User Centric Design and Implementation of a Digital Historic Costume Collection

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This paper reports on the human factors considered in the design and implementation of a digital museum for historic costume. Starting with a thorough elicitation and analysis of the qualitative as well as the functional needs of its users, an evolutionary prototype has been developed for a model of digital archiving that delivers a gratifying web experience, visually and interactively. The prototype is a standards and best practices based information system with the interface designed to be accessible for anyone with World Wide Web experience. An online category thesaurus has been developed to enhance the classification of, and access to, images and data about historic costume. Standards and protocols of the Open Archive Initiative (OAI) and the Museums Online Archive California (MOAC) are being implemented to broaden the user base by making the system portable and extendible.

An Archive is Born

Drexel University houses the Drexel Historic Costume Collection (DHCC), a teaching collection used for research by students and faculty of the College of Media Arts & Design. The Drexel Historic Costume Collection had its beginning in the 1890's when family members of A.J. Drexel, the founder of the University, began assembling a collection of notable garments, accessories, and textiles. The Collection represents two hundred years of historic costume and textile design. Shoes, millinery, parasols, gloves, and other accessories in the Collection present an opportunity to study an entire period ensemble. The Collection is estimated to contain approximately 7000 items, including garments by such notable designers as Charles Worth, Charles James, Adrian, Chanel, Givenchy, and examples from most contemporary designers.

The Collection has been available to the public through changing shows and by appointment with the curator. Design faculty uses selections from the Collection in teaching fashion design and history; and students as part of Independent Study and Special Topic classes. The curator, Bella Veksler, has published two books which include photographs and information about the fans and the large number of excellent examples of lace in the Collection. (Veksler, 1998, 2000). Individual access by scholars and students to the physical collection is limited to those times when the curator is available. Storage space is fully utilized. To date, accession, management and minimal archival data has been stored on 3”x5” paper files.

In order to realize its potential as a teaching and research resource, Renee Chase, Director of the Fashion Program, College of Media Arts & Design (CoMAD) approached, Kathi Martin, Director of the Graduate Fashion Program and Assistant Professor, CoMAD, to create an electronic database that would include archival data and a thumbnail photograph of selected objects from the collection. As she was pursuing an MSIS in the College of Information Science and Technology (IST), Drexel University, the project became an excellent case study for her research in information architecture, 3-D interactive design, and quality image capture. She became Project Director and was joined in the project by Dr. Abby Goodrum, Assistant Professor, College of Information Science and Technology (IST), and collaboration between the two colleges was begun that continues today with Dr. Xia Lin, Assistant Professor, IST, and Associate Director for the project. The request for an electronic archive became the development of an online, searchable database, to increase access to the collection by students and the public. Lois F. Lunin, editor, JASIS Perspectives, author of many articles on image information systems and active fiber artist consulted in preparation of this paper.
User Needs Are Revealed

To begin development, we undertook an analysis of potential users and resources. The purpose of the analysis was to provide a user-centered framework for designing the database and to identify low cost methods for delivering the database. The analysis involved nine steps:

1. Define our mission and responsibilities.
2. Identify population to be served (users).
3. Identify users' needs.
4. Define access points based on needs of users.
5. Identify internal as well as external sources of database creation and support.
6. Identify internal (free) resources for data input (catalogers).
7. Evaluate consistency of catalogers/identify training needs.
8. Develop the database using a small sub-set of items from the collection.

Survey, interview, and observation of fashion scholars, students, design professionals and educators, were used to target user groups, and identify the work environment, available technology, frequency of web use, and other methods of research currently used by the target audience. “Wish lists” of features were elicited and prioritized. Although the work environments, research methods, and technology were varied, the functional requirements were similar. We discovered that what all the users wanted most from this site were high quality images, multiple views and details of the objects in the collection, and multiple ways to create parameters for their online search (Goodrum & Martin, 1999). Our design model is evolutionary prototype, which allowed us to address these common requirements first, test them on the users, and incrementally add features in repeating cycles of design, implementation and testing. Thus the user is included throughout the development process.

A branding keyword dictionary was created from domain language defined in the analysis of the information collected. Adjectives, both positive and negative, used to describe other websites were noted, counted and ranked. This dictionary provided clues as to how the interface should look – uncluttered, fashionably colored and without scrolling and gimmicks or graphics that “didn’t do anything”.

Web Interface Design

In a presentation for “Doors of Perception”, Malcom McCullough states, “The (web) environment is not scenery that you go to, it’s a way of knowing. Design is a process of adding value.” (McCullough, 2000).

Creating and displaying quality images are two driving factors in this web interface design. The challenge was to create a search environment where the image of the object is the dominant information source and reference, enhanced by intuitive navigation links to textual information and quality graphics. In our design solution we use as sparse directives as possible to deliver the highest quality images in a reasonable retrieval time within an attractive space. The images direct the web event and have a prominent presence in it. The evolutionary prototype for the project may be viewed at http://digimuse.cis.drexel.edu.

High quality image capture is costly in both human and technology resources. The ICOM guidelines for photographing Historic Costume have been followed. (ICOM, 2001). Although they are written for digital masters produced by scanning rather than 3-D digital photography, the Digital Library Federation guidelines (Frey, 2000) are referenced as a framework for quality image capture, as are the Museum Online Archive California (MOAC) archival image standards (MOAC, 2000). These standards guarantee images of a high resolution and size, allowing the image to be cross purposed for print and stored as true archival quality files in uncompressed TIFF format.

The domain expertise of the CoMAD faculty provides valuable insights into how to best represent the garments on the web site. The curator’s background is in design and historic costume and she has 20 years of experience teaching from the Collection. The Director has a degree in Fine Arts as well as 25 years of experience in professional Fashion Design. Design faculty at CoMAD, all of whom have professional experience and are representative of several of our user groups, provide expertise and criticism in evaluation of design decisions that are made throughout the development process. The research of the IST faculty in designing and implementing web/database interactivity and their expertise in classification structure create the backbone of the system. The interactivity between these two developer/user groups is paramount to the development of a dynamic interface and database. Several sample screens of the Web site are shown in Figure 1 to 4.
Figure 1: Search Screen

Figure 2: Full Information Screen
Figure 3: Detail, Full Information Screen

Figure 4: Registry Screen, Data Entry Form
To address the consistent need from all users for high quality graphics, close up views of garment details, and multiple views of each garment, we hired Dave Gehosky to photograph the garments and develop 3D panoramas of the objects using Apple’s QuickTime Virtual Reality (QTVR). Dave had worked with Bella Veksler, curator, on her books and was both familiar with the collection and practiced in fashion photography, helping to insure we would be capturing the highest quality images and details of the garments. The quality of the display and efficiency of access to these information rich images comprise the driving forces in the design of the system, as required by the users.

First consideration in the pursuit of optimum display for the garments is how to mount the garment. After photographing a group of garments against several color choices for the mannequin’s surface and showing them to several faculty and designers, we decided to use a mid tone grey, a neutral against which all garment colors, and black or white, would stand out. The garments are mounted onto the mannequins, placed on a Kaidon rig, and photographed every 10 degrees of the rig’s rotation, providing 36 views of each garment. Following recommendations from the curator, design and embellishment details are photographed. These views are then stitched into a movie which allows 360 degree rotation of the garment. After testing several configurations of the QTVR movies for load time and smoothness of motion, we decided to create them from 18 views and size them as large as designing to a 480x600 pixel screen size would allow, with no scrolling.

We next considered backgrounds for the objects for thumbnail images and the QTVR movies. All images have the same background of a pale grey ombre. This ombre provides a soft background which enhances the display of the garments. Finally, web safe, #000033 blue/black was chosen for the screen background color to contrast with the object background and enhance the images. A 12 point, web safe, #999999 grey Verdana font was selected for readability.

Design metaphors were developed from observation of the various users’ work environments, and of user’s behavior viewing other websites offering similar capabilities. Appropriating from the fashion show environment, we decided to use a “runway” of images moving across the top of the search screen with drop lists of search criteria below the images to provide both a visual and a textual means to search the database. The user may view all the images having QTVR movies in the database by clicking “more” next to the images as they move across the top of the screen in the runway, or, narrow his/her search by period, designer, category, fabrication, or donor choices from drop lists under the runway. The viewer controls the number of images he/she may view by continuing to click on “more” and may move forward and backward through the runway with the directional arrows. Lengthy wait time is avoided by only loading six thumbnails per click on “more”. Runway speed controls will be added at a later date. The user chooses to view the QTVR movies details and archival information by clicking on the thumbnail.

The quality of what we have produced has captured the attention of several international communities – Costume Society of America, where the Director now serves as Vice President of Technology for the Executive Committee, The International Textile and Apparel Association, Museum Computer Network, and the International Worldwide Web Conference – all venues where papers and presentations about the project have been delivered.

A Barra Foundation grant of $171,280 is currently funding, for one year, the digital photography of objects from the collection, as well as providing for the implementation and generation of metadata for these objects compliant to the protocols of the Open Archives Initiative (OAI). We project 300 QTVR movies to be created in this time frame. This will very thinly populate the database, but will supply the quality of images and archival information needed for design research. Jack Lenor Larsen, principal of Larsen Design and world renown designer, author and collector of design, and evaluator/advisor for the grant, has stated that choice of garments and details, and the quality of these images are among the highest he has seen and will make an excellent research and teaching tool for scholars and students of design.

Database Design

The highest user priority of high quality images, multiple views and details of the objects in the collection has been addressed in the interface design. The other priority of multiple ways to create parameters for their online search is addressed in the database design.

The database for the system is relational, with tables created from the classes, relationships, and instances necessary to deliver the functions of an information system that would manage both the physical collection and its digital counterpart. The Entity relationship diagram of the database is provided in the appendix.

With a one year deadline and a budget constraining the resource hours for the project, we decided to first develop the Costume Table, which contains the Registry and Descriptive data necessary for Dublin Core compliancy, the twelve elements necessary for OAI metadata harvesting. This is the kind of data available for most of the objects in the collection. We also developed the Image
Table to manage the images being created by the digital documentation team.

The Collection had not had a full time curator in some time, and moved to two locations. It has been accessioned by a variety of staff, with three different numbering systems used as object identifiers in record keeping. This posed a real dilemma in creating a unique identifier for the objects in the collection that did not, in some cases, include the universally accepted biblio-numeric (accession date, number of objects in accession, sequence of object in accession).

Caroline R. Arms, in her report on Lessons and Challenges at the Library of Congress (Arms, 1996), recommends establishing naming conventions early in a digitizing project. The naming convention not only establishes a unique, persistent identifier for each object in the collection, but also can provide structure for project control. We needed a naming convention that would create unique identifiers for the objects in the collection, indicate the use of the file, provide some description of the object for internal use, and allow for the identification of the source of data supplied to data repositories. This naming convention is used for large archival images captured at 300 dpi resolution for print as well as smaller JPEG and .MOV files at 72 dpi, used for the web. After experimenting with several formats that were combinations of the designer name and number designators, we adopted the following convention:

Sysgen#FullDesignerNameObject#_recto/verso (front or back side of object)_file type_file extension

A sample: 023CharlesJames01_r_th_JPEG

The 023 is a systems generated object ID number, unique to the object and transparent to the data entry person. CharlesJames is the designer and this is the first of his garments to be archived. It is a front view, thumbnail image with a JPEG file extension, indicating it is for the web. The type of information incorporated in this convention is meaningful to the human beings involved in the data entry as well as providing a unique object identifier for the system.

It is the job of the designer/developers to “provide the conditions and environment that maximize (user) satisfaction and allow them to focus on and achieve high task performance” (Barcellos, et al. 1999). There was a great deal of “ad lib” HCI analysis and functional analysis activity throughout the development process to determine the quality of how the information system and interface design guided the user through both the data entry process and the information seeking process via the search function of the world wide web interface. The internet was used to support this activity, in a “multi tiered participation model” (Goodrum & Martin, 1999) of designers, developers and directors. Three websites are maintained for this purpose. There is a site where thumbnails, after being entered into the system, are viewed for consistency in scale, brightness and detail, and performance on the runway. Interface design updates are developed from this site and can be viewed and commented on by all team members and whoever from the community of scholars and students the teams wishes comment. Changes can be made and shared here without disturbing the performance of the public site, http://digimuse.cis.drexel.edu. A third site is reserved for testing programming and database changes.

Design of the data entry system interface (Figure 7) began with dividing the data into registry, descriptive and image information. The registry information screen displays the thumbnail with the naming convention and automatically adds, transparent to the data entry person, the objects generated unique ID number to the object ID. All data necessary for classification of the object is done from this screen. Curator notes, text description, fiber content, textile construction, embellishment, measurements and pattern availability are entered on the descriptive screen. New and updated thumbnails, QTVR movies or full graphics are loaded from the image screen. More formalized testing will be done as the database is populated and the developmental site migrated to the publicly accessed URL.

**Category Thesaurus**

To accomplish this, a thesaurus is being developed which marries the International Council of Museums, (ICOM), hierarchy of costume terms which identify a historic costume’s category by where it falls on the body, to contemporary fashion and historic costume terms for category. A branch of the “Category” thesauri, “Women’s Garments” has been fully developed to be used as a model for all branches of the “Category” thesaurus in later development (Figure 5). Currently, we are developing a thesaurus editing tool to allow experts to edit the specific branch of the thesaurus with which they are most familiar. A full description of the “Women’s Garments” hierarchy may be viewed at http://digimuse.cis.drexel.edu/thesaurus.jsp.
The thesaurus serves two important functions in the system. One is to standardize the category entry of each item; the other is to facilitate browsing and searching. The data entry user can enter a “category” choice from one of several levels of the thesaurus. When the data entry user makes a choice all categories further up on the hierarchy are displayed in the field, identifying the category choice in various levels of abstraction. Aliases to higher levels of abstraction were created for all leaves on the “Women’s Garments” branch of the “Category” hierarchy to enable this access. The aliases also link choices from the criteria drop lists on the http://digimuse.cis.drexel.edu/search.jsp interface, where choice is limited to most frequently used criteria.

Let’s look, for example, at dress as a category. At this level in the thesaurus, there are seven entries for various ICOM classifications of dress,” Dress - one piece”; “Dress (1.1) one piece with shape for legs; “Dress (2) two pieces”; “Dress (3) three or more pieces”; “Dress (4) one to three pieces, with additional, optional piece”; “Dress (5) one piece needed additional garment for completion”; “Dress (6) two pieces needing additional garment for completion”. A three piece dress consisting of a sleeveless top, skirt and jacket, would be archived as ” Dress (3) three or more pieces”. The “aliases”, coded pointers which link the entry to the higher levels of abstraction, allow the archivist to see the entire category tree above the ” Dress (3) three or more pieces” level – “Women’s garments”>”Main garments”>”Covering the body above and below the waist”> ” Dress (3) three or more pieces”, when he/she makes an entry.

We have developed” Dress - one piece” to an even lower level of abstraction in the hierarchy. If the archivist makes a “Dress - one piece” level, he/she will get the opportunity to more narrowly define the entry from a drop list of various types of one piece dresses – apron, bustle, chemise, shirtwaist, etc. Likewise, a scholar searching for one piece dresses from the view mode of the data entry form, will be offered the same, expanded list of choices. At this level new aliases can be added as the terminology choices are extended to accommodate recommended terms from costume scholars and new fashion terminology.

From the “View” screen, the user chooses “object type” and “select by”, then selects a designer, category, period, donor or object ID, from a list and a completed record, with thumbnail, is displayed. The lowest level of the category choice is displayed. Clicking on the expand button, shows the entire hierarchy of the category choice. When we add a “search by keyword” function to our “search” screen, these aliases will create multiple levels of access for searching the database, by allowing the user to enter a garment term from one of various levels of abstraction, providing a gratifying web search experience for scholarly, student, designer and aficionado audiences.

Continued development of all branches of the category thesaurus, with the community of historic costume scholars, via an online tool, is a future goal of the project. Recognized scholars will also be invited to submit their edited research to various tables in the database such as designer and manufacturer.

OAI Standards Implementation
To more fully serve our user population, we intend to make our Web site and our database comply with the application-independent interoperability framework defined by the Open Archive Initiative (OAI, 2002). There are three incentives for us to do that. First, the framework provides an excellent guideline for implementing metadata for our collections. Second, by creating OAI-PMH compatible metadata records, we are opening up our resource to OAI service providers and potentially reaching more audiences through them. Third, the interoperability of the framework will help us achieve the goal of making our system portable and extendible.
second is the dc:subject field. A garment may be categorized as “Special Occasion.” But without a visual image, this category may not be useful for browsing and searching. The implementation decision is to include all the terms in the upper hierarchy of the term in the subject field. Therefore, instead of “special Occasion”, it becomes “Women’s garments -- Main garments – Dress, One piece – Special Occasion, Day.”

Conclusion

You can say a little to a lot of people, or a lot to a few people. Believe it? Is it quality or quantity that delivers more value to the user?

Increasing the quality of the data increases its relevance to more users by, making it more appealing to more people. Increasing the quality of the data also increases the value of the visual data delivered to the targeted user. We have applied our resources to the capture the highest quality images and details. Although we hope to secure funding to continue growing the database, we will not sacrifice the quality to provide quantity. This approach does not generate the kind of volume of data upon which traditional IT testing can be done. To really test if we are fulfilling our users’ needs, we will have to develop new kinds of metrics for quality of web experience.

Our use of the evolutionary prototype to dynamically develop our system requires vigilance over the evolution of user needs. Our plans for online thesaurus development will enhance the classification of, and access to, images and data about historic costume. It also connects us to the historic costume community by attempting to “grow” an inclusive verbal language. Our customization of OAI protocols and implementation of MOAC standards help to “grow” the standards language. Compliance with these standards broadens the user base by making the system portable and extendible.

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Appendix: Entity Relationship Diagram, DHCC Database

**PROPOSED DREXEL DIGITAL MUSEUM DATABASE**

As of 29 October 2002

Legend:
- Blue: primary key
- Bold: in DB but not on entry form
- Green: Independent on item
- Orange: dependent on costume item
- Blue Fill: Dependent on item
- No Fill: Dependent on costume item

Notes:
1. Certain tables may have rows that exist independently of the costume table. This may seem improper, but it takes into account
   the fact that other resource types (e.g., art, location, etc.) may also populate these tables (e.g., captions would be the image and note
   tables).
2. Because the temporal (category, floorContent, textileConstruction, embellishment) are unlikely to change often and because they would
   obey an external standard, these tables need not be so readily accessible for insertion, modifications, and deletions.
3. The data held in each resource table is intended as the search field when costumes are examined to determine whether they fit the
   user's criteria. Only terminal entries (i.e., no children) require entries.