportunities offered by CNI and DLF, whose regular meetings attract those at the cutting edge of developments in digital libraries and resources. We will announce the full launch of SmartFox through the journals, newsletters, and e-mail listservs of

various disciplines (with a particular focus on the humanities and social sciences). We are particularly well positioned to disseminate SmartFox among professional historians; in January 2006, for example, we will sponsor a session on digital tools, featuring our work on SmartFox, at the Annual Meeting of the American Historical Association. We will also publicize SmartFox using *History News Network*, a CHNM affiliate, which reaches 11,000 historians twice a week with its electronic newsletters, as well as our own mailing list (which includes more than six hundred people with a particular interest in digital resources). Press releases from the George Mason University Press Office will alert the general media covering academic affairs, including the *Chronicle of Higher Education* and other publications, which in the past have featured CHNM's work.

A dedicated staff member will manage outreach and publicity efforts. This "outreach coordinator" will straddle the library/museum and academic worlds, and will run workshops and demonstrations for both content providers and academic users, particularly at the VIVA schools but also at national meetings. She will moderate our beta tests and evangelize the final software; in short, she will be the public face of SmartFox.

As the translator plugins (as described above) are a vital part of the SmartFox architecture, we will host a central registry of downloadable translators (as the Mozilla Foundation does with existing Firefox extensions). We will encourage the creation of translators by independent institutions, offering step-by-step, non-technical instructions explaining how anyone with a working knowledge of XML can create a translator for any library or museum website. In addition, we will offer a "Translator Wizard" (either as part of SmartFox itself or as a standalone application) that will guide institutions through the process, making the creation of a translator for a given site a matter of pointing and clicking.

6. Sustainability

CHNM is committed to nurturing the SmartFox project for the long haul. As noted, we have already devoted considerable attention to developing free digital tools for historians and history teachers. With the help of an NEH Challenge Grant, CHNM has raised a $2 million endowment. That endowment (as well as our success raising other funds) allows us to guarantee that SmartFox will be a permanent resource for scholars. Significantly, other major history projects—such as the award-winning *DoHistory*—have been given to CHNM because their creators believed they would find a more permanent home among other leading digital history projects.

The open architecture and standards of both Firefox and the SmartFox extensions will enable future development, and we envision the software as a living and sustainable project after its release, both enabling current users and facilitating a shift toward user-side personal collection systems that are interoperable across individual libraries and museums. To foster the future work of other developers, we will produce a document outlining the technical details of how SmartFox works, and how developers of other organization and presentation tools might hook their applications into a SmartFox collection. In addition, we will host a discussion forum for users and developers to share their knowledge and explore new directions for this software.