The Evolution Of A Family Of Multimedia Products over a Decade: the 'Micro Gallery' family tree, past, present and futures

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Abstract

In December 1998 the National Gallery of Art, Washington DC, working with Cognitive Applications of Brighton, England, published The National Gallery of Art Washington CD-ROM. This publication is the latest generation in the family line that began at the National Gallery in London when the original Micro Gallery, conceived way back in 1987, was delivered in July 1991. Each generation of this family inherited a good deal from its forebears, and as we might hope and expect, through fresh inputs and evolution, advanced beyond them. This paper examines the interaction between advances in multimedia technologies, experience and audience expectations, and the evolving requirements of museums and cultural institutions, through the common characteristics and evolving trends in a "family" of applications. Each application was designed for longevity and on time and on budget delivery, which meant that specific technology boundaries of its time needed to be respected. Other family characteristics that have emerged include inheritance of valuable assets from generation to generation, increasing affordability and ease of development, and that joint venture, self-published, commercial products have become a financial reality. This paper looks at the concrete changes introduced in past projects but focuses on future directions indicated by market and technological potential.

Introduction

As a company we specialize almost exclusively in multimedia projects, and we have been involved in this field since our foundation in 1985. This focus on, and long history in, multimedia mean we can look back at a large and varied portfolio of work, produced for and with many partners, and try to draw some useful inferences from these for the future.

This paper refers to developments in specific projects, because it is concerned with what is achievable under 'real world' conditions. These are projects we can speak about with some authority because we have provided the multimedia development and production work in each. The overall aim of the paper is, through reference to these concrete examples, to point to developments and trends which should be of more universal interest or application - regardless of who is the commissioning party and who the multimedia developer, or indeed if they are one and the same.

Background

In December 1998 the National Gallery of Art, Washington DC, working with Cognitive Applications of Brighton, England, published The National Gallery of Art Washington CD-ROM. This publication is the latest generation in the family line that began at the National Gallery in London when the original Micro Gallery, conceived way back in 1987, was delivered in July 1991.

In 1991 electronic multimedia in museums was the exception. Today it is more-or-less the rule in the specification of new galleries and museums, to the extent that we have seen a number of design briefs lately where the budget for multimedia interactive exhibits has been worked out by a Quantity Surveyor on a per square metre basis.

Audiences today expect to find multimedia exhibits in museums. I'm not sure they have yet come to demand that they be fast, worthwhile or in working order - but they undoubtedly should, and soon will. Meanwhile, over the same decade, the requirements of museums and cultural institutions have also been evolving.

Some of the current requirements we see are as follows:

- To ensure flexibility and self-sufficiency in content development and updates
- To ensure consistency between all kinds of publications and integration with existing Collection Management Systems

- To use technology as a cost-effective tool to help fulfil missions of outreach, accessibility and education
- To create and protect intellectual property and multimedia assets
- To generate revenue

Developments that address these requirements are discussed below.

The family history

For those of us caught up in the white-water rapids of technological development which have enabled 'multimedia' to exist it can become difficult to set these developments against a real world time scale. I have therefore included a few 'technical perspectives' below to remind us of how things have changed.

The first Micro Gallery came from a gene pool that included:

The National Gallery London, Its Complete Illustrated Catalogue, Apple Computer, Bill Atkinson's HyperCard, Cognitive Applications. 1989

The Study Collection, Design Museum, London

Starting development after the original Micro Gallery, this HyperCard-based database of designers and products appeared earlier, and contributed to the thinking and software development behind the Micro Gallery. It was installed on three Apple Macintosh SE's with 20Mb hard drives.

Technical perspective: The Mac appeared in 1984. HyperCard appeared in 1985. In 1986 a Mac Plus (the Plus meant it had one megabyte of RAM) cost just under $3000 in the UK, and that was without a 20Mb hard drive at about $1800.

And then came:

1991
The Micro Gallery, National Gallery, London

The original ground-breaking installation in the Sainsbury Wing, contains, 2200 works of art, the entire Gallery collection, occupying 1 Gigabyte of disk space. 8 bit colour display using a single custom palette on 21" touchscreens. Custom personal tours and black and white printing from any screen.

Technical perspective: At the time development started Apple had introduced their first colour computer, but it had no support for 24-bit data. There were no commercially-available hard drives larger than 300 Mb. The scanning, colour manipulation and dithering software had to be written from scratch. (By the end of the project most of this custom software had been replaced by PhotoShop.)

1993
'Microsoft Art Gallery: The Collection of the National Gallery, London'

The Micro Gallery was adapted to make a CD-ROM, which became an international best seller with sales in excess of 300,000 copies world-wide. MacUser magazine called it 'The best example of interactive multimedia to date'. This single disc CD-ROM publication included the entire contents of the London Micro Gallery, with additional guided tours and search facilities.

Technical perspective: The 2200 reproductions (and numerous supplementary images) used the same 256 colour palette as the original Micro Gallery. Most home computer users had at best 256 colour displays at that time. JPEG compression was around, but was extremely slow unless special hardware was used.

1994
The IMAGE Gallery, San Diego Museum of Art, California

Inspired by the London Micro Gallery, this project focussed on around 300 highlights of the collection, with a high percentage of custom editorial treatments and animations.

All images available in a scrollable magnified view. Full colour dye-sublimation printing of all works. Users print on demand and pay for these at the supervisor's desk, greatly widening the range of reproductions available for purchase.

Technical perspective: Increased CPU speed, memory and disk space allowed scrollable magnified views for the first time. High-quality colour printing finally (just) affordable.

1995
The Micro Gallery, National Gallery of Art, Washington

The second official 'Micro Gallery', installed in a specially restored room inside the main entrance to the original West Building, contained 1500 works from the permanent displays. 16-bit colour. Blow-ups of all works. Scrolling timeline. In-depth animated features on selected works. Personal tours illustrated with thumbnail images.

Technical perspective: Faster computers and more affordable storage allowed 16-bit images with 24-bit JPEG compressed details.

1995
National Gallery, London -Complete Illustrated Catalogue on CD-ROM

Produced and published simultaneously with the CIC book. A scholarly product (by contrast with Microsoft Art Gallery CD-ROM which was aimed at general consumers.) The original request to us was to extract the text from the Micro Gallery installation, to form a starting point for the new editorial work. In fact we were able to build comprehensive electronic 'editorial workbench' tools for the Gallery team and ultimately produce book layouts generated automatically into Quark XPress.

Once again all 2200 works were incorporated on one disc, but this time including large size blowups of all works in 16 bit colour. Self-published jointly by the National Gallery and CogApp. (Version 2 (1997) added electronic Bookmarks and multiple image windows, enabling side-by-side comparison of two or more images.)

Technical perspective: Desktop computers now routinely supported 16-bit or 24-bit colour and were powerful enough for JPEG compression.

1997
Microsoft Art Gallery published in three more languages

Proof of the longevity of excellent content in multimedia. The original content of *Art Gallery* was translated and published in French, Italian and Spanish four years after the original English version.

Technical perspective: Sophisticated translation workbenches were created to make it possible and cost-effective to translate half-a-million words, with links, from custom layouts into three languages in about 9 months.

1998
The National Gallery of Art, Washington, CD-ROM

The core of the Micro Gallery installation was published on CD-ROM. Web links from every page automatically open a relevant URL on the National Gallery's excellent web site (developed and maintained in-house). This ensures that users get access to any additional information on a chosen work, including a growing library of in-depth web features. Self-published by the National Gallery and CogApp.

Technical perspective: The 'lightbox' image windows introduced in the CIC CD-ROM were now available in a consumer product. Web links open up a new arena.

1999-2000
The National Gallery, Prague

Yet to be installed, the progress of this project to date demonstrates that the 'Micro Gallery' concept can be developed by local teams on tight budgets, with external consultancy and support as required. With twin language options throughout, this project is likely to make extensive use of web technologies, other new features to be announced.

Family characteristics

What can we learn by studying the common characteristics and evolving trends in this family tree?

Thoughtfully crafted systems can have long and valuable lives

High-tech is characterised by rapid evolution. This might by implication mean the equally rapid redundancy and 'extinction' of earlier generations, naturally a concern when precious resources of time and money must be invested. However, we have found that this does not necessarily follow. Each generation of this family inherited a good deal from its forebears and, as we might hope and expect, through fresh inputs and evolution, advanced beyond them. At the same time, however, the older generations have, to date, remained fit and active and continue to live useful lives.

What factors account for this longevity? There are three key ingredients that shape the development and final form of all these projects: content, design and technology. By focusing clearly on the development and presentation of the content, and by striving for the highest standards of quality and integrity in all three elements, the resulting product will age gracefully, becoming out-of-date to no greater extent than any other well-designed artefact.

As noted above, the London Micro Gallery opened in 1991. Its later incarnations have also been described. Meanwhile, at the time of writing, the original installation (several editorial updates later) is still up, running and extensively used. We are just now discussing the replacement of the original equipment (Apple Macintosh IIFX's for those who remember them) which will make possible subsequent upgrades to incorporate some of the features introduced by its descendants.

Valuable assets can be passed on from generation to generation

A first-generation project begins with the organisation's existing assets, such as written material and photographs, and returns new assets, such as digital images and multimedia databases which can be widely reused. Not only does each further generation receive and build upon the gene pool of technology and design of its ancestors, but it can also inherit the wealth of content its ancestors have created - in the form of digitised media assets such as databases, text, images, computer models, video and audio. These can be passed on and recycled in new and traditional forms. Often these assets can be inherited not only by new multimedia generations, but also by distant media cousins, to be used in forms quite different from the original - from books to broadcast TV. Unlike most forms of wealth these assets are not simply transferred from generation to generation, but can be replicated or shared at will. Portability of data and other assets mean freedom to evolve and develop, without the danger of heading into a technological cul-de-sac. Making sure that the initial collection of multimedia assets is well organised and of a high quality plays a crucial role in facilitating and encouraging all of the above.

Project planning and development gets more straightforward

Proven tools, accumulated experience and better, faster, cheaper technologies mean performance and feature-richness escalate while in real terms average project budgets tend to fall. The proportion of these budgets that can be spent directly on content development tends to increase. This ever-increasing wealth of experience, passed from generation to generation, means that it becomes easier to plan new projects. Quantifiable and predictable outcomes mean guaranteed safe delivery of the core project on time and on budget, and underwrite the development of exciting new features at low risk. We aim to deliver a 'complete' system at the earliest opportunity in the project timetable. This builds confidence for all parties and encourages creative flexibility in the final stages.

Joint-venture, self-published, commercial products are a financial reality

Two of the most recent publications referred to above are CD-ROMs. Both were developed as joint-ventures between the content-providers and the producer. In both cases, the CD-ROM was developed as a spin-off from another project. In one case a printed catalogue, in the other a public multimedia installation.

Both of these projects were organised in broadly the same way:

- The content-provider undertakes to supply all the editorial input, text, source images and permissions.
- The producer undertakes to provide the design, the software engineering, the multimedia production and the manufacturing of the disks and packaging.
- A contract is drawn up which, once income begins to flow from the finished product, covers in the first instance the development costs incurred by both parties, and then divides the revenue as agreed.
- In both cases the product is marketed primarily through the in-house gallery store. This means there are no third-parties to pay for marketing and distribution. It can also be marketed and sold via the web site or by mail order.

It is perfectly feasible that in some situations everything could be done in-house by the content-providing organisation, though there are aspects of producing a commercial product which should not be overlooked and which may put undue and unrealistic demands on any existing infra-structure. I refer in particular to product testing across the gamut of home PCs and to ongoing technical support.

Intellectual Property

The development of the London Micro Gallery coincided with developments in the National Gallery's intellectual property business. The project and its spin-offs prompted the Gallery to devise terms for new kinds of publication with the holders of related rights, such as copyrights and moral rights. In the case of an art gallery this mainly involves the artists who still own copyrights in more modern works of art. In the equivalent case of a performing arts organisation this might be actors, directors, writers, and other artists contributing to the productions. At another Cognitive Applications' client a spin-off from the main project is providing the basis for a commercial photo and media library. In all cases where we have been involved, a Micro Gallery-type project has created a valuable intellectual property asset.

Future directions

Seamless, frequent updates combine with the highest production values

The development of these projects has coincided with the development of an IT infrastructure in many Museums and Galleries. Whereas in 1989 most staff had little or no computer access, now they do, and there are often thriving IT departments in place. This means that the maintenance and development of content will naturally move in-house and become integrated with other important information resources.

Case study

At Manchester United Football Club Museum and Tour Centre, Old Trafford, we delivered a very large interactive exhibit which has 18 touchscreen kiosks occupying an entire floor of a new museum.

Fast response times, extremely robust technology, high production values (in particular lots of near full-screen video and pictures) and the ability to display masses of data (approximately 27,000 screens worth) in a touchscreen-friendly way were given requirements. Equally, an interactive encyclopedia for a very busy and tremendously successful football club demands fast, frequent updates. It would be in no-one's interest for the content-provider to be dependent on the multimedia developer for these updates.

We therefore worked with the curator at the Museum to develop a database with an easy to use front end where he and his staff can add new data as frequently as they need. Typically, during the football season this will be after every match - on average twice a week - but there is no reason why daily updates cannot be made. (In other circumstances it may be better to 'suck' data live from a database which can be updated at any time. However there are good reasons why this is not necessarily a good idea for big public access exhibits, hence the decision not to do this here).

The curator can easily add new data about the last match - the opponent, the score, the MUFC team sheet, the goal scorers and a 'one liner' summary. He can also add new players and update player biographies at any time. Once a set of updates are entered in the database the curator hits the big 'compile' button on the front of the database, setting off a compilation process. This process adds all the new information and automatically updates all the statistical information in the system. For example, on the 'home' page for any player who played in the most recent match, his total appearances will be incremented up by one. If he scored a goal or two his total of goals scored will be incremented by the appropriate amount. More subtly in a popup from his home page called 'team mates' the number of times he has appeared with other players will also be modified. MUFC's record against that particular opponent will be updated. Cross-references, indexes and page layouts update automatically.

At the end of the compilation process (which takes from between a few minutes and several hours depending on the type and extent of the changes) the curator receives an automatically generated report of any errors encountered. The most likely errors are hypertext links which have not been fulfilled (because they attempt to link to screens that have yet to be created), and text which overruns in the few areas where we have agreed maximum words counts - for example the match one-liner descriptions. These errors can then be easily found and resolved. However, more often than not there are no errors and at the press of another button the update can be published straight away.

The publication process involves sending the updated data to a central file server. The 'client' machines in the museum are all networked to this server, but each individual client has the entire encyclopedia stored locally on its internal hard drive. Each client is configured to start up automatically about an hour before the Museum opens its doors to the public in the morning. A small macro programs is run, which logs the client

on to the server, and checks to see if there is any modified data present. If not the client simply logs off again, if so it automatically copies over the new data to the relevant places on its local hard drive and then logs off. This approach produces a fail-safe, fast system of totally independent kiosks combined with the opportunity for significant daily updates.

We currently process and integrate the 'bigger' media assets - photographs and video - on a 'per season', or 'special occasion', basis. There is no reason why this work could not be undertaken in-house at MUFC should they so wish. These decisions should be about the most practical use of in-house and out-of-house resources, and not forced as the result of being 'locked-in' to a particular supplier.

Increasing use of web technologies for installations

- We expect the following developments to become more widely evident:
- Fast client-server configurations mean that large touchscreen systems can be delivered using browser front-ends.
- The use of templates and database servers means even greater dynamism in system updates.
- Auto layout reaches new levels of sophistication by the use of DHTML and stylesheets.
- Feature development becomes faster, more flexible and more democratised by the use of off-the-peg web technologies like Shockwave and Flash.
- Java applet libraries continue to expand and are developed to allow clients to apply and extensively modify the use of these applets through the simplest of HTML.

Case study 2

Working with the National Maritime Museum in Greenwich, London, we developed a new public installation - the Maritime Research Centre Search Stations - entirely with internet technologies. All the data for the stations was built in a set of FileMaker Pro databases. This included data such as the dimensions of images, and their media type. We then developed a set of HTML templates for a wide variety of layout options, to accommodate all shapes, sizes and types of media. The elements of the various screens are pulled from the database at run-time, and the appropriate layout template is picked automatically by reference to image dimensions or the media types to be displayed. This means that the Museum can add data at any time and be sure that the system will display properly, without custom layout work in or out of house.

The installation uses flat LCD panels, fitted with touchscreens. The systems run in Internet Explorer set to kiosk mode to take over the whole screen. We used JavaScript and DHTML to overlay hotspots accurately on full screen graphics, achieving a visually rich, touchable, effect. We used Shockwave and Flash to build animated features such as maps and battle plans, animated interactive timelines and the topic index. The use of these technologies means that the development of additional features is more easily delegated or taken in-house by the Museum, as they are readily available technologies that are being learnt by an increasing number of people. We used Java to build an animated quiz for the National Maritime Museum Search Stations. We made sure that many of the parameters needed to modify the quiz are outside the applet. They can be written straight into the HTML, but we took this a stage further and placed all of this in the central databases too. These parameters include the images to be used in animations, the number of questions, the number of wrong answers allowed, the questions, each with three possible answers, and so on. This means that new quiz questions and whole new quizzes can be built by changing database entries. Animations can be varied by producing simple GIF files.

Case study 2

Working with the New Britain Museum of American Art, New Britain, Connecticut, we developed a suite of Java applets for a web feature on a set of murals by the American artist Thomas Hart Benton. These were:

- A sketch pad, with different size pencils or brushes, and a set of 'paints'. This is used to encourage visitors to try to copy details from the works, drawing their attention to tone and colour.
- A set of jigsaw puzzles of varying degrees of difficulty. This is a user-friendly way to focus the visitor on composition in the panels.
- A 'closer look' applet which enables the user to scroll over a large image of a panel. Embedded

'hot' areas in both the overview and in the large image enable us to give contextual information and to embed links to related documents - primarily in this case image details.

In each case we designed the applets to make them easily modified by the museum staff, without the need to refer back to us for new versions of the compiled applet code. In the sketch pad we enabled the Museum to modify the range of paintbrushes and paints available to the user (Because the colours are simply RGB values, a monochrome sketch pad or even a pure black and white "pen and ink" set can easily be achieved.) In the jigsaw applet the number of pieces and the starting and final location of each can be set easily in the HTML, as can a "timer" so that users can complete the puzzles against the clock, with different outcomes. The images used are simply transparent GIFs, so new jigsaws can be created by anyone with fundamental web graphics skills. In the 'closer look' the most important parameters that can be set are the number of, and location of, hotspots in the images with associated captions and URLs.

Greater fluidity between installations, the web and other media

Case Study - A web feature becomes an installation with an hour's extra work

The Thomas Hart Benton feature referred to above was built to appear on the New Britain Museum of American Art web site. Through a small amount of forward planning and an even smaller amount of work at the end of the project, we were able to install a stand-alone 'kiosk' version of the system in the Museum itself for visitors to use.

We ensured that all external links were accessed from a single page in the on-line version, which was in turn accessed from a single menu item. Because the feature was built to run in a frame on the main web site (in common with the rest of the existing NBMAA site design) we did not need to remove any general site navigation links, though it would have been easy to do so if necessary. We also removed the links to the feature's Bulletin Board and any e-mail links. The net result of these changes was that we needed to modify three files from about 100 for the kiosk version. We then set up an iMac (a wonderful machine if you need an instant kiosk!) and wrote a tiny AppleScript to automatically launch the browser and put it into kiosk mode on startup. All done.

Case Study - An animation for an installation becomes a video

The London Micro Gallery has been used as a test-bed and forum for new work. Recent conservation work on Holbein's *Ambassadors* gave the Gallery an opportunity to revisit its theories about the anamorphic skull that is the painting's most distinctive feature. The process of constructing digital animations to illustrate those theories provided a concrete proof of their plausibility. The Micro Gallery now provides visitors with a way to see precisely how the skull was constructed and viewed. A broadcast-quality video produced for the unveiling of the restored Holbein incorporates the same computer animation, rendered from the source model at the appropriate resolution, colour gamut and frame-rate.

Other spin-offs or by-products of the London Micro Gallery project have included:

Internal Database - source material from the Micro Gallery has been used to populate internal CMS databases used by the Gallery's staff.

Book and CD-ROM Combination (see above) - the Micro Gallery source material provided the starting point for the Gallery's fundamental scholarly publication, 'The Complete Illustrated Catalogue' (CIC).

Digital Image Library - the CIC project has in turn created a digital library of the Gallery's images.

Web Pages - the Micro Gallery is providing material for the National Gallery's web site. All the Micro Gallery material can easily be re-purposed for the web.

We have been able to meet the demands of the developments described above because we have ensured that reusable data has been held in formats that can be readily and systematically accessed, with a proper differentiation between the content and the particular requirements of a given way of looking at it. We have invested many person-years of development in technology that allows us to build projects this way.

Increased computer power means a richer repertoire

The continued exponential development of computer power means that speech technologies, biometric devices, virtual reality and intelligent technologies will become standard terms in the grammar of 'real world' museum system design very soon.

Database-driven applications are the way to go

Perhaps the most exciting of the various development threads running through this family tree is in the relationship between the authors of content and the final laid out pages. In the original Micro Gallery in London, scripts for a work were written in long hand, with photocopies of post cards pasted on to the pages to indicate details. These were passed around the gallery for review on paper, and then handed to graphic designers who laid out each page by hand. By the time of the Washington Micro Gallery, scripts were authored in WordPerfect, and a custom work-flow application automatically routed each script between authors, editor, revlewers, and curators, keeping track of the status of each script until it had been signed off. Signed off scripts were then imported into a database from which initial pages were automatically laid-out; then each page layout was adjusted by hand. The National Maritime Museum, which features quite simple scripts associated with exhibits, is edited entirely in the database, and the vast majority of the pages are laid out automatically.

Now we are currently working on a project for another National Gallery which will take this thread to its final conclusion: a system of the size and sophistication of the Micro Gallery projects, in which the content is editable in a database at the Gallery; and the Gallery staff have the ability to publish a new edition automatically. In 1991, we handed over a Micro Gallery to the National Gallery in London; early next year we will be delivering to this new client a publishing system.

Conclusion

For organisations that are in a position to undertake one, a comprehensive or encyclopaedic multimedia project can produce a uniquely valuable asset. The methods of construction are well understood and what pitfalls there are can be clearly sign-posted along the way.

In a very fast moving world of technology it may be impossible to foresee exactly what future projects an organisation will want to pursue. Who knows exactly what the future holds for the world-wide web ? how quickly DVD-ROM will take off ? when if ever people will want to engage with interactive TVs ? What we do know is that activity in the area of electronic communication can only increase and that organisations should plan to respond.

An organisation that can accumulate a comprehensive, high quality and well organised base of multimedia assets will find that its efforts produce virtuous circles; each new development feeds off its predecessors, and in turn creates material for use by those that come after.

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