The Micro Gallery
Observations from three projects: London; San Diego; Washington D.C.

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The first Micro Gallery opened at the National Gallery in London on July 21st 1991. The first facility of its kind, it provided visitors with a comprehensive multimedia reference to the Gallery's collection. Since then the author and his colleagues have had the privilege of working on two further projects of a similar nature. The Image Gallery at the San Diego Museum of Art opened on October 26th 1994, the MicroGallery at the National Gallery of Art will be open to the public on October 29th 1995.

The concept is simple: provide visitors to a museum or gallery with an enjoyable information system that they can use to find out more about the works on display. The underlying motivation is the belief that people visiting a museum want to find out about the exhibits the more they learn the more they will appreciate and value their experience. So far as we can tell from research and observation this belief is reasonably well justified. Beyond their use of computers all three projects have elements in common. In what follows we discuss our experience, topic by topic, trying to identify common themes and lessons.

Organization of the Projects

In all cases, Cognitive Applications Limited has been employed, on contract, to help the museum to develop the project. The balance of effort has shifted over time, with Cognitive taking on design and layout work in San Diego and Washington that was otherwise done by the team in London. In London we were necessarily writing original software and solving technical problems, many of them on the bleeding edge of the technology. Now the hardware and software are mature and the methodology a little clearer we can adjust the project teams accordingly.

On the two American projects we have had to operate project teams separated by very large distances. This is not ideal but has taught us the possibilities of modern communications methods. The vital ingredient here has been easy-to-use and efficient e-mail communications with the capability to exchange data files and work-in-progress. As the Internet expands this will be easier and easier. For the moment we rely on Apples proprietary AppleLink system it is easy to use, has an international network of telephone access points, and good facilities for data exchange and text messaging. Even with electronic connections there has been a lot of transatlantic travel.

We can now list the main activities involved in creating a MicroGallery-type system. Comments on relative responsibilities appear in brackets.

Content design (Internal team + Cognitive)
Graphic and Interface design (Cognitive,
        in London graphic design was done internally)
Photography (hopefully not too much to do - Museum photography department)
Scanning (either)
Manual Image Processing, e.g. cutting out non-rectangular images(either)
Automated Image Processing (probably Cognitive)
Original Writing for Catalogue etc. (Internal team)
Editing and Review (Internal team)
Provision of tools to support the editorial processes (Cognitive)
Screen Layout and Animation (led by Cognitive, in London done internally)
Indexing (Internal team with advice and tools from Cognitive)
Engineering and Integration of the media elements (Cognitive)
Hardware specification (Cognitive, now less of a problem as technology improves)
Hardware procurement (Internal team assisted by Cognitive)
Obtaining permissions for external illustrations (Internal team advised by
     Cognitive)
Testing (everyone)
Debugging (Cognitive engineers and internal editors)
Physical installation (outside contractor or installation department)

Project Management (internal with assistance from Cognitive)
Project Monitoring (this has been either by a committee of senior members
   (London and Washington) or personally by the museum director (San Diego)
   in either case the important thing is for the project to have a place to present work
   in progress for definitive approval)

A common thread in all three projects has been the demanding nature of the writing and editorial work. There has consistently been more work, and more difficult work, on this front than was expected. Effective text for a general audience, reading from a screen, has to be short, accurate, visually oriented, and make good use of cross-references and glossary pop-ups. Scholars who can master the art history and also turn out this kind of writing are a rare and valuable breed. Experience, particularly experience of writing for the public, seems to be the key qualification.

Installation

All three systems are installed in specially fitted rooms adjacent to the galleries. None of the institutions we have worked with has wanted to disturb the atmosphere of the galleries with more equipment. The dilemma of the museum designer is to reconcile the desire to provide information with the provision of uncluttered exhibition spaces in which to display the works of art. The concept of a separate room for information seems to work well and can easily be scaled down withstand-alone kiosks where a whole room is not available.

Tour Planning and Printing

All the systems include facilities for displaying location information on a floor plan and for planning and printing out a tour of the museum based on objects selected from the system. This, in our view, is absolutely essential and provides a direct connection for the visitor between use of the system and his or her visit to the galleries. The implicit message of the system should be use this to get more out looking at the objects not use this and marvel at what a high-tech facility we have here. In all cases printing out the floor plan with your personal selection of objects has been free. At the National Gallery in London visitors are also able to print out pages from the system in black and white for a nominal fee (five pages for 1). London is a big center for the study of art history and there is a strong demand for this service particularly from students. In San Diego visitors can request a high-quality color print of any of the art works. These are produced on a dye-sublimation printer and are extremely attractive products. The cost of a color print is $5 for the general public and $3 for students, these prices reflect the relatively high cost of dye-sublimation paper and toner ribbons. Systems can be configured for printing in any way that makes sense for the local audience. In London there is one printer for each workstation, this is convenient for users, but has meant relying on an enthusiastic and knowledgeable staff to keep them operational. Printers are the only elements in an installation of this sort that involve significant routine maintenance. In San Diego and Washington the printers are centralized.

Display and Interface Technology

Touchscreens and large color monitors have been the standard equipment for the human-computer interface. One of our most gratifying experiences in this connection has been to observe quite elderly people using the systems confidently and to hear them say how pleased they are, for the first time, to

be able to work a computer system. Touchscreens have the advantage of directness and invisibility; our design objective has been as far as possible to simplify the controls and make the interface disappear. From a physical point of view the touchscreens seem to be reliable and robust. Very occasionally a visitor may accidentally scratch a touchscreen; where this has happened we have found that it will continue to work perfectly well. In our experience the screens work best if they are tilted at about 10 to the vertical, bottom forward. The correct angle can easily be established by observing how people adjust their monitors for personal use. The best installations allow the user to rest their wrists on a a ledge or worktop while touching the bottom of the screen. [Surprisingly, given how fast technology advances in this area, the color monitors in all three installations are basically the same; a 20 Sony Trinitron display. This is on, or at, the limit of size available for desktop computer displays and there seems to be little change over time. The resulting computer display is effectively twice the area of piece of letter paper.

In choosing displays we have consistently found that increasing the number of dots per inch in the display has a good effect on perceived image quality. The standard computer monitor gives approximately 72 dots per inch (dpi), in our experience 82 dpi is much better for looking at works of art on screen.

Behind the touchscreens we see an enormous difference in computer power and storage capacity. In 1991 in London we installed Macintosh IIfx computers with 8 Megabytes of RAM and 1.3 Gigabytes of online storage. The Washington installation, opening four years and three months later, is based on PowerMac 9500 computers with 48 Megabytes of RAM and 6 Gigabytes of storage. The workstations each cost roughly the same price. The 1995 computer runs somewhere between four and eight times faster. The extra computing power has been used to provide larger, higher quality, images. Every work of art in both San Diego and Washington has a large size image that the visitor can examine using a magnifying glass facility. In Washington these large images are up to 3,000 by 2,400 pixels, equivalent to a screen area of about 36 by 29 inches. The effect of being able to look at images in this much detail is wonderful. Even museum staff looking at favorite paintings have found details they had not noticed before. It is unlikely that future installations will be much constrained by lack of computer power or storage.

Image Processing and Display

In order to produce the images for display we have in all cases proceeded by scanning from transparencies using a flat-bed scanner. Modern scanners are now wonderfully fast and accurate. We have become increasingly able to rely on batch color correction to produce faithful results. In general, our strong preference based on experience, is for the application of simple but scientifically derived color correction methods. We have found that manual color correction tends to produce artificial results, warmer and brighter than the originals. For our purposes we have not found it necessary to have access

to more expensive drum-scanning equipment nor have we used Photo-CD. Fortunately all the museums we have worked with have had good, up-to-date, photo libraries based on large-format transparencies; it would be difficult to overstate the importance of this fact for the success of our projects. On the display side we have been working towards higher and higher color resolutions. As hardware, especially disk space becomes cheaper 24-bit color is a more and more realistic objective (i.e. images where each pixel element is rendered in the best choice from 16 million possible color values). For the moment we are still operating under some storage size constraints and have had to use data compression. In this context we have had excellent results with the JPEG system where compression ratios of approximately 10:1 are easily achieved without noticeable loss of quality. Higher compression ratios are also possible but will lead in some cases to artifacts in the form of unattractive blocks of flat color.

Organization of Content

One of the most important decisions taken in London was that the MicroGallery should be designed in the form of a multi-part encyclopedia with a catalogue of art works at the center. This has been replicated with variations in San Diego and Washington. In London we have the following sections: Artists Lives; Picture Types; Historical Atlas; and General Reference.

An encyclopedia of the sort we are discussing will naturally include some treatment of artists, subjects, times and places of origin and other important concepts like techniques and genres. Precisely how this caches out into the organization of a system is less straightforward. An Artists Lives section has been universal but the other sections from London have not. The Picture Types index in London is based on the notion of genre rather than subject. So religious paintings divide between altarpieces and devotional works. A more direct index of subjects where religious paintings divide between Old and New Testament has been preferred elsewhere. Both approaches are obviously worth attention and may be reconcilable given sufficient time and enthusiasm, but the philosophical and practical difficulties of this kind of indexing are easily underestimated. Our own view is that the simpler the conceptual scheme the better for everyone, indexer and audience; if there is trouble establishing a satisfactory hierarchy of subjects, alphabetical organization should always be considered as an alternative.

London's Historical Atlas includes articles for every artistic center and period represented in the collection. This syllabus has not been attempted again and in any case depends for its effectiveness on having a collection that presents an adequate survey of a large enough area of the history of art. An approach that includes a timeline and/or atlas and/or catalogue by national schools seems simpler and more easily achieved. In this sort of decision it becomes most important to understand the collection and its audiences. Whatever makes sense for the collection and relates most directly to the needs of the audience will be best.

In all cases the secondary, encyclopedic, sections lead the user to the collection. Each entry, for example, an artists biography, has an accompanying index of thumbnail illustrations that take the user

to the relevant catalogue entries. Your navigation through the catalogue entries depends on how you got to where you are. If you come from an entry on Altarpieces then you will travel through the catalogue entries for altarpieces, arranged chronologically; similarly for works by an artist, works depicting a subject, etc. The effect of this navigation scheme is to allow the system to present a limitless variety of mini-exhibitions. Any theme or topic (sensible or not) can be represented in such a system and given an associated index, this index then becomes an exhibition, albeit of an electronic kind.

Once the user has arrived at a catalogue entry the London Micro Gallery presents him or her with a page that resembles, as closely as possible, a page from a book. This design objective was quite deliberate and reflected the desire to make the system as accessible as possible to people without experience of technology but with a high degree of literacy. As we have gone on to other projects the philosophy has evolved to include more direct on-screen buttons while retaining the typographic quality of the pages.

The Presentation of the Works of Art

How to present the works of art must be the central question for anyone considering a project of this type. In London, catalogue entries were laid out as pages in a book, more important works got more pages, each page dealing with one topic. This has the great advantage of simplicity and flexibility but the disadvantage that longer entries maybe tedious for the reader. Pages with no text look odd so this design also presupposes that there will be material available for all the objects, easily achieved in London, not so easy elsewhere. A further drawback of the London scheme is that pathways from the catalogue entries to related entries in the secondary sections, artists, historical atlas entries etc.... are tucked away in a See Also facility accessed from the main control bar. Many people using the system may find it difficult to get from a painting to the biography of the artist who painted it.

In the design work for San Diego, and most recently, Washington, we have concentrated on several issues: making designs that emphasize the pathways and work well without needing texts; incorporating better tools for viewing magnified images; developing interactive methods of discussing works of art. In this context we have had good success in two directions

a) in-depth essays on individual works of art, divided into sections and very heavily animated using the battery of image manipulations possible in advanced tools like PhotoShop;

b) styles of writing that encourage personal exploration; Use the magnify button to see how the angle of the womans hand has been changed.

We still have much more work to do before this subject is exhausted, even for the first time. For a more detailed account of our ideas the reader is referred to our paper Interacting with works of art - with and without computers (ICHIM Proceedings 1993).

Interface Controls

In all three systems we have tried to make the system as simple as possible to use for first-time users. This has sometimes meant excluding more powerful features if they were in danger of confusing people. We have found by experiment that people using a system of this sort quickly master basic controls, 'next page', 'go back', and 'contents' for example, and then prefer to use those rather than experiment with different navigation methods, for example, 'skip ahead' or 'previous page' or 'show history'. More powerful navigation controls may be appropriate when a system is published on CD-ROM where to user has more time to master the software and may be assumed to start with a higher degree of computer literacy.

'Next page', 'go back', and 'contents' have become our standard navigation controls, with the contents panel appearing over the page in a pop-up. Where possible we have tried to make the experience of navigation as gentle as possible - not jumping people around unless absolutely necessary and always providing a go back button that restores the previous position.

At all times, a context message appears adjacent to the next page control to explain the current navigation path e.g.

'Page 1 of 3 on Leonardo da Vinci'

' Artists A-Z' or

' Page 1 of 2 on Mona Lisa'

'2 of 3 works by Leonardo da Vinci'

The context message is especially helpful as a secondary reassurance to the user that they know where they are headed. All the navigation paths are joined at the ends, so Zurburan wraps round to Aachen and soon.

Cross-references and glossary pop-ups in text have both been consistently useful devices.. We have used a highlight color to mark the text and a prefix character to distinguish functions;

> for across-reference
* for a glossary pop-up.

A cross-reference takes you to a new page, e.g. to the biography of a cited artist.

A glossary pop-up produces a window over the current page containing a definition or explanation of a technical term, e.g. rococo.

Pop-ups are now capable of containing pictures, animations and their own hot text for pop-ups and cross-references.

Further Developments

The London Micro Gallery project has produced a series of spin-offs. First the Gallery concluded a publishing deal with Microsoft that led to the Art Gallery CD-ROM. For this project Microsoft employed Cognitive to do the necessary conversion work. Published in Autumn 1993 we believe that this is now by far the best-selling CD-ROM of its kind to date with sales well in excess of 150,000 copies. For a new publication, the Complete Illustrated Catalogue, the Gallery commissioned Cognitive to produce an editorial system based on the material and tools used for the Micro Gallery. This system was used by writers and editors to create the text for a new systematic catalogue. Once the text was complete, software was written to produce QuarkXpress page layouts, taking account of text size, style, image size, placement etc.

National Gallery Publications and Cognitive then worked together to produce the Complete Illustrated Catalogue on CD-ROM, containing the complete contents of the book and providing rapid direct access to the text, a hugely expanded index, and large size reproductions of the works of art. The CD-ROM plays equally well with Macintosh or Windows computers. It is the first of its kind that we know of to be produced in this way and has been financed by National Gallery Publications and Cognitive, two relatively small businesses.

San Diego Museum of Art is developing projects on the Internet both on their own account and as supplier to Internet publishers. Both National Galleries will no doubt also publish by this method in due course. When the time comes the material assembled in electronic form for the Micro Gallery projects can be easily reworked to produce an HTML version that forms the basis of an Internet publication. Since this whole process started for us in 1988 the exact nature of future developments has not been easy to predict. But the clearest lesson we have learnt is that if worthwhile projects are pursued in practical ways then they will provide resources for the next generation. The watchword here, as in so many areas, is Think Globally, Act Locally. In other words, do the best job you can on the job in hand and where you have choices make sure that you go for the most general and well-supported practical standards.