

PROBLEM SOLVE
OVERHEAR
INTERACT
REFLECT
REMEMBER
ANALYZE

OBSERVE
CONNECT
COMMUNICATE
RECORD
ENLIGHTEN
MANIPULATE

EXPERIMENT
ASSOCIATE
EXPLORE
PROBE
EXTRAPOLATE
INTENSIFY

INTEGRATE
NOTICE
EXPERIMENT
SOCIALIZE
WONDER
IDENTIFY

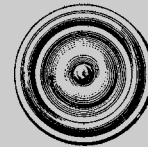
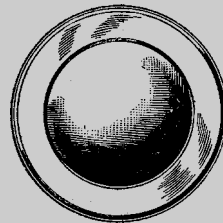
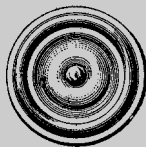
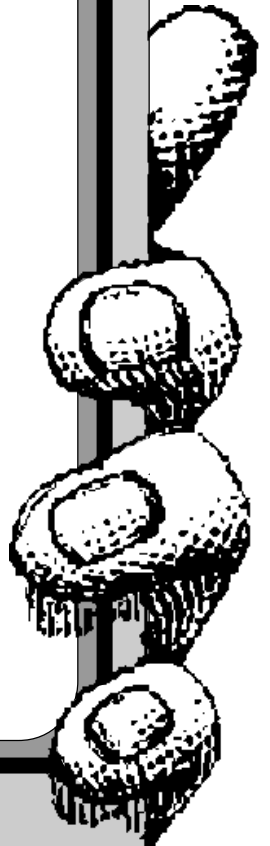


Electronic Guidebook Forum

October 11 - 12, 2001

San Francisco, California

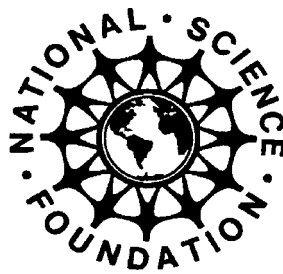
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the museum of science, art
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This unpublished document is intended to be a faithful synthesis of the discussions that took place at the Electronic Guidebook Forum held at the Exploratorium, San Francisco, October 11 - 12, 2001. It is meant to serve as a resource for those who attended as well as others in the field, and it does not necessarily reflect the views of the Exploratorium or of individual symposium participants.

Participant comments have been paraphrased. These are not exact quotes, rather they are an attempt to capture the content and meaning of the ideas presented.

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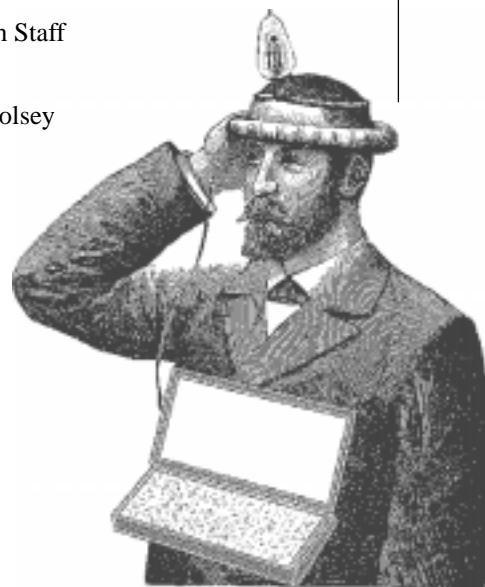
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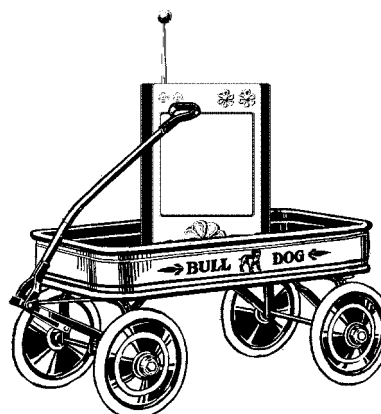
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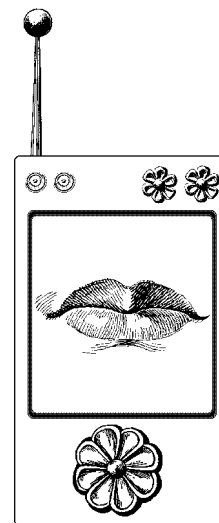


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I. OVERVIEW

A. The Forum

Participants, Process and Goals

This two-day forum brought together researchers and developers from industry, academia, and the museum world for discussion of the latest findings on the application of handheld computers and wireless networks in museum exhibitions.

Forum content centered on interrelated aspects of electronic guidebook projects in museums and on emerging questions from the field. The format included full group discussion of these topics, as well as discussion in small groups on lessons learned and recommended next steps.

The goal of the forum was to identify key issues that will inform further work in the museum field on wireless handheld devices and stimulate research and implementation.

Beginning Groundwork

The forum did not, nor was it expected to, result in a template or a how-to manual concerning implementation of nomadic computing projects in museum settings. The forum did underscore the fact that this is a new field in the early stages of evolution, based on emerging, rapidly changing technology.

The candor and honesty of the projects that shared early findings, results, and visitor feedback about their research and deployment efforts was noteworthy and contributed significantly to the forum discussions.

Those discussions resulted in recognition of the varied potential of nomadic computing in museums settings, and identification of challenges, issues, commonalities in problems, and intriguing questions. The result is an understanding of the beginning groundwork and a set of questions that may serve as pointers for museums continuing projects in progress, museums about to launch electronic guidebook projects, and museums just beginning to think about the potential nomadic computing may hold for their particular context.

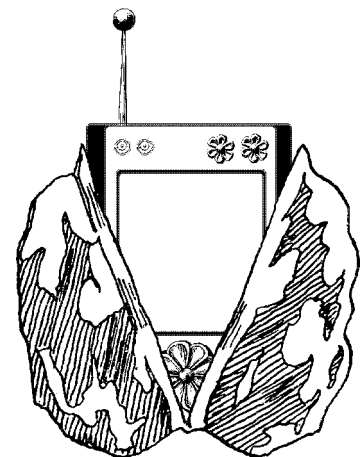
Ongoing Dialogue

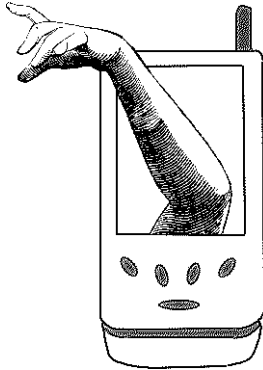
Forum participants appreciated the excitement and opportunities inherent in assuming pioneering roles in what is a raw and largely unexplored landscape. Participants also expressed a desire to continue the discussion and information exchange on an ongoing basis and to track the progress of participating museums over time. Rather than

Questions

Participants were asked to consider the following questions prior to the session. The questions then served as a focus for discussion during the forum.

- Which aspects of using handheld computers in museums do you find most promising?
- Which aspects concern you the most?
- What unanswered questions do you have about using this technology in museums?





Sample Projects

Presentations and demonstrations from electronic guidebook projects, including those in a research phase and those in full deployment, offered insight into initial findings in the field, highlighted the promising aspects of introducing nomadic computing to a museum setting, and helped to surface common problems, challenges, and questions.

The projects represented a spectrum of contexts including a science, art, and human perception museum; a children's discovery museum; a historic house; a museum of world culture; a modern art museum; and a probeware project that works in both museum and formal education settings.

convening sessions as an adjunct to exhibiting museum association meetings, it was felt that this should remain a separate forum, one that represents a diverse group composed of industry, academics, and a cross-section of museums, forming a learning community in a new domain.

B. Sample Projects

Points of Departure - San Francisco Museum of Modern Art

www.sfmoma.org

www.sfmoma.org/exhibitions/exhib_detail/01_points_of_departure.html

Making active use of new technologies and multimedia education programs, this exhibition presented works from the museum's permanent collection that can be inaccessible, confusing, or disturbing to visitors, organized in six curatorial themes. Video clips of artists talking about their work were presented on the iPAQ Gallery Explorers. In each gallery, information kiosks called "Smart Tables" featured introductions to the exhibition's themes and video clips of artists and curators discussing the work. The exhibitions also included Making Sense of Modern Art – the Museum's flagship multimedia program, with new content developed especially for Points of Departure – and Make Your Own Gallery, which invites visitors to organize their own exhibitions.

Sotto Voce - Xerox PARC

<http://www.parc.xerox.com/guidebooks/>

Sotto Voce is a prototype developed and evaluated at Xerox PARC. Sotto Voce employs a user interface based on imagemaps and an interaction technique called "tap tips." Tap tips are transient highlights that indicate imagemap targets as needed. An outline appears around targets if you miss a target. To mitigate the potential problem of visitor isolation, the handheld device includes the opportunity to eavesdrop on a companion's guidebook so that visitors can share information, thereby increasing social interaction. Sotto Voce has been tested in several rooms at Filoli, a historic house in Woodside, California (<http://www.filoli.org/>).

Kid Club Communicator - Port Discovery

www.portdiscovery.org/

Port Discovery is a children's museum in Baltimore, a hands-on, skills-oriented museum in which children learn to cooperate, problem solve, and communicate, with exhibits designed by Walt Disney Imagineering. Wireless handheld devices called Kid Club Communicators (RIM Blackberry Pagers donated by Aether Systems) utilize custom software and enable increased interaction and problem solving activities with exhibits. The communicators have e-mail capacity and there is a two-way pager – a highly popular feature with kids.

MUSEpad - Mathers Museum of World Cultures

www.archimuse.com/mw2001/papers/kirk/kirk.html
www.indiana.edu/~mathers/new/index.html • www.worldboard.org
Mathers Museum, in partnership with Information in Place, Inc. and others, engaged in a six-month NIH feasibility study to determine whether a mobile computing tool called the MUSEpad that uses emerging WorldBoard technology could serve as a useful device for people with disabilities. WorldBoard, which represents a convergence of technologies, utilizes wireless connectivity and positioning systems to enable visitors to access Web-based information correlated with physical locations or objects.

The interest was in customization of content for different users, specifically those with low vision, low hearing, and mobility problems. The study created user profiles, utilized exhibit spaces at Mathers Museum (a museum of anthropology) as the focus for content, developed “channels,” or different modes of developing content (audio, video, etc.), and investigated authoring kits.

Findings, which relate to both features and functionality, include audience preference for larger screens, the audio mode of delivery, and manual control versus auto updating. Video clips (watching a craftsperson at work, rotating an object 360 degrees) were a popular feature. Audience requests included the ability to bookmark, wheelchair mounts, customizable “skins,” access to objects not on view, ability to record and retrieve information after the museum visit (“my museum”), and paging capabilities.

Concord Consortium Probeware

<http://concord.org/ccprobweare/guidebook/slide1.html>
<http://concord.org/data-models/conductivity-system.html>
<http://concord.org/ccprobweare>

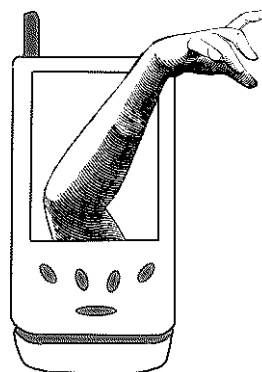
The Concord Consortium (CC), a nonprofit educational research and development organization, is one of the partners working on the Exploratorium Electronic Guidebook project. One Concord Consortium focus is on sensors, modeling, and handhelds. Other work includes online learning and professional teacher development. Work on the Electronic Guidebook project involves exploring the use of sensors in a museum setting – for example, building sensors into exhibits, with data displayed on handheld computers. Other CC projects contributing to the development of CCProbeware include the Data and Models project, TEEMSS (Technology Enhanced Elementary and Middle School Science), and modeling across the curriculum.

Electronic Guidebook Project at the Exploratorium

www.exploratorium.edu/guidebook/
<http://cooltown.hp.com>

The Electronic Guidebook is a research project investigating the use of handheld computing devices and wireless networks to support a richer learning experience for science museum visitors. In collaboration with the Concord Consortium and Hewlett-Packard Research Labs, with funding from the National Science Foundation, the Exploratorium is testing a network of mobile devices, wireless systems, and Web-based content that supplements the museum’s interactive science exhibits. The goal of the project is to develop a knowledge base on how this network will allow individuals and groups to engage in a continuum of activities before, during, and after a museum visit to support a deeper engagement with the exhibits.

Activities include applying H.P.’s CoolTown concepts, testing various technologies applied to the museum environment, prototyping user interface components, and investigating the potential to increase visitors’ learning experiences.



C. Summary of Key Lessons, Ideas, Issues, & Questions

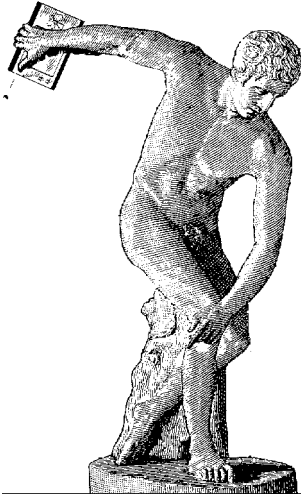
During the two days of presentations, discussions, and work groups, a rich spectrum of ideas, questions, and concerns emerged that may assist in guiding future research, provide valuable background for museums in the early stages of thinking about introducing nomadic computing to their environments, and serve as useful pointers for those actively engaged in planning and deploying handheld devices in a museum setting.

A summary is provided here and an attempt has been made to categorize the ideas that surfaced. However, there are understandably many overlapping issues. Most notably, questions and issues listed under discrete categories could also be easily translated to fit within the research and evaluation category as well.

The Potential

A Visitor Tool For Reflection, Creation, Input

More exploration is needed to investigate the potential of portable devices as a visitor "notebook." How would this work? What motivates the visitor to contribute their own knowledge? How much will visitors contribute? When? In what forms?



Overarching Issues For Museums

Institutional Mission, Goals, and Objectives

- Why do this? Does this add fundamentally to what the museum is trying to accomplish?
- This should be museum-driven rather than device- or technology-driven. How does this fit into the way your museum encourages new ideas and projects?
- Be very clear about your objectives: are handhelds the best way to meet those objectives?

Return on investment

- Assess the investment versus the payoff. The investment is considerable, both for the museum (in terms of staffing, technology, content development, etc.), and for the visitor (learning to use the device, spending time with the device). Will the return on investment justify the effort?

A Customized Individual Visitor Experience

How can these devices be used to enable a personalized experience tailored for the needs and interests of the individual visitor so that every visitor feels like a VIP? What does this mean? How do we want this to happen? When and where? Will content be shallow or in-depth? Will it stretch into the pre-visit and post-visit domains?

A Channel For Different Voices, Diversifying Sources of Content

Via use of portable devices, it is possible to diversify the sources of the content the visitor receives on a museum visit. For example, a scientist, an artist, and a ten-year-old talking about the same interactive science exhibit. The idea is that different voices would model learning about an exhibit from diverse perspectives.

Access & Enhancement For People With Different Abilities

There is the ability to enhance the museum experience in the moment in a way we wouldn't otherwise be able to do, particularly for people with different abilities.

An Expanded, Multifaceted Role For Visitors

Equipped with this device, the visitor can become a curator, a researcher, a content provider.

Enabling an "Aha!" Experience and Stimulating Further Exploration

Ideally, the device should further what the museum is attempting to accomplish. How can the device help people to pay attention, to have an "Aha!" experience that stimulates them to explore the exhibit or subject in depth?

A Mediator, Manager, Meaning Maker

The device can enable the visitor to record, reflect, make meaning, make connections between exhibits and, potentially, between experiences at different institutions and between the museum and the outside world. Ultimately, the device could be a personal "notebook" that is attached to the visitor rather than to the museum; something that is embedded in the visitor experience rather than an individual museum's philosophy and ideas.

A Take-Away Experience That Extends Beyond the Museum Visit

Because the devices have the potential to access the Web and create personalized pages on the Web, the experience can extend to the classroom or the home computer after the visit. An example of this in operation is the Exploratorium Electronic Guidebook project's incorporation of personal Web pages for visitors, called "My Exploratorium Scrapbook," which can be accessed during the visit as well as during pre- and post- visit experiences.

A Catalyzer for Social Interaction

While there is concern about the negative potential of handheld devices in terms of isolating the visitor, the potential for the use of handhelds as catalyzers for face-to-face interaction also exists. In the Xerox PARC Sotto Voce project visitors could "overhear" what a companion was doing with the device, and visitors observed that the device became a third party in conversations. At Port Discovery, visitors can electronically communicate with each other via instant messaging. Other socializing aspects might include dual earphones. SFMOMA considered incorporating a screen visible to other visitors so that others can see what you are exploring and potentially come over and strike up a conversation.

Extend Your Observational Capabilities, Create Your Own Data

There are devices (e.g., probes attached to handhelds) that allow you to extend your observational capabilities and create your own individual data, to keep track of what you've learned, to build data about who you are.

Increased Interactivity With Exhibits

Introducing the virtual realm enables visitors to "touch" objects they wouldn't otherwise have access to; to see a 360-degree view of an object; to flip through the pages of a rare book; to see what a painting would look like in a different color or style.



The Audience

- Who is the audience?
- What impact does the age of the visitor have? Are the applications/approaches we are using multigenerational regarding access? How do demographics of the audience affect the audience experience?
- How do we accommodate casual, drop-in visitors with one of these devices?
- How much training does the visitor require? How much can you assume about visitors' technological savvy?
- To what degree are our goals audience-driven?
- How will we use the capacity to gain input from the audience? As an evaluation tool (e.g., rating an exhibit)? As a legacy of information, experiences and insight that become part of the museum experience?
- Do these devices isolate the visitor or enable increased socialization?
- Does visitor data collection invade visitor privacy?
- Does the procedure for checking out a device (e.g., credit card deposit) create an economic barrier?
- Have language and other access issues been addressed?

Management, Staff, and Operation

Lessons Learned

Set Clear Goals and Objectives

- Be realistic regarding expectations
- Gain management buy-in

Assemble A Team

- Assure your team includes the necessary skills (UI designer/graphic designer; content developer; museum educator; exhibit developer; visitor advocate; participant designer; program manager/decision maker).
- Team must include someone with ability to make decisions for the team and the project.
 - Include stakeholders from the beginning (e.g., maintenance, visitor services, docents).
- Communication between team members is key.

Adequate Resources

- Assure adequate resources for staffing, equipment, and content development. Trying to do a wireless project with less resources than you need will make it twice as hard. Put enough resources into content – this isn't just a technology project.

1. Concerns

- Developers need a variety of skills (knowledge of exhibits, interface design, programming, etc.) and you want those working on development to have as wide a range of skills as possible.
- Maintenance concerns include having adequate staffing for ongoing maintenance, and budgeting for spare equipment so that you have replacements when equipment is broken or goes down.
- Concerns regarding adequate staffing, commitment, and team work include the observation that you need at least one team member working more than 50% of their time on the project. Assembling many team members who can only dedicate 10% of their time doesn't work.
- Who will be distributing, supervising, overseeing use of devices on the floor? Don't assume your front line staff will take this on; they're already overloaded.
- Staff training will be required. Include staff training as part of your overall plan.
- The practice of requiring visitors to give their credit cards to check out the devices raises concerns regarding the security of the credit card information.

2. Questions

- What impact will a wireless guidebook system have on the role of docents? This could be an opportunity – the devices could serve as conversation provokers that stimulate visitors to interact with docents. Some docents might see it as a threat, interfering with their role. There is a need to involve docents in addressing these questions from the early stages.
- How does this affect visitor paths through space? Have crowd control issues been considered?
- Can this be integrated with the existing network of the institution? Are there opportunities to integrate this with ticketing, the call center, the museum store?

Collaboration - Issues and Potential

- The collaborative possibilities posed are exciting.
- Clarify protocols for collaborative relationships.
- Address intellectual property issues.
- Recognize the potential tension in test projects between a museum's mission and industry research; a museum's desire to meet its own goals in a cost-effective way and an industry's desire to push the field.
- Are there existing models for developing in partnership, (for audio guides for example) that would make sense here?

- Are there marketing opportunities related to branding; things that could affect the business model?
- Can this be used internally to increase communication among staff members, particularly between floor staff and office staff?
- Can this be coordinated with those who have responsibility now for updating exhibits - with the public programs department of the museum?
- How do you make this a permanent part of your budget, including ongoing evaluation?

Technology

Choices

Is A Mobile Device What You Need?

- Make sure a mobile device is what you need.
- Is there another way to accomplish your objective?
- Consider the alternatives.
- Benefit to user must outweigh the cost (inconvenience, learning curve, limits to social interaction).
- Use a handheld device only when it is the most effective way to reach your objective, and be very clear about your objective.
- Don't use handhelds for things that already work well (e.g., if you have a scavenger hunt activity that works well with clipboards, why use a handheld?).
- Be willing to admit when it doesn't work well (which is not up to you, but up to the visitor).

Selecting Appropriate Technology and Applications

- How will this integrate with your existing network? If you plan to integrate, assure that your existing network is stable and well documented. An alternative is to skip integration with the existing network and start new.
- Don't use bleeding edge technology in the deployment stage.
- Use technology that works - visitors won't cut you a lot of slack.
- A mundane but important point - tethers and fanny packs or alternative methods for assuring that visitors can tote the equipment around and still have use of their hands for interactive exhibits.

Ubiquitous Versus Portable

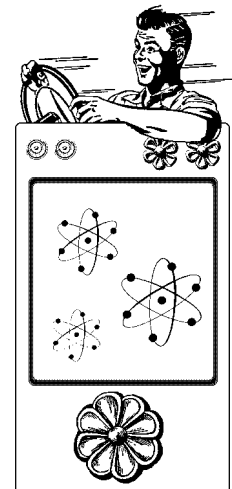
- Articulate the differences between ubiquitous and portable; between computing devices everywhere (with presumably larger capacity), and portable, more limited and fragile devices that the visitors carry with them. Which best meets the goals your museum is trying to achieve?

The Larger Context

- The end configuration may be a combination of technology devices or a combination of technology and non-technology. The end design should fit into the larger context of your museum in terms of both the museum's mission and its physical environment.

Promise

- Information storage on the Web - deciding what you want to store locally and what you store globally.
- What potential is there for networking between museums?



"First, what success have you had in focusing the use of the tool to address only a few questions well? Second, what success have you had in developing a global system of stimulation to deepen the access of people to this environment?" • Goéry Delacôte, Executive Director, Exploratorium

Coping With Rapidly Changing Technology

- While there was general agreement on the wisdom of avoiding "bleeding edge" technology in this rapidly advancing field, questions remain about where the museum should jump in, how to make the wisest investment, how to deal with rapid obsolescence. One solution was to budget in advance for rotating new units in on a staggered basis.
- How does rapidly changing technology affect goals and objectives? It's possible to do things now with technology that weren't possible five years ago. There's going to be a tension for some time between technology and goals and objectives.

Concerns & Questions

- Variations in user Web configurations
- Rapid obsolescence of technology
 - The need to plan for resources to maintain the infrastructure. Can you fix it when it breaks?
- Bandwidth capacity and scalability. What happens when a lot of people use it all at once?
 - Battery life
 - Ergonomics
 - Robustness, durability
- Relationship between the device and the network
 - Security of your infrastructure
 - Security and privacy regarding visitor information
- Interoperability - across devices and across museums
 - Are different devices needed for different types of museums?
 - Are we designing for single or multiple users?
- How do you manage the information this technology is capable of collecting from visitors?

Ideas and Potential

- Enable visitor input to the information base, to build an active role for visitors.
 - Work on using these devices to increase social interaction is promising, whether that may involve paging capabilities, the ability to “overhear” what another visitor is doing, having two earpieces on a device, etc.

Lessons Learned - Important Considerations Design and Development

Apply The Basic Rules of Design

- Start at the beginning, look at the environment, focus on the use of the device within the space.

The Importance of Prototypes

- In early stages use paper prototypes or low fidelity prototypes.
- Be clear on the difference between prototype activities and prototype technology (you can test activities prior to investing in technology).
- Test the simple things first.
- Consider making prototyping part of the visitor experience at the museum, which establishes your museum as an innovative place.

Simplify, Eliminate, Minimize

- It's important to select a minimal set of features you're going to address; make it good at a few things.
- Avoid "feature creep" - just because a device has capabilities does not mean you should use them.
- The focus is not on the device, it is on the objectives you want to realize.

Vertical or horizontal design and goals

- There is the vertical arrangement, in which the electronic device is part of the design of an exhibit. There is the horizontal arrangement, spanning across the whole museum so the visitor carries the device across different settings. Be conscious of the choices you make between vertical and horizontal design.

User Interface

Concerns

- How do we assure that the technology is transparent and easy to use?
- Does the technology interfere with the experience? How can this be avoided?
- How do we avoid technoisolation – visitors walking around, headphones on, heads down?
- Does the digital divide mean those who are technologically savvy will benefit while those who aren't will not?
- Are we confusing the devices with the general problem? For ideal design, we need a general theory of the problem and appropriate use of technology.
- Ensure good visibility of the display in a range of settings.

Questions

- Are different applications required for different settings or is there one universal approach that will work for all? How do age and gender issues affect this question?
 - How do you design a user interface that will work on different systems (from portable to larger systems, from small to large screen)?
 - Are we talking about ubiquitous computing or highly mediated experiences?
 - What voice or personality will be used – the omniscient voice of the museum or something more personal?
-

Content

Concerns

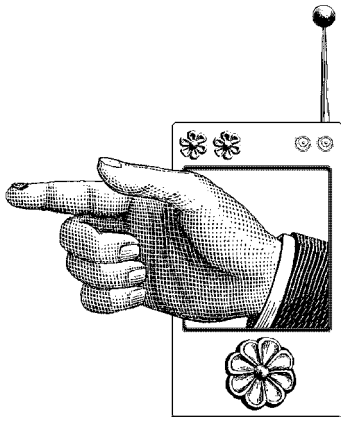
- There is a difference between conveying information and process skills. Is there a context for integrating that information?
- How do age, gender, technological savvy, individual abilities affect how much visitors gain? Affect content development?
- Can we go beyond information content to enable visitors to conduct their own research, collect their own data, reach their own conclusions? In some exhibits, this may be as simple as user-added data.
- Idiosyncratic information about users and exhibit developers contributes to the charm of the experience with the Exploratorium's Electronic Guidebook. How can this idiosyncratic charm be maintained in a museum with limited staff or on a project with high expectations?
- Related to the above question, who designs the content? What if an artist was involved in designing the handheld interaction in an art museum?
- Regarding who designs the content, is it exhibit developers or software people? There is a need for software that exhibit designers can use.
- There is the danger of two content streams: general visitor content versus research content. Make sure that the two groups talk to each other.
- How do we maintain, upgrade, renew content over time?

Questions

- How do you choose the content? How do you choose the best format (text, audio, video) for content delivery?
- Do you layer this on top of old exhibits, or start from scratch, designing new exhibits with this in mind?
- Is this a tool for conserving old knowledge, or for the changing, shaping, and innovation of knowledge?
- There is a lot of information out there. How do we select what is interesting or engaging?
- How does this relate to state education standards and benchmarks? How much will they drive content development?

Promise/Potential

- There is potential for flexibility in content, for using existing content on Web pages, for creating new content.
- It's possible to develop customized content that can meet user interests and needs upon demand.
- What happens in the space between the physical and the virtual world? What are the possibilities for designing in the space between, for developing interactive content that pushes back and forth between the two realms?
- The scope and nature of information you are able to offer visitors extends far beyond that of the average museum catalog.
- In addition to offering visitors a tailored, individualized experience, the visitor can build on previous experience in repeat visits. You can also remind the visitor to come back.
- You can have experiences across physical space (e.g., between two rooms) and across the connection between virtual and real space.
- You can use the exhibit as a base for further learning, whether formal (in the classroom) or self-taught.
- You can integrate live content and create on the fly.
- There is profit potential: you could have links between content and items for sale in the museum store.



Promise/Potential

- These electronic guides offer a way to gather information and feedback that can be used for rating exhibits and for making associations between exhibits.

- How in-depth will the content be? For example, do we include complicated scientific papers? How much do we need to mediate the content? How much original material will there be, how much mediated, and how much repackaged?
- How much capacity do museums have for generating new content? Is it possible to scavenge existing content?
- Who owns the content? What intellectual property and copyright issues are involved? How will this affect sharing of content between museums, and between museums and other institutions?

Research and Evaluation Questions

- What does the visitor think (and how do we find that out)?
- What impact does this have on visitor behavior? Does this change their perceptions? Does the device improve their experience?
- What device works best? How far can we drop it? What is the killer application?
- To what extent does this stimulate understanding and inquiry?
- Does use of this technology enhance retention of experience or knowledge after visitors leave the museum?

Methods, Approaches

- How do you get access to the data that exists?
- How can we build on or link to what is already known or has already been researched about nonnomadic visitor experience so that we can improve practice and increase knowledge in general?
- Can we use marketing research techniques, specifically online demographic research, to understand audience use of information?
- How does the research and evaluation feed into exhibit design?
- Currently we are thinking in terms of case studies. As this matures we will see categories of intentions and categories of place. We are in the early stages of the process of developing the taxonomy, of seeing the patterns.
- Can you apply existing research methods and evaluation techniques to a field that hasn't really existed before?
- Because we start designing these systems without knowing what the research questions are, we need to make sure that we capture enough data to recreate the situation.
- Concerning the visitor experience, how do you capture, measure, quantify, or express differences in quality? How do you measure impact over time, the effect on the visitor years after the museum experience?

- What is the validity/effectiveness of the pre-visit experience versus experiencing an exhibit cold?
- What are the indicators of success regarding visitor experience? Does extended time spent with an exhibit improve visitor interaction with the exhibit? How important is retention? They might remember something, but does that mean they had a better experience?
- How will the data that is collected affect the museum? How will information about the people who come to the museum and how they move about the museum influence the museum itself and the way the museum is organized?
- There may be a lot of research and information that exists regarding video, audio, and text in fixed installations. The difference here is that it's portable. What difference does portability make?
- How does personalizing or customizing the experience for visitors affect the way visitors behave (e.g., increased cross-communication? isolation?) or the way that exhibits are designed?

- What aspects of security and privacy do visitors care about most when it comes to data collection? Do we even need to know their names?
- How much, realistically, can visitors contribute to content? Learning how to input is not easy.
- What impact will this have regarding usefulness to the museum in terms of brand extension?
- How do audience demographics affect audience experience with this equipment (including age, gender, physical abilities)?
- What impact do real-world trends have on these efforts – specifically increasing use of portable devices, particularly among teenagers? To what degree does the technological sophistication of the visitor affect the visitor's experience?
- What is the difference in experience/outcomes between a walk-in visitor with his or her own handheld and a visitor who received an orientation using special programs? What is the difference between walk-in versus repeat visitors?
- How do different classes of users (students, teachers, walk-ins, etc.) use this in different ways, including both pre- and post-?
- Which delivery mode works best: audio, text, video, various combinations?
- How does the museum environment affect choices regarding content delivery?
- What is known about scalability questions? Explicit scalability tests are required prior to roll-out.

Concerns

- There are visitor privacy and ethical issues regarding data collection. What data should you collect and is it ethical?

