How People Use Electronic Interactives:
"Information Age - People, Information & Technology"

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Introduction

Electronic interactives are a powerful new method for communicating with museum visitors. Although museum professionals differ on specific uses, most agree that such devices can be valuable additions to traditional display techniques. They unquestionably attract visitors. But how do visitors use the interactives? How much do they use them? How does their presence affect visitors' experience with traditional displays? In this paper, we will reflect on these questions as we describe what we are beginning to learn about visitor behavior in an exhibit at the National Museum of American History called Information Age: People, Information & Technology. This exhibition not only has many different sorts of interactive displays, but also a network that monitors user activities at a dozen of these stations.

Description of Information Age

Information Age is a 14,000 square foot permanent exhibition. It traces the evolution of electrical and electronic information technology and how it has affected American society. Chronologically it spans from Samuel Morse's invention of the telegraph in 1832 to the computer networks of today. The exhibition has around 700 artifacts, including Morse's original telegraph, original telephones made by Alexander G. Bell, the ENIAC computer of World War II, the first electronic fingerprint computer, a working automotive robot, personal computers, and a high definition television. It also has over 700 graphics, 20 mannequins, and 3 environmental settings. The label copy runs about 90 pages long.

Interactivity

Besides being large in a traditional sense, Information Age is highly interactive. It has 56 personal computers, 4 workstations, 2 minicomputers, 44 video disk players playing 2 1/2 hours of audio and video material, 2 high speed printers, 3 video projectors, 4 large projection monitors, 20 standard video monitors, a high definition television, a 12 screen video wall and an automated sound sampling and regulating system. An exhibition of this size and scope would have been impossible without extensive support and help from private industry. The Smithsonian received over $4 million in cash donations and the equivalent of over $5 million in donations of computer hardware, software, and services.

We wanted the exhibition to be what it is - the most interactive exhibition the Smithsonian has ever done. But we did not want the interactivity to dominate the visitors' experience. We wanted it to be supplemental to the basic Smithsonian experience of seeing original artifacts in historical context. Our goal was to use interactives to provide fuller context and more experiences related to understanding our subject.

Most of the interactive components are connected by two electronic networks. An IBM token ring links the personal computers. These PCs control video disk players and other peripherals, the theater systems, the exhibit database, and other components. Connected to the token ring is an Ethernet backbone that handles the exhibition monitoring system. The network requires 23 distinct software programs. It serves three major functions. First, it enhances the visitor's experience. When visitors come into the exhibition, they can "log in" by scanning an "interactive brochure" on an NCR bar code scanner. This is the same type scanner used in many grocery stores or other point-of-sale terminals. The brochure is a printed guide to the exhibit that has a bar code on the back. Each bar code is different, so each visitor is tracked individually. At 8 different locations visitors can scan their bar codes and then use a computer-based interactive to learn about a subject related to the surrounding displays. At the end of the show, they can get a customized printout about their experience. The network collects and passes along the data necessary to build the printouts.

Secondly, the network helps keep track of the operational status of the computer stations, video interactives, theaters, and other electronic components in the show. Network software alerts operators in the control room immediately when a station goes down. The show relies on a customized version of the same software that EDS Corporation, one of our corporate sponsors, uses to monitor banking, insurance, and other networks throughout the world. This monitoring system has helped us keep our up-time on systems at around 99%.

Finally, the network helps us learn about visitor behavior. Using the individualized brochures, it monitors and counts visitor interactions. We do not track visitors by name, and using the interactives is completely voluntary. Although our monitoring system does not give us rigorous statistical samples, it does provide us a much fuller and richer understanding of visitor behavior with interactives than we have ever had before. We are monitoring hundreds of thousands of visitor interactions unobtrusively and at little cost above regular operating expenses.

Visitor Behavior

Information Age opened on May 9, 1990. From data on interactive brochure usage, we estimate that we have had around 1.5 million visitors in the first year. Visitors can scan the bar code at a total of 19 different stations. We know that 426,000 different brochure users scanned at one or more of the bar code readers. Periodic studies tell us that between 1/3 and 1/4 of our visitors choose to use the brochures at some point in the exhibit. Often, for example, only one member of a family group will use a brochure. We multiply users by 3.5 to get our total visitation estimates. Rough as this metric is, it is much better than that for any other exhibition in the museum.

The busiest day we had during the first year was July 4, 1990, when 6,185 people used brochures, for a total visitation of perhaps 21,647. Neither of us was in the museum that day, but we guess that we actually had only about half that number. At that time, we were using a stanchion system to encourage brochure use, so it was higher than average during the year. Whatever the actual count, reports were of wall to wall people, and the exhibit had to be closed at certain points during the day because it was too crowded.

On an average day, around 1,100 people use brochures, for a visitation of perhaps 3,850 or some 500 per hour. We designed the exhibit for a maximum of about 400 per hour. We have a limited estimate of time people spend in the exhibit. The 30% who use their interactive brochures at both the beginning and near the end of the show spend at least 35.34 minutes in the exhibit. We say at least because the last, most interactive section of the exhibition comes after the point where people "log out" of the system. Since this section has 15 interactive stations and since most of them are sit-down experiences, people frequently spend much time there.

We don't know how representative the 35 minutes is for all visitors, but we believe it supports our general impression that visitors tend to spend much more than the average 20 minutes per exhibit in Information Age. The tours we give take about an hour, and we know from random interview data that some people spend many hours in the exhibition. Obviously, many others only breeze through. But if we have increased visitation to an average 30 minutes per visit, we have made a major difference in visitor behavior.

We have two basic categories of interactive displays in the exhibit: video selectors, at which visitors can choose among 4 video clips related to surrounding displays or related topics, and computer interactives, in which visitors engaged in programmed multi-media experiences shaped by their own input.

Video Selectors

The traditional use of film or video is in continuously looping programs. We use this format in two sit-down theaters in the exhibition, one mid-way through showing a 6 minute program, and the other at the end of the exhibition. The latter is a 12 screen video wall production that summarizes the themes of the exhibition. We also have 15 "environmental"

video or audio loops in other sections of the exhibition. We won't be discussing them further here, as we do not measure visitor reactions to them.

Video selectors, in contrast to loops, give visitors the opportunity to choose what they want to see. We have six video selectors in the exhibit, each with 4 selections, for a total of 24 programs in all. Visitors make a selection by touching the image of a frame from the video clip. They can restart or change their choice at any time. They also can choose to turn off subtitling. On average, video clips run around 2 minutes. The longest clip is 3 minutes and 13 seconds; the shortest is 47 seconds.

In the first year, we recorded 437,244 playings of video selections. We say "playings" instead of "viewings," because normally more than one person is watching a selection at any time. To convert "playings" to an estimate of "viewings," we multiply by 3. Thus we had approximately 1,530,354 "viewings" in the first year. This means that on average, each visitor to the exhibition watched between one and two video segments in the exhibition.

Popularity

The most popular video segment in the exhibition was played 36,622 times, for 109,866 viewings; the least popular 8,048 times, for 24,144 viewings. Interestingly, the most and least popular items were on the same station. The other two selections on this station were also generally lower than those of other stations. This probably shows that visitors were likely to look at only one selection on the station, and thus the most popular item drew attention away from the other possibilities there.

The most popular item was a humorous cartoon giving visions of how new technology would change American society in the post- World War II era. The popularity clearly depends on the subject, style, location and format of this piece, not the novelty of the technology. By this time, visitors have had the opportunity to use 3 other video selectors and four interactive computer stations. This statistic indicates the drawing power of both humor and the cartoon format. Incidentally, the two other comedy clips among the video selections are also highly popular. One, with 31,370 playings, includes a section of Charlie Chaplin's Modern Times. The other, with 30,004 playings, is a clip about Abbott and Costello using the telephone.

A second, less complete group of statistics gives us an indication of what percentage of the videos people are watching by telling us when they switch to another program. In this case, we can only sample days. We do not have complete year-long statistics. On a recent day, we found that people on average were only watching 26% of the most popular video before switching. Of course, we have no way of measuring when people are walking away and just letting programs run to the end. The average for all the videos was 50% before switching. The 26% was the lowest for any video. People watched 51% of the second most popular clip, and 41% of the third most popular. We don't have statistics on the spread of viewing behavior, so we don't know if behavior clusters around the average viewing, if we have many quick samplers and a balance of people who watch the whole program, or if we

have some other distribution. Unquestionably, however, browsing of some sort is the predominant behavior of people who use the video selectors.

Content observations

The video selections include clips with both social content and technical content. We were interested in what the difference would be in visitor popularity. There is no definite pattern. For example, a "technical" video showing how Morse's telegraph and Bell's telephone work logged 14,420 selections; one on the operations of the ENIAC computer logged 30,908. The latter was the third most popular video in the show last year. A "social" video on scientific management got 26,809 selections - a number between the previous two. On one video selector, people were more interested in the technical stories of the development of the mouse, the microchip, and the PC than they were in the people who worked on the assembly lines to build computers. When we were developing the show, we believed we should have a mix of technical and social sections. Our data seems to show that this assumption was correct.

Computer Interactives

Information Age has 12 interactive computer stations on the network. It has another 15 that are stand-alone interactive stations, all in the "interactive gallery" section of the show that concludes the exhibition. There are also two printers at the beginning of the Interactive Gallery where visitors can print a record of their activities. Ten of the 12 networked stations in the body of the show are IBM InfoWindows with touch screen interfaces. These systems provide multi-media presentations in a form that is responsive to visitor input. The other two stations are operated by an electronic pen that visitors can use to "write" and record their comments on the face of a computer screen.

The 10 InfoWindows play 7 different programs. The first three programs in the show play on two stations each. This duplication near the beginning of the show helps prevent lines. We assumed that by the end of the show, demand for stations would spread out so that lines would be less of a problem. In addition we provided more alternative stations at the end. With the exception of very busy days, our assumption has proved true. We can have lines on busy days, but the number and variety of experiences available in Information Age keeps them from being a significant problem.

According to our statistics, visitors have used the interactive stations 931,397 times. Again, as with the videos, several visitors will frequently watch the interactive when one person is using it. We estimate that the appropriate multiplier to convert uses to "viewings" in this case is much lower: about 1.5 viewings per use. Using that multiple, the interactives have been viewed 1,397,096 times. Because our statistics do not track individual visitor behavior, we cannot compute behavior distributions. We can only say that on average, visitors are using around one computer interactive in the show. What this probably means is that many visitors are not using any at all, while other visitors tend to use 2-3. We suspect that only a limited percentage are using more than three. Of course, with the numbers of people we handle, even a small percentage equates to thousands of people.

Fifty-six per cent of the uses of interactive stations are initiated by bar codes. This means that the interactive brochures are popular with people who choose to do interactives, but that many people also choose not to use brochures. Obviously giving visitors a choice provides an appropriate option.

Popularity

The most popular program in the exhibition relates to code breaking. It runs on two stations. Visitors played it 314,564 times in the first year, so it had approximately 471,846 viewings. With the program, visitors can encipher their name using a simulation of the German ENIGMA cyphering machine. Then they "decode" it by remembering the machine rotor settings they used to encode it. Finally, they can see actual German messages that were intercepted and decrypted during World War II. These stations are not the first in the show, so their popularity does not depend on their novelty.

We believe that the subject attracts visi their own names. Making programs personally r popularity.

The least popular station is one of three grouped near the end. At this station, visitors can simulate being a news producer. This station had 15,697 uses during the first year, or approximately 23,545 viewings. We think several factors contributed to the somewhat low usage: the 5 minute length of the program, the several alternatives nearby, and the limited degree of visitor activity in the program. Our statistics are useful in confirming that this station needs modification to attract the attention that other stations are receiving.

Visitor statistics

The first pair of stations in the exhibition present a program related to the 1890 census. This program is the second most popular in the exhibition, with 314,564 uses, or approximately 471,846 viewings. When using the program, visitors give several bits of information about themselves: their sex, age category, and where they live. Then they learn what their life might have been like according to 1890 census data. Finally they can see a video of what processing 1890 census data with an original Hollerith "punched card" machine looked like. An original Hollerith machine is on display in the adjacent case.

In the first year, 99,230 users scanned their bar codes at the census stations, and we have some interesting detailed statistics about them. Fifty-one percent told us they were women, and 49% told us they were men. We had expected a larger difference.. We worked hard to make Information Age as attractive to females as males, and this statistic is at least one definite indication that we are meeting our objective.

The users of the census stations were 40% from the Northeast, 15% from the Midwest, 14% from the Southeast, 13% from the West, 8% from the Southwest, 7% from foreign countries, and 3% from Alaska and Hawaii. This distribution reflects the fact that we are

truly a National museum, with more people coming from outside our region than from within it. We also have a large international visitation. For example, if we extrapolate these figures to cover total visitation, we can estimate our foreign visitation in the show in the first year at around 105,000 people.

The age distribution of station users is also interesting: 28% are under 15, 25% between 15 and 25, 35% are between 25 and 44, 9% between 45 and 65, and 3% over 65. We think that the 12% over 45 is under-representative of this age group in our exhibition visitation, and most likely reflects the reluctance of this group to use interactive devices. The 53% under 25 likewise probably over-represents this age group among our total visitation, and indicates the expected interest of these age groups in interactive technology. The fact that the majority user group is between 25 and 44, however, shows that this group is also interested in and comfortable with interactives. Probably this has much to do with the pervasiveness of computer technology in the office and society generally, and also to the simplicity of the touch screen technology and the program we are using.

Polling Station Statistics

Some other interesting statistics in the exhibition come from a station where visitors express opinions about television. Forty-two percent say TV impairs education, while 58% don't think so. The "experts" in our background research were closer to 50-50. Among our visitors, 72% found prime time TV programs more interesting than coverage of presidential political debates in 1988.

Financial Stations Statistics

In the last section of the show are three interactive stations where visitors can explore different applications of computer networks. One, which we discussed briefly above, relates to producing a news documentary. The second allows visitors to listen in on an emergency 911 call and see the charts and maps that provide emergency information. The third allows visitors to become international currency traders. We give them $10 million and give them several opportunities to make money by moving their funds to other currencies in response to changing news headlines. This third station is the most inaccessible of the three, but it is also the most popular, with 34,502 uses. Interestingly, several members of our planning team believed this station would be too complicated for visitors to enjoy. The moral of our statistics: never underestimate the drawing power of money.

Comment Station Statistics

At the end of the exhibition, visitors can make comments on the exhibition. Using an "electronic pen" that records their gestures on a computer screen, they can indicate whether they liked or did not like 10 different areas of the exhibition. On average, visitors said they liked 75% of the areas. The most popular area, the section on television rated an 82% positive rating. The least popular on the ENIAC rated a 66% positive rating. We frankly don't trust these reactions too much. We suspect that visitors are as interested in the novelty of the technology as they are with making a definite vote on likes or dislikes. They may be

making some positive and some negative checks just to try the device out. Still, it gives us a relative measure of reactions to different sections of the exhibition.

Conclusions

At the Smithsonian, we would like to believe that visitors are really scholars and are as interested in the details of our subjects as we are. They aren't. The behavioral measurements we are collecting with our network are helping us develop a more realistic pictures of visitor behavior. To a large extent, they are confirming patterns we had already detected in other ways.

We know that most visitors come to the museum in groups, not alone. They are there primarily to have a "successful outing." They come to do something that is interesting and fun. They are happy to learn, but they are generally not engaging in purposeful learning behavior directed toward new conceptual understanding.

A good general description for visitor behavior is "educational browsing." Like someone scanning a book or looking around in a section of a store that interests them, visitors tend to browse an exhibit space. Since they are there primarily to explore and not to get specific new information, they will frequently stop their exploration before they complete an experience. They are particularly likely to do this if they are having trouble. They want to be challenged, but do not want to have to learn many new techniques or overcome significant obstacles.

After going through an exhibit, visitors are much more likely to give a coherent answer to the questions "What did you see in the exhibit?" and "What did you do in the exhibit?" than they are to "What was it all about?" "What are the main themes and message?" or "What did you learn?" Most visitors are collecting impressions and experiences that will "make sense" later in conjunction with other experiences and activities in their lives. Unless prompted, they do not usually think through and synthesize what they have just done as an independent learning experience.

As our statistics clearly show, interactive devices do not change this browsing behavior much. They only broaden and increase it. They provide new forms of presentation and greater choice. They also have a very useful ability to personalize experiences, by presenting information or experiences customized to the characteristics of the individual visitor.

Interactivity and traditional exhibitry

Displaying original artifacts and images and explaining their cultural significance is the main mission of the National Museum of American History. Our goal in Information Age was to use interactive elements to supplement, not replace traditional exhibition techniques. Although our data is not complete, our statistics show that we are accomplishing this objective. Visitors are clearly still spending most of their time looking at the traditional displays in the exhibition. The availability of interactives does not diminish interest in seeing

artifacts or period settings. In Information Age at least, the time visitors spend with interactives seems to increase the normal amount of time they would have spent in the gallery if the interactives were not present.

Item-specific and contextual explanations

We have a running debate at the Museum of American History over the balance between item-specific presentation and contextual presentation. In the area of science and technology, this usually becomes a debate over presenting technical explanations of what the devices are and how they work or information related to their social context and use. Traditionally, of course, most of our presentation was item specific, focusing on "What is it? How did it function? Who made it and why?"

The trend in recent years has been to focus more on social context. Information Age worked to present a balance. Our statistics, especially from the use of video selectors, shows that visitors want that balance. Material related to social context interests them - particularly if it is humorous. But they also retain a strong interest in knowing what the artifacts are, even when they are highly technical items like computers or chips. We would like to know more about whether individual visitors inherently seek a balance in satisfying their individual interests, or whether the balance is desirable to satisfy different sorts of people. Either way, maintaining a balance in the exhibition is an important goal.

Networks in exhibits

Electronic information networks are an interesting new tool for museum exhibits. They can monitor and regulate system operations, measure visitor activities, and enhance visitor experiences by maintaining a personalized record of visitor activity. Of course there is a significant cost for implementing and running an exhibition network. It requires greater complexity and cost in exhibit development and more sophisticated exhibit operations and maintenance. Based on our first experience, however, we believe that information networks hold much promise for exhibitions in the future.