The design and development of an online exhibition for heritage information awareness in Singapore

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Abstract

By combining the capabilities of latest computers, communication and multimedia technologies, web-based multimedia systems provide an exciting means and communication channel for information access and sharing throughout the world. These systems have immense potential in public education, stimulating the learning process by exploring and doing, and enabling children to go on trips around the world with just a few clicks. In this study, a web-based multimedia exhibition “Colours of the Wind” was designed and developed based on an existing exhibition that took the original form of static physical displays. The exhibition is part of a series of National Education exhibitions put together by the National Archives of Singapore to promote heritage information awareness. As part of the design, a requirements gathering study was carried out with 77 university students to determine the users’ requirements in terms of their computer and web experience, content expectations of an online exhibition and their prior exposure to these systems. Based on these user requirements, a prototype of an online exhibition system was developed and then evaluated by 30 students from the same pool from which requirements were gathered. The respondents were of the opinion that the online exhibition satisfied most of their requirements, apart from a search engine. They also felt that online exhibitions were a flexible mode of delivering heritage information to inculcate awareness among public, particularly in the context of Singapore which is one of the countries with the highest percentage of Internet users in the world.

Keywords: Online exhibition systems, Singapore, Heritage information, User needs, Evaluation techniques
1. Introduction

In this digital era, technological advances are rapidly changing the environment in which we live. The impact of technology can be felt in many areas, one of which is heritage information delivery. Today, a large percentage of children grow up in urbanised cities around the world, where old and culturally significant architectural structures often have to give way to modern buildings due to land scarcity. The loss of such heritage icons, less interaction between children and their parents (who spend increasingly long hours at work), result in many school children not being well informed of the historical richness of the ancestors in their society. This is quite unfortunate, because the way leading to nationhood for many countries is often paved with interesting and noteworthy events. Such events will form an important part of a country’s heritage. This information has to be passed to school children, so that they can better understand the efforts and sacrifices of the people who build the nation, understand the cultural diversity in modern society, and contribute productively to foster unity.

This is where heritage exhibitions enter into the picture. The National Archives of Singapore (http://www.museum.org.sg/NAS/abtus/abtus.shtml) collects, manages and preserves historical records, and also promote public interest in heritage through travelling exhibitions, publications and ICT-based projects. It originally developed a series of exhibitions of differing themes as part of the Singapore’s government larger National Education initiative to promote cultural heritage information awareness among school children and the general public. Such awareness services took the form of static information panels, multimedia kiosks, audio narratives and videocassettes. However, such physical exhibitions are limited in the demographic reach of their target audience. They are also open to the public to access only at certain times of the day. As most of the information is presented in physical form, teacher and student visitors find it difficult to customise the materials for their teaching and learning purposes.

Online exhibitions offer a practical and cost-effective solution to the above problems. They are not limited by time, distance and space. Students from the nation and all around the world can view the exhibitions remotely both from their homes and schools any time. As the contents in the online exhibitions are in digital form, new materials can be added quickly and existing materials can be updated easily. This dramatically reduces the lead-time and eliminates costly physical space required to display an exhibition (Kassay, 1995; Spadaccini, 2000 and Thomas, 1991). Teachers can easily download the digital materials for integrating into their teaching syllabi. Students can also learn to gather online information, organise it, create some meaning to it, reach insight, and present their findings online to their teachers (Boily, 2000 and Sumption, 2001).

In this project, a prototype online exhibition of a physical exhibition “Colours In The Wind: Old Hill Street Police Station In Retrospect” was developed (http://aavis.nhb.gov.sg/exhibit/). This exhibition celebrates the rich history of the Old Hill Street Police Station, a former police barracks which has been converted into the Ministry of Information and The Arts (MITA) building, Singapore.

The aim of this project was for staff in the Division of Information Studies at Nanyang University to work with the National Archives of Singapore to develop an online exhibition for promoting cultural awareness among Singaporeans, and also to study various Internet and multimedia technologies required to build online exhibitions.

The objectives of this study were to:
• elicit users’ and information requirements for an online exhibition
• develop an online exhibition for promoting cultural heritage awareness
• evaluate and identify the gaps in the design, and
• find out the impact of online exhibitions on promoting cultural heritage awareness

2. Background

Prior to designing the online exhibition, a study of existing online exhibitions around the world was made to examine aspects of their content, presentation, navigational structure, implementation issues, etc.

American History Documents (http://www.indiana.edu/~liblilly/history/history.html). This online exhibition that showcases some of the most important documents in American heritage, e.g. the Declaration of Independence. Each document is shown as a thumbnail image (192×300 pixels) which can be zoomed to 500×780 pixels, together with a short descriptive paragraph. A link is also provided to the full text of the document.

Asian Civilisations Museum (http://www.nhb.gov.sg/ACM/acm.shtml). This online exhibition was originally hosted on an online television station in Singapore between February and May 2001. It showcases Chinese culture and heritage in architecture, history, symbolism, religion and ceramics. These are presented via narrative videos (MPEG-4 video with MP3 audio) of the curators, who provide brief introductions to each subject area.

Note: dead link. This is an online exhibition on the early history of the African continent. The information is presented through the maps and travel narratives of the Europeans who travelled extensively throughout Africa from the late fifteenth century to the late nineteenth century.

Harlem, 1900-1940: An African American Community (http://www.si.umich.edu/CHICO/Harlem/) is an online exhibition that describes the cultural heritage of the African American community. The images on the site may be zoomed from 249×141 pixels to 429×271 pixels. Teachers are provided with online information on the objectives of each sub-exhibit, instructional strategies, photograph interpretation and guidelines on oral history. A search engine is also provided to find the related materials in the New York Public Library.

SCRAN (Scottish Cultural Resources Access Network, http://www.scran.ac.uk) is an online multimedia resource base for Scottish history and culture. It provides carefully designed educational resources, (e.g. resource packs with instructions for teachers) which range from static content (text and pictures) to multimedia (audio and video in Apple QuickTime).

3. Methodology

The development of the online exhibition made use of widely available graphical development tools which saved development time by abstracting the design problem at a higher level. The tools then generated the necessary code to carry out the intended tasks. The advantage of this model of development is its ability to specify system functionality at a level approaching natural language(Dix, 1998; Ghezzi, 1991). Through this, the authors
were able to concentrate more on the design and functionality aspects. Dreamweaver 4.0, a web editor, was used for prototyping and implementing the online exhibition system. Dreamweaver can be used for both the purposes with the result that software resources, design time and manpower can be saved. Dreamweaver is an internationally used industry standard tool for web design.

Although there are several evaluation techniques, only five important techniques were considered for use in this project. Surveys based on questionnaires and interviews are channels through which the user can communicate his or her opinions passively (e.g. questionnaires) or actively (e.g. interviews) to the system designer. In the observation of task performance technique, users are encouraged to be verbose on their actions and problems faced, which are noted by remote observers for subsequent analysis. Activity logging makes use of manual or automatic recording of the users’ actions (e.g. videotaping), which are then examined for possible design problems. Heuristic evaluation is the systematic inspection of a user interface design, based on the principles formulated by Nielsen (1993). Co-operative evaluation involves the user discussing with the evaluator on system interface problems encountered during usage. The evaluation technique chosen was a combination of co-operative evaluation, together with questionnaire-based surveys. This combination offers the best compromise in terms of resource and time requirements, and the reduction of biases in the final results due to the Hawthorne effect, which causes people being watched to act in a different way because of the presence of the observer (Faulkner, 1998).

4. Requirements Gathering

University students were surveyed to determine the user requirements of the online exhibition. The reasons for selecting university students were:

- this exhibition is intended for use by all levels of users in Singapore although the initial phase was designed primarily for school children;
- it was felt that school children were too young to ask about their information and system requirements;
- it was felt that university students are mature enough to identify their cultural information and system design needs;
- university students were also easily available in the Division of Information Studies for this experimental purpose.

A total of 77 respondents took part in the requirements gathering process. These respondents were postgraduate students mainly in their mid- to late-20s, with an equal proportion of males and females. Most of the people in Singapore are very familiar with ICT and are web literate. Moreover, the network facilities (speed of access, and bandwidth) within Singapore are very good. This is very important in the case of a browser intensive application such as an online exhibition. About 96% of the students owned a computer at home with web access, and this allowed us to test the effectiveness and efficiency of content delivery, especially in the case of bandwidth-hungry applications such as digital video streamed across public networks (e.g. the Internet).

Amongst the respondents the IBM-PC was the most widely used type of computer (96%), with Windows the most used operating system (97%). These findings were major influences in the decision to develop the online exhibition on a PC platform. The most common monitor screen sizes used by the respondents were the 15” CRT (39%) and the 12.1” LCD (30%). These screens are capable of displaying images up to 800×600 pixels resolution. Surprisingly, 15% of the respondents were still using 14” CRT monitors,
therefore the screen resolution selected for development was 800×600 pixels, to cover the widest possible user base. Although 71% of the respondents had 56 kbps modems, about 7% of the respondents were still using 33.6 kbps modems. Therefore, a decision was made to provide streaming video and audio at the lowest possible file sizes so as to reach as many viewers as possible.

The majority (79%) of the respondents surfed the web daily and were familiar with the web browsers. Hence, it was decided that a basic help system was good enough and that a detailed help system would not be required. During their interaction with the system, about half of the respondents expected to see something on the screen within 11-30 seconds of the initial click, which means that the most efficient compression techniques must be used to deliver digital audio and video with reasonable clarity. Internet Explorer was used by 83% of respondents and Netscape by 17%. This necessitated the need for cross-browser compatibility through careful coding of DHTML (Dynamic HTML) elements so that the system will reach out to most people.

Almost half of the respondents preferred text-based sites with moderate interactivity, while 34% preferred highly interactive sites. A decision was therefore taken to incorporate interactivity in the form of DHTML, Java applets and digital audio and video, but exclude complex animations such as Flash and Shockwave. The pervasiveness of Shockwave technology can be observed in the high proportion of users familiar with it (82%). Respondents, especially those with high-bandwidth Internet connections, felt that the interactivity and entertainment value of Shockwave elements were worthwhile in spite of long download times. For this, over half of the respondents (55%) were willing to download the Shockwave browser plug-in, but 27% found that downloading the plug-in is troublesome. More than half (56%) of the respondents had not visited any online exhibitions before. For those that had (34 people), Table I show their stated media preference.

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<th>Media preference by the respondents (n=34)</th>
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The most common form of online exhibitions seen by these respondents were art galleries on the web, in which static images were seen more often than animations, audio and video clips. Images were considered to be the most important form by the respondents (83%), followed by video (70%), and then text and audio (69%). Animation was felt to be slightly less important (60%), while a small percentage (4%) of the respondents would also like to see online help, zoom features and interactive media.

The majority of the respondents (59%) preferred brief abstracts with links for more detailed information, whereas 38% liked only brief abstracts and 3% also expressed the need for elaborated text. This is consistent with the basic design philosophy of web information systems, which is to cut down the amount of information presented on each page for better reading. About three-quarters of the respondents indicated that there is a need for text transcripts to accompany the audio and video clips. Of these, English was the most preferred language (86%), while 12% would like to have multilingual transcripts.

A large proportion of respondents (89%) indicated that important historic events should be accompanied with video clips for better understanding of the events. Video clips of
moderate duration (between two to five minutes) were considered appropriate. About 56% of the respondents indicated that they would rather see animations than video clips, so that it would help them to quickly display the movie file on the web. Nearly 72% preferred Shockwave animations, followed by animated GIFs (Graphic Interchange Format) (51%), AVI (Audio Video Interleave) animations (49%), Java applets (42%) and DHTML animations (23%). This clearly shows that the majority of the users want to see shorter video clips of all the important events, but they are quite flexible about the video form or format. Depending upon the context, the video format can vary from animated GIF to digital movie so that downloading time will be faster.

A large proportion (87%) of the respondents agreed that online exhibitions have considerable educational value although 13% considered otherwise. About 78% of the respondents expressed interest in getting more information from archival organisations, so these exhibitions may be provided with links to other sources for getting more information. The most popular archival items (80%) that the respondents were interested in were photographs, particularly on historic sites, followed by audio/video recordings and maps/charts (77%), public records (67%) and oral history (57%). This clearly shows that the respondents were not so keen on text-based information, but more interested in other media resources. This means multimedia with minimum textual information was popular, but links for additional information should be provided.

Most of the respondents (94%) felt the need for a good search engine for effectively retrieving the information, online help, and selective dissemination of information (SDI) through e-mail. Content accuracy was vital, together with quizzes, tutorials and games to bring the educational message across to the school children. Site personalisation or customisation was also suggested by some of the respondents. A few also felt that different information formats were needed to cater to the different modem download speeds of users. Free access to all the archived materials on a topic and links to other relevant materials would help them in getting the complete information. There were also suggestions for more advanced user interfaces and systems to cater to visually impaired users, virtual reality (VR) and video on demand (VOD) applications for advanced users.

5. Design and Development of the Prototype Online Exhibition System

The Colours In The Wind online exhibition was developed with three major components: the Manager, Sub-Exhibits Content and Support components as shown in Figure 1. The Manager component consisted of a main directory that contains the administrative pages, and a global stylesheet. The administrative pages comprise of an “About” page that describes the online exhibition in general, a “Site Map” page that briefly explains the contents of each sub-exhibit, a set of “Help” pages, a “Search” page and a “Feedback” page. Links to these pages are provided through a horizontal navigation bar in a title frame at the top of each page, so that they can be reached from anywhere within the online exhibition. There is also a pull-down selection list of menu options, which are used to select each sub-exhibit for browsing.
The Sub-Exhibits Content component contains the pages for each of the 12 sub-exhibits, organised into seven directories. The Support component consists of an “audio” directory that contains the oral interview sound clips, a “video” directory that holds the video clips, and an “images” directory that contains all the pictures used in the online exhibition. The “images” directory is further divided into sub-directories, each one containing the images used in each sub-exhibit, with a “gen” sub-directory to hold the images used by the Manager component (e.g. images used in the “Help” pages), and a “nav” sub-directory to store the navigation button images. In addition, there is a “download” directory that contains the Netscape plug-in for the Windows Media Player; this plug-in can be downloaded by Netscape users to view the Windows Media audio and video clips used in the online exhibition.

Fig 1: Organisation of the online exhibition

Fig 2: Home page of the online exhibition
Figure 2 shows the home page of the online exhibition. All the pages in the site share the same general formatting using cascading style sheets. An animated flashing “Visit” label at the top left corner of the screen draws the visitor’s attention to the exhibit selector. The exhibit selector was implemented using a pull-down menu with automatic page redirection, instead of a left-hand frame with links, because some of the sub-exhibit titles were rather long. This helped to save screen space and made it look less cluttered in order to reduce the visitor’s cognitive overload.

Each page is divided into three horizontal sections (frames). The top navigation bar holds commonly accessed pages (e.g. the “Help” pages), which can be clicked from any page since the navigation bar is located in the fixed top horizontal frame. The large middle section is the content area that holds the text and multimedia elements used in the online exhibition. The bottom section of the page contains navigation buttons and the title of the currently using section. At the bottom left corner of each page, there is a navigational bar with three navigation buttons. These are the common “Previous”, “Next”, and “Back” buttons used in many web sites. The “Back” button brings the user back to the last visited page, which is similar to the function of the “Back” button provided by the browser.

To reach a sub-exhibit quickly, a pull-down menu is provided at the top left-hand corner of each page in the online exhibition. This pull-down menu contains links to the starting page of each sub-exhibit. On the right of the pull-down menu, there is a horizontal navigation bar containing links to the “About” page, the “Site Map” page, the “Help” page, the “Search” page and the “Feedback” page.

![Fig 3: A typical exhibition page in the online exhibition](image)

The original text of the physical exhibition was broken down into major topics, which were further divided into sub-topics based on the general flow of the original topic as can be seen in Figure 3. Due to time constraints, the video clips were provided only in English with English transcripts. Likewise, English transcripts were provided only to the English audio clips and not for the Chinese, Malay and Tamil audio clips because of non-availability of translators in the Division of Information Studies for this project. In Singapore professional translators are very expensive and take a lot of time.
It was decided to embed the media player inside the web pages instead of playing media clips on a stand-alone player as can be seen in Figure 4. If a stand-alone player had been used it would pop up in a separate window above the web browser, blocking the user’s view of the text transcript, which could be inconvenient for the user to close.

For an architectural aspect, a 3-dimensional viewer has been provided via a Java applet as can be seen in Figure 5. This displays a slowly spinning view of selected sections of the Old Hill Street Police Station building and gives a virtual reality interface that lets the users explore parts of the building.

Online help pages are also provided for users to find out how to use the web site effectively. This presents basic help information for users about the organisation and use...
of each section. Each help page comprises a short amount of text, mostly in bulleted lists for easier reading, and appropriate graphics. In fact, the general design of the online exhibition has been deliberately kept simple with the objective of making it intuitively easy for visitors to browse the site, even without looking at the help pages before viewing the exhibit pages.

6. User Evaluation

An evaluation was carried out using a questionnaire-based survey process involving university students. The reasons for using university students again were:

- the students come from a variety of backgrounds and professions;
- the students who have helped in the design of the system may be better able to judge the system better than others;
- the students are easily available for evaluation;
- the students can easily test this system in their homes so that problems from different parts of the Singapore could be identified.

Of the total number of 30 participants in the evaluation, half of them were in their mid-twenties, with females outnumbering males by nearly two-thirds (63% females versus 37% males). Most of them were students, librarians, teachers or IT professionals. There was about 70% overlap in respondents in the user requirements and evaluation surveys. Students were more particular about the critical design problems, while the other professionals provided technical input on improving the efficiency and effectiveness of content delivery.

The majority of them (74%) felt that the text size chosen (Verdana 10 point) was appropriate and readable, and the use of colours, buttons and icons was appropriate (70%). The use of cascading stylesheets to control the formatting and general appearance of the pages in the online exhibition helped in the visual consistency of the pages. Stylesheets provide a powerful mechanism for maintaining a consistent and (most importantly) cross-browser look for all the pages. Surprisingly to us, though this site is simple and plain, nearly half the respondents (46%) found that the site was attractive. This could be traced to the fact that most of the respondents were adults who were more interested in content and simple presentation rather than over-excessive aesthetics vibrant colours, more action and interactivity, that could be used to attract younger users.

The online exhibition is also an information system, and so the information must be organised in such a way as to allow the users to access information easily. About 67% of the respondents found that the organisation of information was good. The contents were reasonably comprehensive (37%), and some pointed out that there was too little details on certain topics in a few places. Therefore, more information along with links to other resources related to those areas need to be provided. Due to the absence of a search engine, one-third of the respondents (33%) were neutral when they were asked about the ease of finding information within the site. Due to time and resource constraints, it was decided to relegate the development of a search engine to Phase II of the project, in which a proper search engine will be developed to index and search not only text but also multimedia elements such as images, video and audio.

Almost half of the respondents (57%) found that the exhibit selector (a drop-down list) was easy to locate. This was because the selector was deliberately placed at the top left-hand corner of the screen. Its presence was further highlighted with a flashing “Visit” animation beside it, and it was also explained in the Help pages. However, a respondent
suggested that the selector may be at the centre of the navigation bar for better visibility. According to interface design principles, the top left-hand area of the screen is the most important one in terms of its visibility, so the selector menu was placed there. In general, the respondents found that navigation within the site was easy; even without reading the Help pages, the visitors are able to use the online exhibition. In terms of speed of downloading, the respondents generally felt that the pages loaded fast enough. This could be attributed to the basic design of the online exhibition site, which does not require the user to download special plug-ins, e.g. the Shockwave plug-in to view Shockwave movies.

Most of the respondents (90%) never read the Help pages before exploring the online exhibition and agreed that the user interface was simple enough for them to browse without further assistance. For those who had gone through the Help pages, 60% of them found the details were sufficient to understand the system.

All of the respondents used the Windows operating system, and most of them (87%) were using the Internet Explorer browser compared to the Netscape browser (13%). In general, there was no problem in delivering the multimedia elements through both the browsers, since the codecs (software for compressing/decompressing various types of data) for playing back the clips were cross-browser compatible. Most respondents found that the media clips could be viewed. However, there were a few hiccups in video reception, resulting in jerky frames and the corresponding garbled audio narrative. It was found that this was due to the fact that the web server hosted for the online exhibition was a Pentium I-based server with no MMX (Mildown Media Exchange) capabilities to support multimedia.

On an average, 60% of the respondents felt that the window size of the video player, frames rate and the playing times of the media clips were acceptable. About 73% of the respondents found that the multimedia elements were useful in enhancing the learning experience, and the text transcripts were useful in aiding the understanding the audio-video clip contents. A small percentage of the respondents (20%) encountered difficulties in loading the video stream, resulting in reading the text transcript without seeing the video, which was admittedly not an enhanced experience.

7. Ongoing Studies and Future Extensions

This project formed the basis from which advanced studies can be carried out in several directions. A large-scale requirements gathering study is going on with a 400-user sample size sought from a myriad of professions, extending the existing study which was done solely on university students. In addition, a fully developed version of the online exhibition is being developed in HTML, and compared against the same exhibition with an animated user interface. Content delivery models will also be examined to find out the most preferred and efficient method of packaging and providing online heritage information to the public, for example, over the web, or delivery of information through CD-ROMs, etc. Another area under study is the management of digital media centres – their setup, media asset management and content management. Finally, the indexing and retrieval of multimedia resources using the latest programming approaches (e.g. Java) are also being explored.

8. Conclusion

This project has demonstrated the feasibility of using online exhibition systems to promote cultural heritage information in today’s world, based on the availability of modern powerful computers, communications technology, multimedia technology, and the
Internet. Details of historical events can be brought alive via streaming video technology, which are becoming readily available to many users. However, the user interface of such systems must be kept simple so as to reach out to as many users as possible. In general, it was felt that a moderate level of interactivity was also needed to attract and retain the attention of the younger generation. Finally, the simple and best design will attract the visitors to visit the exhibitions again and again to gather more information, which requires the system to become a truly dynamic information system for the promotion of cultural heritage.

Heritage information systems have an important role in preserving and promoting the cultural information of the world, as well as help to foster global cross-cultural exchanges. By knowing what has taken place in the past, and appreciating the cultures of one another, the human race can then build a better world tomorrow – one where mutual co-operation and understanding reigns over conflict for the good of all mankind.

References


