3 MULTIMEDIA INTERFACE DESIGN

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Interface design plays a vital role in the production of multimedia displays. To a large degree, the plan and layout of multimedia screens determines how visitors perceive the key ideas in the display as well as how to travel from one idea to the next. At its best, effective interface design will interest, engage and thrill a visitor. Effective design also integrates each multimedia element text, graphics, animation, video into a seamless whole where the information is clearly presented, where visitors have a chance to perform interesting activities, and where the visitors understand how to navigate through the interactive at a glance.

At its worst, poor interface design will confuse and bore a visitor. Poor design will clutter a screen with too many options or offer too few choices so the presentation becomes a linear story. Poor design can often cause a visitor to turn away, move on to something else, wasting the time and money and resources spent on developing the display.

Developing effective, understandable interfaces involves coordinating the work of curators, graphic designers, interpretive editors, and multimedia producers. Its a recipe which includes basic design principles as well as intuition and creativity. In this paper, we will explore six key steps to designing effective interfaces.

Determine the scope and purpose of the interactive presentation

Define and focus the subject matter. The more focused you are, the easier your design decisions will become. When determining the scope and purpose of the interactive presentation, consider three components:

- *Decide on the purpose of the interactive presentation.* You should be able to state the purpose of the interactive exhibit in a single sentence. For example, the purpose of a display could be, to illustrate four possible ways dinosaurs could have died. It could be, to demonstrate how the Earth's tectonic plates have moved over the past 250 million years. Or as in the case of a recent interactive display at the Royal Ontario Museum, it could be, to illustrate three optical properties of gemstones: why diamond's sparkle and glitter, why cat's eyes and star stones show bands of light, and how precious opals display a play of spectral colours. Although stating the purpose may seem simple and obvious, it does provide the function of providing a clear target. When you know exactly what you want to communicate, you can then determine how best to communicate the ideas. Clear targets also help to judge how effective the interactive presentation is as well as to contain the scope of work which so often can grow exponentially.

- *Decide on how much information the interactive presentation will cover.* For example, if you are making a presentation on Egyptian mummies, determine if you want to focus on a particular mummy (say one which is on display) or if you want the visitor to view many mummies. Each approach will dramatically affect the production of the interactive display. In one case, you may have all the resources available by videotaping and photographing the mummy at hand. In the other case, you need to determine where the images of the other mummies will come from and how you will secure them. In the case of the *Light and Gemstones* interactive presentation at the ROM, the production team decided to focus on three optical effects of gems, rather than explore countless others. The more specific you can make your interactive presentation, the easier to design becomes.
- *Decide on the resources the interactive presentation will require.* Estimate the amount of time the presentation will take to build, how large the budget will be, and the amount of hardware required. Often the process of estimation is difficult because multimedia production is a young and temperamental art. Software and hardware is upgraded several times during the course of the production cycles. There is no formal multimedia infrastructure as there is in print design or television production. A good approach is to contact several developers who have gone through several production cycles and ask for estimates. Then double the time and multiply the budget by one and a half times.

As with any creative process, you have the freedom change your mind about the scope of the work. As you explore the ideas and search out new ways to bring out the interesting features of the subject matter, you might want to shift the focus. The important point is to communicate the options and decisions to the team. The target may change just make sure everyone is aiming at the same target.

The scope of an interactive display often depends on the nature of the subject matter being presented. At one end of the spectrum, a display can be encyclopaedic. In an encyclopaedic database, the visitor is free to browse through a great deal of information. We implicitly understand that most visitors will not have the time or patience to view every entry in a visual database of 3000 paintings. But as multimedia developers, we should allow the visitor to browse through the paintings in several ways so the visitor will quickly find the paintings which hold the greatest interest. The visitor could view the paintings by themes, by location in the gallery, by artist, by style, and so on. For encyclopaedic displays, design the interactive so the visitor can sit comfortably for as long as he or she desires. In higher traffic areas, consider using multiple stations and incorporating slave monitors so that visitors can still watch, listen, and learn from the interactive while not directing it.

At the other end of the spectrum, a display will illustrate a single idea or set of ideas. An interactive presentation which explores the techniques Rembrandt used to paint Nightwatch will encourage a visitor to look very closely at the real painting. Thematic presentations tell a story, allow a visitor to understand a process, or describe the interesting features of artefacts. Often, the best thematic interactive presentations are those which elucidate an artefact on display and range in duration from two to five minutes. At the end of the presentation, you would hope that a visitor would be able to say, "Yes, I learned the following points ..."

As developers of museum digital media, we should recognise that we are still in the Guttenburg era of interactive multimedia. There are no hard and fast rules to develop the right presentations. And in this era, technology changes at a bewildering pace where new

authoring systems emerge and computer performance doubles every two years. Each of us will continue to learn what works and what doesn't.

What are some of the other factors to consider when determining the scope and purpose of an interactive presentation? Naturally, one essential factor is budget. Hardware, software, development, and maintenance costs guide every interactive display. Large encyclopaedic presentations obviously cost more. Even an apparently simple interactive presentation can become very costly in production time. Consider an interactive display on the creatures in the Burgess Shale. If you had fifty screens in the interactive, you might spend a year gathering the material and pay a developer $40,000 just for the authoring.

Another important factor is what the curator wants to display. Some curators are not familiar with multimedia technology and think of it as an infinitely deep text panel. As we will see, multimedia is at its worst when it displays endless screens of text. It is at its best when it illustrates ideas.

Usually the scope and content of a presentation is determined in consultation with the curator, project manager, and educator. To consider possible targets, ask, "What do you want the visitor to know and feel after using the interactive?" You may also want to ask, "What are three key ideas you want the visitor to understand after using the interactive?"

Although you may have to spend a great deal of time in answering these questions, the answers also help to define the target and to develop an interesting and effective interface design.

Know the visitor

Who are your users? In many ways, the answer to this question affects the design decisions more than any other single factor. To design information effectively you need to identify the visitor's knowledge, expectations, and mindset. Interview visitors formally or informally to find out what they already know, what they don't know, and what they would like to know.

Consider the differences between an interactive presentation on armour aimed for eight year- old children and one for graduate students. To get ideas about how eight year-olds think, go ask a class of eight year olds about what they think about armour. Ask why they think armour is, how it was used, who used it, when it was used, where it was made, and how much it cost. You might be surprised at the preconceptions. Ask them what is most interesting about armour as well as what they would really like to know about armour. In the process of gathering information, pay attention to their vocabulary. You might want to try this with several classes.

For a target audience consisting of boys and girls who have a low reading level, a short attention span, and a need for constant positive reinforcement, look to children's learning software for inspiration. For a target audience consisting of highly motivated individuals, more complex information can be presented. Motivated visitors will want to delve as deeply as curators.

At times, the results of your market research will fit in nicely with a curator's expectations and wish list. But there will be times when the target audience wants to know something different from what curator wants to say. Resolving these differences is a compromise: the screens can offer options which incorporate the visitor's interests as well as the curator's. You may want to develop a prototype to determine what will work best.

When thinking about interface design, put yourself in the shoes of the visitor. He or she will probably have been walking around for the better part of an hour or more. The visitor

may have seen fifteen rooms brimming with artefacts. What will their mindset be? Likely, the visitor will be fatigued.

Wouldn't it be wonderful if museum visitors approached an interactive project with full attention and full enthusiasm? As anyone who has watched visitors know, visitors are bombarded with a wealth of impressions, from finding their way around a gallery to looking after the time, to keeping track of the children, to actually concentrating on the interactive exhibit. Like a television commercial, the interactive presentation competes for the attention of the visitor wanting the visitor to buy into the product being presented.

The information should be presented simply and clearly. Instructions should be simple and self-evident. The visitor should have a visual reward and be look at something interesting. A tired visitor is not going to want to read six screens. They will want to listen and watch.

Information design

Now that you've got the raw information in terms of content, scope, and purpose of the interactive as well as the information about the museum visitor, it's time to arrange the content of the information. What are the best ways to express these ideas?

Interactive presentations can be categorised into several formats, ranging from slide shows, animations, sequential stories, quizzes, games, demonstrations, and simulations among others. Brainstorming the possible methods of presentations can produce a wealth of ideas (and its a lot of fun).

Take out a sketch pad and jot down possibilities. Ask yourself how you might illustrate the key subject matter idea into a game. If you made a quiz, what form would it take? Is it possible to produce an interactive map of the subject matter which allows the visitor to compare and contrast the ideas.

- *Consider a quiz.* Quizzes can engage people and get them into an "That's fascinating! I didn't know that frame of mind." Can you formulate six questions which connect to your idea? What images would accompany each question and each possible response?
- *Consider a build-an-object format.* One of the Royal Ontario Museum's most popular interactives is a Build-a-Bird. Children can select options of a bird, such as body type, and then make a series of choices type of type, type of wing, colouring, and so on to interactively construct a bird. After just a few choices, the child is presented with the bird he or she has just developed along with information about the bird based on the choices the child has just made. Then the child can start again and build another bird based on other choices. Consider Build-a-Fish, Build-a-Barrier Reef, Build-a-Dinosaur, Build-a-Castle, Build-a-Song, Build-a-Piano, Build-a-Gallery.
- *Consider a time-line.* Interactives seem to be especially effective when a visitor can control a linear parameter and view the effects. Consider a timeline in the evolution of the horse. A timeline fixed in one location of the screen allows a visitor to select a horse at particular time, and see the size and properties of the horse. Moving through the timeline allows the visitor to compare the evolution. You can modify any linear parameter: vary the depth of ocean to see the colour of water; vary the amount of sunlight to see the effect on the plant growth; vary the ratio of predators to prey to see how the ecosystem evolves over time; vary the amount of time to see how an artefact decomposes. You can produce some

interesting effects by presenting something which you cannot ordinarily see. For example, vary a star's initial mass and view its evolution. (Large stars have very short lifetimes and turn into Supernova quickly. Medium stars have 10 billion year lifetimes and turn into white dwarfs. Small stars evolve very slowly and turn into red and brown dwarfs.)

- *Consider a valued-added tour of an artefact.* Curators are the voice of artefacts. They tell the many stories of an object, how it arrived at the museum, what its purpose was, why it came into being, and what is particularly interesting about the object. At the Royal Ontario Museum, we are experimenting with multimedia interfaces where a curator can describe an object, specifically a Tang dynasty camel burial figure. Visitors can select questions about the figure What is a burial figure? How was it made? How did it come to the museum? Why did the Chinese represent camels? What is most interesting about this artefact? and watch and hear curators provide the answers. In a way, this format allows a visitor to have a conversation with the curator. Spontaneous video sequences convey the curator's excitement and passion about the objects.
- *Consider a simulation.* Simulations are one of the most powerful techniques in designing information. In the *Light and Gemstones* interactive exhibit, visitors learn that diamonds are faceted in such a way that most of the light that enters the top of the gem is reflected through the surfaces up back up the top of the gem. As a result, a properly cut gem casts a shadow, you can't see through it, and is sparkles and glints. The proper cut depends on the gem material refractive index. To actually *demonstrate* this concept, visitors can interactively control the shape of a faceted gem and see what happens to the light. The computer generated image shows that when the shape is too steep or shallow, the gems casts a soft shadows rather than a strong shadow and is less brilliant. In other sections, visitors can vary other gem characteristics including the refractive index and dispersion and see what happens to the light when it travels through the gem. Visitors can identify the proper cut for a specific refractive index, and the correct refractive index for a specific cut. In other sections of the interactive, the visitor can vary the orientation of a star sapphire and see how the bands of light play across it surface. For opals, visitors can play with virtual opals, varying the size of the silica spheres inside the gem to see the effect on the colour. Opals with smaller spheres tend to produce blue colours and opals with larger sphere produce a full range of colours. Simulations work well when illustrating a process. Consider how it could be used in how the pyramid was built, how to make a mummy. Rather than describing something, allow the visitor to participate in the process. Perhaps this is the most important point in designing information.

In each format of interface approach quiz, game, build-an-object, time-line, value added tour, and simulation look for screen design elements which are familiar and easy to understand. A video cassette recorders buttons of play, stop, fast forward and rewind are familiar to most people. Map metaphors which have active regions of different parts of the map are also easily understood.

Information design, just one particular step of the interface design process, is the step where you tease out multimedia activities. It is where you decide what the visitor can do to learn a concept or to experience an event.

Integrate text, images, video, and sound

Most people don't want to read text on a screen. Visitors expect to see something on a screen - preferably something visually striking and something moving. Because visitors are familiar with high quality images of broadcast television, commercials, feature movies, and computer generated imagery, a text-heavy interactive can quickly bore visitors. As well, an amateurish graphic can quickly make an interactive appear less than professional.

- *Use text appropriately.* Write for the screen, not for paper. Interactive presentations are not books. Nor are they articles, text panels, or treatises. In general, written material needs to be concise and structured to fit into bite-sized chunks. You will find that museum visitor particularly one who has been walking through galleries for the past two hours will have little mental energy to read large amounts of text. Consider using audio narration so that a person can concentrate on looking at the images. And if the budget can support it, use a video narrator to guide the visitor through the interactive presentation. When you do use text, use spaces, bullets, and screen layout to make the reading easier. The main points are clarified when there is a graphic element surrounding the words. Have the narration pleasing to the ear. Write sentences that sound good to listen to. Read the text aloud to yourself. Hear the words as a visitor would hear them. And when you write, use humour carefully. Humour can liven up a presentation or it can be deadly. If you use humour, make sure that it doesn't interfere with the content of the project. Humour should be something the visitor has the option of noticing but is not forced to wade through.
- *Use high quality graphics.* Computer graphics programs can produce virtually and texture and image. Many people associate interactive computer projects with a hard edged computer look. These screens often use primary colours and are cluttered with complex selections. But computer imagery can reproduce the soft look of mediaeval bibles to the high tech look of the Space Shuttle cockpit. The choice of colours will affect the look-and-feel of the presentation and provide a kind of tone for the entire presentation. Select a design which reflects the subject matter. Adopt a visual metaphor which helps visitors understand a new subject in terms of something familiar. Select a screen look-and-feel which engages the visitor. Modern computer graphic production tools can produce virtually any look ranging from a high-tech to a soft airbrushed design to a mediaeval text.
- *Let the graphics convey meaning.* Use graphics and images to carry ideas. A simple animation of how a dinosaur jaw is hinged conveys an idea far faster and more effectively than a written description of the process. Use graphics to take the burden off of words. Remember that most visitors are familiar with and expect high quality images.
- *Illustrate ideas rather than describe them.* Determine how an idea can be expressed in a graphic or animated form. In some cases, some concepts can be put into the form of an interactive demonstration. For example, a visitor can learn about the concept of index of refraction by interactively varying the refractive index of a prism and watch how light interacts. In many ways, demonstrations express ideas faster, more clearly, and in a more entertaining way.
- *Use sound appropriately.* Sound serves several purposes. One use is to reinforce the user's sense of transition. Combined with visual effects such as dissolves, wipes, and pushes, a consistent brief sound will tell the visitor that they have returned to a specific location in the stack,

such as the main menu. Visitors will associated what they hear with what they see. If one sound is associated with a particular button or icon, the visitors will learn the button's use faster. If a button produces different sounds, users may become perplexed.

- *Use sound for transitions.* The length of the sound conveys information about the importance or kind of transition. A good guide is to have the sound last a little longer than the visual transition. Use short sounds to travel to similar ideas or related screens on the interactive, and longer more dramatic sounds to change sections or return to main menu. Sounds combined with visual effects can help to reinforce the visitor's sense of place and travel within the interactive presentation. It's worthwhile noting that most computer systems can produce sound instantaneously, whereas visual transitions take much more time to compute.

Sometimes the sound can actually be the main point of the presentation. An interactive on musical instruments may compare and contrast musical instruments. In these cases, the sound should be of the best quality and played back at the best fidelity.

Decide how users will navigate through the presentation

When a visitor first walks up to a presentation, they need to learn its purpose, how it works, and what they have to do to use it. Make the opening short and simple. Provide only as much information to get moving forward. "Press here to start" or "Press from these three options". Get the user doing something quickly.

When a person starts using a stack they need to know the content, the locations, where they are now, the destination, where they can go, and how to get there. In a typical touch screen design there are a number of guidelines to follow.

- *Strive to keep the information tree shallow.* Don't clutter the screen with endless choices or options. One key suggestion is to reward the visitor for presses. What frustrates a visitor is pressing a menu option to be rewarded by another collection of choices, which when pressed rewards a visitor with another series of choices. Arrange the menu so that visitors are rewarded with information and a strong visual.
- *Use the minimum number of buttons.* Keep navigation simple and consistent by giving only the appropriate choices. Allow the visitor to know where he or she is. Make it easy for the visitor to know where they are in the overall context of the program. In some cases, produce a map which shows the major options. The visitor should never feel lost.
- *Keep the navigation buttons consistent.* The buttons should be consistent with each other through colour and shape and should be in the same place. Keep buttons closely linked together. Large buttons are the most important. Use larger buttons when using a touch screen.
- *Give feedback when a button is pressed.* When the visitor touches the screen, have the button depress, or change colour, or create a sound. The more feedback the user receives, the more control they feel that they have.
- *Don't use too many options.* No more than six main options. (Others would say no more than four main options.) Don't have endless series of buttons or options. Don't reward the visitor necessarily with text. Text is vital, it may not be well illustrated in a museum interactive.
- *For icons, use images as well are words.* The images are easier to understand and more aesthetic to the eyes. This is particularly helpful

for multi language support. Choose icons which are easily understood and add to the content rather than distract from it.

If you're presentation is content rich, then consider using a map of the content. This map is essentially a flowchart of the main sections covered in the interactive presentation. For example, the map could include the main menu, the introduction, the five key options, and sub options beneath. The map should also tell the visitors where they currently are in the map of ideas.

Test and refine

Show your example to many people and ask questions. Listen carefully to their responses and implement their suggestions. As well, watch very carefully how the users use the interactive, where they hesitate, and what they do easily and automatically. Ask the users about the content and how they enjoyed the display. In the production process, set as much time for the testing as for the actual production. Testing and debugging should not be rushed or slotted into the end.

What should you look for in the feedback? Look at the body language of the visitor. Is he or she really interested in the presentation? Does she say, "Hey, that's really neat?" or "That's fascinating, I didn't know that?" Or does she look at it from a distance, and then walk away after half a minute. Are there parts where people simply look confused, as if they don't know what to do? Are there features which the visitors are not actually making use of? Keep accurate and honest notes about your observations, make adjustments to the interactive, and then continue to observe. This is really the only way we eventually get an interactive at its optimal performance.

Designing an interactive presentation is a cyclic process of splashing ideas, designing, adding graphics and video, writing, obtaining reviews, and revising. Keep your project simple by focusing on the main purpose and scope of the presentation, knowing who your intended visitors are, and how to creatively present ideas to the visitors. Keeping these key factors in mind gives you a basis for guiding your other design decisions and helps to stop wasting development time.

Multimedia development is an evolving art and it will continue to develop for the next several years. As multimedia developers in the museum community, we have the exciting opportunity to develop first-rate, exciting, and informative multimedia presentations, and to communicate the rich tapestry of ideas and artefacts which our museums house. Let's make our presentation sparkle and sizzle and get the job done.