Front-end Evaluation of
Building Your Internet

Prepared for the Tech Museum of Innovation

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INTRODUCTION

This report presents and analyzes the findings from a front-end evaluation of an exhibition being developed by the Tech Museum of Innovation about the potential of the Internet. Front-end evaluation helps planners understand how visitors comprehend and think about themes, ideas, concepts, and activities that will be displayed in an exhibition. It seeks common ground between visitors and the exhibit. Findings demonstrate people's understanding of various concepts integral to the exhibition and will inform the Tech during the exhibition development process.

The objectives of the evaluation were to:

- Determine visitors' comfort threshold and preferences in regard to the Smart Museum

- Gauge visitors' awareness, understanding of, and interest in the "anything to anything" concept (including its potential), and identify the exhibit concepts that appeal to them most

- Determine whether visitors understand the connections between open standards and changing hardware and software and the evolving Internet

- Gauge visitors' awareness, understanding of, and interest in the "many to many" concept (including its potential), and identify the exhibit concepts that appeal to them most

- Determine whether visitors are aware of and understand social issues of the Internet and what connections these issues have to their own lives.

METHODOLOGY

Data consisted of in-depth interviews, collected in May 2002.

Interviews

Interviews are a useful tool for understanding ideas and concepts from the visitors' point of view. The purpose of conducting in-depth interviews is to encourage and motivate interviewees to describe their experiences, express their opinions and feelings, and share with the interviewer the meaning they construct from ideas, concepts, and experiences. In-depth interviews produce data rich in information because interviewees talk about their experiences and ideas from a personal perspective.

Two separate interview guides were developed (each addressing different objectives), and both were conducted with two different audiences: middle school students and museum visitors of all ages.

Interview I addressed the first three objectives, including the Smart Museum, the concept of "anything to anything," and the technology of the Internet (see Appendix A).

Interview II addressed the last two objectives, including the concept of "many to many" and social issues (see Appendix B).

The Tech recruited students from two middle schools in the San Jose metro area to participate in interviews. Students whose parents completed a permission form were selected to participate. Additionally, by following a continuous random-sampling method, visitors to The Tech were asked to participate.

Interviews lasted from fifteen to thirty minutes. The interview guides were intentionally open-ended to allow interviewees the freedom to discuss what they felt was meaningful. All interviews were tape-recorded with participants' awareness and transcribed to facilitate analysis.

DATA ANALYSIS

The interviews were qualitative, meaning that results are descriptive. In analyzing qualitative data, the evaluator studies the data for meaningful patterns and trends.

METHOD OF REPORTING

The data presented in this report are qualitative in nature. Following the qualitative tradition of data reporting, trends and themes within the interview data are presented from most frequently to least frequently occurring. Verbatim quotations from the interviews (edited for clarity) are provided in this report to illustrate respondents' thoughts and ideas as fully as possible. The quotations are intended to give the reader the flavor of visitors' experiences. Within quotations, the interviewer's questions appear in parentheses, and an asterisk (*) signifies a change in speaker.

PRINCIPAL FINDINGS: IN-DEPTH INTERVIEWS

INTERVIEW I

Demographics

Interview I was conducted with two audiences, museum visitors and middle school students. Nineteen interviews were conducted with a total of 33 museum visitors. Interviews with museum visitors included 14 children, from 11 to 14 years, and 19 adults, ranging from 16 to 53 years. A little less than half ($n = 15$) of the interviewees were female, and 18 were male.

Nine interviews were conducted with a total of 18 middle school students ranging from 11 to 13 years. One-third of the interviewees were female ($n = 6$), and two-thirds were male ($n = 12$).

The Smart Museum

Museum Visitors

Nearly all the museum interviewees found the idea of the Smart Museum (see description in Appendix A) interesting and exciting. They described it as "cool," "neat," and "fascinating." Interviewees said they liked the idea because it would personalize their experience and afford them the opportunity to extend the exhibition beyond the museum and into their homes (see the quotation below).

> That's nice. It can help you. I leave here, at the end of visiting the Tech Museum. I go home [and see my web page] right away. It'd be nice to be able to revisit some of the things that you may have looked at. And possibly learn more. That's a pretty cool feature. (Male, 25)

Only a few interviewees expressed suspicion of the Smart Museum, describing it as "creepy" or an "invasion of their privacy." Nevertheless, even these interviewees were intrigued by the idea. As one woman explained, the idea was "freaky" but at the same time "interesting."

Of the various features the Smart Museum might provide, the web page was preferred most. Interviewees liked the web page since most of them did not already have their own. As they described it, the web page would allow them to "take a little of the museum home" and "share it with friends and family."

Some interviewees especially liked the idea of using the smart bracelet for role-playing, which they said sounded fun and unique. As one woman said, role-playing offered a way to use the Internet in an imaginative way (see the quotation below).

> I like the last [feature] the best, in terms of the character [role-playing]. I think one of the things the Internet's missing right now is the immersion piece that makes people feel like they're part of it, or even the story piece of it. It could play a huge role in [the Internet], really kind of capturing the imagination. That'd be pretty cool. (Female, 44)

A few interviewees preferred the idea of using the smart bracelet to customize their visit according to their interests and hobbies. They said this feature allowed them to have a very focused, personalized experience. For the same reasons, a few interviewees said they liked the idea of customizing their experience according to their knowledge level.

Interviewees were asked which features of the Smart Museum appealed to them least. Most interviewees said all the ideas were appealing, and they could not choose one of least interest. However, a few interviewees did not like the idea of role-playing or customizing their visit by their hobbies and interests. Those who did not like role-playing explained that they did not like to take on other personalities. Those who did not like customizing their visit by their hobbies felt the feature would limit their experience.

Interviewees were asked what personal information (from among a list) they would be least comfortable providing a smart bracelet. Most interviewees said they had no concerns about providing personal information. As one man said, "I feel like all my information is pretty easy to get anyway," and as a woman said, "I have complete confidence in the Internet" to keep her personal information secure. Nevertheless, about a quarter of interviewees did not want to provide their e-mail address since they were wary of receiving advertisements. A few interviewees said they did not want to provide their name or a digital photograph because it was a little too personal.

Interviewees were shown two versions of the smart bracelet—one, a plastic bracelet similar to those found on hospital patients, and the other, a hard plastic card attached to a cord that would be worn around the neck. About two-thirds of interviewees preferred the card worn around the neck. They explained that the card was "sturdier," more "hi-tech looking," more easily "taken off and on," and more "hands-on" than the bracelet. About one-third preferred the plastic bracelet because it would "stay attached" and be more "difficult to lose."

<u>Middle School Students</u>

Nearly all the middle school interviewees liked the idea of the Smart Museum because it sounded fun and would personalize their experience. Only one student said the Smart Museum seemed like an invasion of her privacy.

Over half the students preferred the web page feature of the Smart Museum because it would be personalized to their interests, and they did not already have their own. About half the students liked the role-playing feature best because it allowed them to take on another character.

Most students said none of the Smart Museum features sounded uninteresting or boring. A couple of students each did not like the idea of role-playing or tailoring their experience to their level of knowledge.

Nearly all the students were concerned with providing the smart bracelet some of their personal information. Over one-half did not want to give their digital photograph because they did not want to be easily identified. About a third each did not want to provide their e-mail address or their name.

When shown the two versions of the smart bracelet, most students liked the plastic bracelet because it was small and would be difficult to lose. A few preferred the card because it seemed sturdier.

"Anything to Anything" Concept

To determine interviewees' understanding of the "anything to anything" concept, they were shown the following written statement:

> Almost any person, place, or thing can be connected to the Internet, making information portable and creating environments that can sense your presence and respond to you.

They were also shown three written examples, referred to as the Tree House, the Grand Canyon, and the Grocery Store (see Appendix A for full descriptions) that might be used in the exhibition to illustrate the concept. They were asked a series of questions to determine how well they understood the concept and which example would be most explanatory and interesting in the exhibition.

Museum Visitors

In general, most interviewees at the museum had a difficult time wrapping their minds around the entire "anything to anything" concept. Most of them only understood the concept partially. Upon their initial reading of the statement, many interviewees said the concept meant we could access any kind of information or any person from any place. They named chat rooms and e-mail as examples.

Few interviewees could explain the connection of the Internet to "environments that can sense your presence." Of those who tried to understand how the Internet would "sense your presence," some named video surveillance as an example. About a third of the interviewees said it sounded as though devices would track and identify an individual's every movement, and, as one man said, be like "Big Brother." They found this concept intrusive, describing it as "creepy" and "scary" (see the quotation below).

> It's a little invasive. It reminds me of *Enemy of the State*, that Will Smith movie, because I was just on the computer [in the Exploration Gallery] where you can type in your address and it zooms in on your [address]. That's a little too much,

yeah. And so this is like a little too invasive for me, the whole concept. (Female, 27)

A few interviewees had a firm grasp of the concept. They tended to be those working in the technology industry. These interviewees said the concept describes how, with wireless technology, the Internet could connect us to devices to create locations personalized to our preferences, such as a smart house, which would anticipate our needs and desires and respond accordingly (see the quotation below).

> Well, that's where we're going. I know we're eventually going to have smart houses and things that'll know us. Bill Gates already has one. The art. You wear a little clip on your shirt, and it goes in and the art changes to what you want to see. I think that's a perfectly reasonable statement ["anything to anything" statement] to make. (Female, 37)

The three exhibition examples (the Tree House, Grand Canyon, and Grocery Store), while appealing and interesting to interviewees, did not help them comprehend the entire "anything to anything" concept (except for those few who already understood it). Interviewees tended to respond to the three examples in a similar way. About a quarter of interviewees said they could not explain how the exhibition examples conveyed the concept. Another quarter said the exhibitions demonstrated how computers could sense your smart bracelet, but they could not make a connection back to the Internet. Some said the exhibition showed how the Internet can be portable and available in remote locations (see the first quotation below). Some said the exhibitions showed how the smart bracelets keep us connected to one another, like cell phones or pagers (see the second quotation). A few interviewees (those who tended to be technologically savvy) said the exhibitions were like a smart house, using the Internet to form electronic connections between various devices to customize an environment to the visitors' preferences (see the third quotation).

> The information is portable when you watch the eagles at the zoo. You are not actually at the San Francisco zoo, but the information is portable. (Female, 23)

> If you lose somebody, [the smart bracelet] tells you where they are so you don't have to get lost or anything. (Male, 12)

> [The smart bracelet is] connecting you to a place that you can immediately identify with, and, if it's personalized, it kind of knows the kind of things you might be interested in and can point out those aspects, so maybe the plants over there or animals or the water rock formations or something else. (Female, 44)

In general, all the exhibition examples were well received, eliciting exclamations of "wow" or "cool" as well as visibly widening eyes as interviewees read the descriptions. However, no one example seemed to convey the "anything to anything" concept better than another, even though interviewees did demonstrate preferences. Over half of the interviewees, including adults and children, preferred the Tree House exhibition. They

found it to be the most fun, most personalized, and least threatening because of its unrealistic, fantastical nature. About a quarter of interviewees preferred the Grand Canyon example. These interviewees liked the idea of role-playing and learning some interesting information about geology in the process. About a quarter liked the Grocery Store example best, explaining that it seemed most realistic and most personalized.

In general, about a quarter of interviewees found the concept and the exhibition examples to be an intrusion of their privacy and somewhat disturbing. Nevertheless, even among these interviewees, only a couple were completely turned off by the exhibition ideas (see the quotation below). Even those who said their sense of privacy might be compromised found the exhibition examples intriguing at the same time.

> Actually, it's almost kind of scary. It's like crossing a line that's too personal. *I don't want to come in my house and have the computer know I'm in there. You know. It's my house. It's not the computer's. *It's, like, too space age or something. *I don't want somebody tracking me through the house, or turning the music on . . . *Or through the store, or everywhere you go. (Female, 45, and male, 53)

Most of the interviewees could not see a connection between their own use of the Internet and the exhibition examples. Most explained that they use the Internet for research, gathering information, game playing, e-mailing, and chat rooms (see the first quotation below). Those interviewees who understood the "anything to anything" concept best said the examples reminded them just how limited and generic most people's use of the Internet is. They could imagine how the Internet might be much more personalized one day (see the second quotation below).

> We can access the Internet anywhere, and we use the Internet sometimes when we are lost someplace and we want to retrieve directions, maps, information about restaurants, entertainments. We depend heavily on the Internet for information. (Female, 32)
>
> [In five years, the Internet will be] a lot different as far as [it will] be more on an individual basis. (What do you mean?) [It will] more respond to your personal needs and interests, instead of just general information that you might not even care about. (Male, 16)

Middle School Students

None of the middle school students clearly explained the "anything to anything" concept. They tended not to be able to comprehend the statement beyond their own limited use of the Internet (see the quotation below). Most of them said the concept meant we could access any kind of information or any person from the Internet (see the second quotation). They named instant messaging, web searches, chat rooms, and e-mail as examples. When probed, students had difficulty explaining the connection of the Internet to "environments that can sense your presence."

This [statement] says almost every person, place, or thing [can be connected to the Internet]. How can a thing be connected to the Internet? (So you have questions about the statement?) Yeah, because you are not going to connect a building to the Internet. What can the building do? (Male, 11)

It tells me that the World Wide Web can help you to access information about people who have put their information out on the web, and anyone can access it. And anyone can contact you if you've put out an e-mail address or anything. And all you need is a computer with e-mail and with Internet access. (Male, 13)

Furthermore, students' understanding of the connection between the "anything to anything" concept and the three exhibition examples was very limited. When asked to explain how the exhibition examples supported the statement, many students either said they did not know or gave explanations that were not relevant (for instance, some students talked about the Grand Canyon example as if it were a simulated ride). A few students focused on how the three examples provided information, and others talked about how the smart bracelets keep us connected to one another, as with instant messaging (see the quotation below).

And [the grocery store] can be connected to the Internet because you can see your family on a screen and all the wires go to the cameras. *And then information. It tells you like if you have . . . *. . . your favorite cereal. (Males, 12)

Regardless of their ability to explain what the three examples were meant to show, students liked all of them. About a third liked the Tree House exhibition best because it seemed most fun and offered the most variety of experiences. About a third of students preferred the Grocery Store exhibition because it seemed to "know" them best. Another third liked the idea of role-playing in the Grand Canyon exhibition.

As with most museum visitors, the students could not see a connection between their own use of the Internet and the exhibition examples. In fact, some of the students said they never even use the Internet. Of those who do use it, most said they search for information, play games, or send e-mails.

The Technology of the Internet

In order to gauge whether visitors understand how technology makes advances in the Internet possible, they were asked a series of questions. Adults were asked open-ended questions, while children were shown a list of Internet-related terminology and asked which they could explain.

<u>Museum Visitors</u>

When asked what the Internet might be like in five years, interviewees at the Museum responded in a variety of ways. Most talked about it optimistically, saying that bandwidth would allow more data to move faster across the lines. Some talked generally about the speed of the Internet improving, while others talked more specifically about the future of fiber optics. Only a couple said the Internet would be more portable and present "everywhere." Some interviewees talked about the future of the Internet negatively, saying we would be overwhelmed by information or have a lack of privacy.

When asked which technology makes advances in the Internet possible, many interviewees said they did not know. About half offered some kind of explanation. Of those, most talked about speed and bandwidth affecting the amount of information we can send over the Internet. A couple each talked about modems, file compression, and wireless technology.

When asked specifically how wireless technology affects the Internet, most interviewees responded easily. They said that it makes information portable and gives greater access to all (see the quotation below). Only a few interviewees said they did not know.

> It allows more people to get access to the Internet. Normally you have to be in front of a computer terminal, but with wireless, you don't have to be there, you can be mobile. Only downside is, it's not very fast. Once it gets faster, it will be much more popular. (Male, 25)

Similarly, when asked how encryption affects the Internet, most interviewees knew. They said that encryption provides security and protects our personal information (see the quotation below). Only a few did not know.

> [Encryption] definitely has a big impact because when you're interacting, using very crucial data, you would like to have some privacy. And there are hackers, you know, people who would like to retrieve that information. So definitely encryption is going to be play a major role [in the future of the Internet]. (Male, 33)

On the other hand, many interviewees could not explain how software affects the Internet. A few said that software has something to do with browsers or file compression. A couple described software as "buggy" and said it slows down the Internet.

While only a few interviewees had heard of open standards, once they were shown a written description (see Appendix A), nearly all could explain what the Internet would be like without open standards. Most adults said open standards are similar to language or the alphabet and, without them, communication on the Internet would be limited. Most children said without open standards the Internet would be "boring" since people could not share music or photographs (see the quotation below).

[Without open standards the Internet would be] sort of boring because you can't take pictures off a digital camera and throw it on your website. Or you can't download MP3s. Or you can't even make that good of a good CD-ROM. (Male, 11)

Children in the Museum were shown a list of Internet terms (see Appendix A). Of the fourteen children, only a few could explain any of the ideas accurately. A couple corrected identified MP3, digital photograph, encryption, wireless, and web page. One child was also able to define HTML, .JPG, PDA, newsgroup, and compression.

Middle School Students

When asked what the Internet might be like in five years, students had limited responses. Most said they did not know. A few each said the Internet would be faster or bigger (have more websites). A few said the Internet would offer more virtual experiences (see the quotation below).

My guess is there are going to be virtual chat rooms where you wear body suits, and you appear in a chat room, and there's going to be couches and you sit down on them and you just chat like it would be real life. *I agree with him. Just virtual chat rooms. *And another thing, say you want to read a book. You'd go on line to the virtual library or something. You'd say I want this book, and then you'd be in the book and someone would be narrating it as you saw the story go by. (Males, 12)

When shown a list of Internet terms, most students could accurately identify two or three. About one-half of students defined web page, digital photograph, wireless, or MP3 correctly.

INTERVIEW II

Demographics

Interview II was conducted with two audiences, museum visitors and middle school students. Sixteen interviews were conducted with a total of 25 museum visitors. Interviews with museum visitors included 8 children from 11 to 13 years, and 17 adults from 16 to 64 years. About one-third ($n = 7$) of the interviewees were female, and two-thirds were male ($n = 18$).

Four interviews were conducted with a total of 8 middle school students ranging in age from 11 to 13. All the interviewees were male.

"Many to Many" Concept

To determine interviewees' understanding of the "many to many" concept, they were shown the following written statement:

> The Internet can link people across time and distance to bring together knowledge from lots of people and to work together in cyberspace.

They were also shown three examples, referred to as Avatars, Painting On Line, and the Nupedia (see Appendix B for full descriptions), that might be used in the exhibition to illustrate the concept. They were asked a series of questions to determine how well they understood the concept and which example would be most explanatory and interesting in the exhibition.

Museum Visitors

For the most part, interviewees in the Museum easily grasped the concept of "many to many." Most of them described it as long-distance communication or collaboration. They named many real-life examples, especially teleconferencing, e-mailing, and chat rooms (see quotation below). Some interviewees named file-sharing, stock/banking transactions, and newsgroups.

> I guess it's an opportunity to talk to people who have similar interests. As an example, when I was still working before I retired, we'd do video teleconferencing and link people from three or four different locations around the world. Saves the travel. Get the answers to problems very quickly, and that's an example of what [the "many to many" statement] means. (Male, 64)

A couple of interviewees instantly brought up issues of security in response to the "many to many" concept. They expressed apprehension about sharing personal information over the Internet since so many people could access it.

In general, interviewees easily made connections between the three exhibition examples and the "many to many" concept. Most interviewees believed the Avatar example demonstrated a virtual meeting place. Most associated it with recreation, such as chatting, game playing, or dating. A few of interviewees could imagine the Avatar-based world being used for work; for example, in conflict resolution or schooling (see the first quotation below). While some of these interviewees referred to the virtual meeting places in a neutral manner, others expressed opinions. For example, one man said people who participate in the Avatar world represent a new subculture, another adamantly said the Avatar world is no substitution for face-to-face interaction, and another man expressed concern that his son may become "lost in cyberspace" while participating in the Avatar-based worlds (see the second quotation below).

> [The Avatar example is] showing people working together on the Internet. Separate locations and communicating together. Which is how I see that ["many to many"] statement working—it is really when people have a mutual goal or project, they can use the Internet or e-mail to communicate together to solve problems. They don't necessarily have to be in the same room. I don't quite know how the Internet could be used for this, but someday [it could be used for] conflict resolution. That would be amazing. I don't know how much it's being used for that now. (Female, 40)

> We have a 13-year old son who is using a substantial part of his time playing Internet games, and my wife is very concerned that he is going to get lost in cyberspace, and he argues that he meets new people. I think there is some truth to both. I really don't know yet. I'm also worried because I would like him to go outside and meet with his friends eye to eye. (Male, 53)

Most interviewees associated the Painting Online example with work rather than recreation. Interviewees described this example as a place to create a product, sharpen skills, teach new skills, and problem-solve. Most interviewees did not express concern about this example, except for one woman who wondered who would own the final product (see the quotation below).

> Bringing people together, I mean, it obviously relates to the ["many to many"] statement because it's like painting with someone who's not in the same room and sharing the canvas with somebody who's not in your same room. It's actually doing something with somebody in a complete different . . . Like who would own the painting? I don't get how that would work, but it seems like a really cool idea. Or maybe [it would work] even to give painting lessons. (Female, 29)

Most interviewees described the Nupedia as shared knowledge (see the quotation below). A few of them said the Nupedia raised questions about authenticity and validity, wondering whether the knowledge produced could be trusted. Of all the examples, the Nupedia most often reminded interviewees of their own use of the Internet since they tend to use it for the collection of information.

People are all connected to the Internet and can share information that they know and their knowledge, . . . maybe it's something that lots of people wouldn't know. And they can share it, and people all over the world could access it. All the knowledge that they want to share. (Male, 13)

Interviewees were mixed in regard to which example best supported the "many to many" concept. About one-third (mostly children and teens) said the Avatar example supported the concept best because it was the most high-tech. Another third said Painting Online was the best example because it demonstrated cooperative learning and provided immediate interaction. Another third believed the Nupedia best illustrated the concept because it seemed to have the most practical applications and produced real usable knowledge.

After viewing and discussing the exhibition examples, interviewees had a variety of ideas about the Internet's potential in five years. About a third believed the Internet would be more widely used as an educational tool. A few could imagine the Internet being used for remote operations (such as programming machinery in outer space). A few talked more generally about faster connections. A couple thought the Internet would become overloaded with information.

Middle School Students

The middle school students appeared to understand the "many to many" concept, though they had difficulty explaining it in words. It was easier for them to give examples—such as e-mailing and chat rooms. Notably, most of these students said they do not use the Internet much (see the quotation below).

Maybe [the "many to many" statement means] people go to chat rooms and they could, like, pass along ideas instead of calling [each other] or going over [to one another's houses]. Pass ideas on. (Do you all use the Internet?) I used to. *I do. *I don't use it anymore. *I don't use it that often. Wait, let me correct myself, I use it frequently, but not as frequently as I would like to. (Why is that?) Because of homework and stuff. I don't have enough time. (Males, 11 and 12)

All the students were able to see a connection between the three exhibition examples and the "many to many" concept. They explained that all the examples showed how people across distances could communicate to one another or work together (see the quotation below). Without exception, they all preferred the Avatar example because it seemed most fun and game like. They tended to dislike the Nupedia because of the reading required.

[With the Avatar example] your friends can go into an assignment and you can talk. *And play. *Yeah. Talk and play. So you can go right next to each other and paint and send pictures and like compare and have fun. (How about the Nupedia?) Bring together knowledge. This says that the Nupedia brings together

knowledge because all you have to do is go to the web page and you can see the information you would want on something. (Males, 12)

Social Issues

Interviewees were shown a list of five topics relevant to the Internet (with brief definitions), including privacy/security, safety, universal access, copyright, and censorship (see Appendix B for a full description). To determine visitors' awareness and understanding of these issues, they were asked to talk about one or two of them relevant to their own lives.

<u>Museum Visitors</u>

Three-quarters of interviewees in the Museum talked about privacy/security. None of them had first-hand experience with the issue, but all had heard stories and given it some thought (see the quotation below). They expressed concerns about junk e-mail, identity theft, credit card theft, and other inappropriate uses of their personal information.

> I would say security. I'm always concerned about security because, although I have been on the Internet for a long time, I would say that I'm still nervous when shopping. The easiest things for me to buy are books, and I use different credit cards so I can track it. I'm still paranoid. (Female, 29)

About half the interviewees talked about safety. Again, none of them had experienced a violation on the Internet, but had heard stories (see the quotation below). They talked about meeting unsavory people in chat rooms, hackers breaking into their systems, or financial theft.

> What could I tell you about safety? I got a couple friends who chat on line. But there was this one time, there were two of my friends, and they were just chatting, and they were basically offending people. They got a kick out of it. They were just having fun. I don't know, I mean, it's the Net. Somebody's trying to be rude, just click him off and don't talk to him. And if you find anything disrespectful, if you're chatting with somebody, and you think they are disrespectful, just don't talk to that person. Just block them off your system. (Male, 22)

About a quarter of interviewees named copyrighting as an issue of interest or concern (see the quotation below). Some of them talked about their own personal experiences with downloading music or images. One woman wondered who really owns anything on the Internet.

> Copyright is a little bit important because some people take music off Napster and stuff without paying for it, so that's kind of bad. *And [people] can download stuff that they're not supposed to. (Females, 12 and 11)

A few interviewees—all children or teens—talked about censorship. They mentioned that both their schools and parents censor Internet sites that are inappropriate for children (see the quotation below).

> Censorship. I think [adults] should block out the sites that are not really appropriate for kids until they're mature enough to handle it. And they should be cut off at schools and libraries because certain age groups go there. (Male, 11)

A couple of interviewees talked about universal access. One talked about it personally, explaining that because of the speed at which technology changes and his own lack of knowledge, he is always behind the times (see the quotation below).

> I'll mention briefly, universal access. You have to pay to play. If you're not constantly upgrading or you don't have the latest plug-in, it could be kind of frustrating. So, if you have to constantly upgrade and keep spending money, is it universal? My twelve-year-old TV still works fine. You don't have to upgrade it each year. I think I'd lose interest in TV if I had to upgrade my TV every year. So in that way, it is frustrating and not really universal. (Male, 47)

<u>Middle School Students</u>

All the middle school interviewees brought up the same two issues—censorship and copyrighting (see the quotation below). As with the children in the Museum, all the students had experienced censorship in school or by their parents. Additionally, all the students knew about downloading images, games, or music from the Internet—from either personal experience or their friends.

> Yeah. Censorship. When they block [websites] out for the school. *And copyright because a lot of people will do that. (What do they do?) They can just copy anything off the Internet and sell it. *Pictures and stuff. (Where have you heard of that?) I just know about it. *[From] TV shows. (Males, 11 and 12)

DISCUSSION AND RECOMMENDATIONS

Oftentimes when working on an exhibition, developers find themselves trying to convey information that the general public has little familiarity with, much less knowledge about. This is not the case for The Tech's exhibition about the Internet. Nearly all museum visitors and middle school students have some familiarity and personal experience when it comes to the Internet. The Internet has become an integral part of daily life for many. Nevertheless, as evidenced by the findings, many individuals have a very narrow understanding of what the Internet is. Moving visitors beyond their narrow understanding may be one of the greatest challenges of the Internet exhibition. The discussion that follows provides an interpretation of the findings and identifies red flags, questions, concerns, and "hooks" that emerged.

In order for visitors to envision the potential of the Internet, they will need to have a strong foundation for understanding what the Internet is. Although interviewees were not asked to define the Internet, it became clear from the way they talked about it that they have a limited definition of it. In general, it seems that most interviewees, and especially children, conceptualized the Internet strictly as a source of information or method of communication between people rather than what it truly is—a massive networking infrastructure. In other words, they tended to confuse the Internet with the World Wide Web (which is, in reality, only one part of the Internet). This is not an uncommon phenomenon. In general, people use the terms "Web" and "Internet" interchangeably. This limited understanding rises from the typical, yet limited, ways in which most people use the Internet—for research, collecting information, e-mailing, chat rooms, banking, and shopping. With this limited understanding, it is not surprising that interviewees could more easily explain the "many to many" concept—which embodies the ideas of information and communication sharing among people—versus the "anything to anything" concept—which is more about connections between computer devices.

Adding further to their limited understanding of the Internet, interviewees did not readily imagine how wireless technology would affect the future of the Internet. Wireless technology is especially critical to understanding the "anything to anything" concept. For devices to sense and respond to other devices, they must use wireless technology. Interviewees had the most trouble understanding the connection between the Internet and the part of the "anything to anything" concept that reads, "creating environments that can sense your presence and respond to you." Furthermore, interviewees' explanations of the "anything to anything" exhibition ideas revealed the same lack of understanding. While most adults, and some children, knew what "wireless" meant when asked specifically, the notion did not immediately play into their idea of the Internet and its potential for the future.

Of similar concern, though less explicit in the findings, interviewees may need to have their imaginations pushed to understand that the Internet can be connected to something other than what they might traditionally think of as a "computer." A close analysis of the interviews shows that interviewees, especially children, did not clearly know what it meant for a "person, place, or thing" to be connected to the Internet.

In regard to other technological matters, findings show, not surprisingly, that children know very little. Adults, on the other hand, were a bit more technologically savvy, particularly those working in the technology field. Nevertheless, to reach the middle school audience, exhibit developers should start with the assumption that their visitors know very little. Like wireless technology, any other technology—such as software and compression—that is influential in the development of the Internet should be integrated and made explicit within the exhibitions rather than explained separately.

Although interviewees had difficulty explaining the main messages of the exhibition and were limited in their knowledge of the technology, they expressed enthusiasm for the exhibition ideas. The Smart Museum received very positive feedback. As intended by exhibit developers, interviewees liked that the Smart Museum would personalize their experience and allow them to extend their visit at home via the web page. Interviewees were mixed in regard to which features they liked and disliked about the Smart Museum, indicating that the various ideas have wide and varied appeal. Museum staff had expressed a concern about the role-playing feature, and findings show that while some visitors may not be interested, others will be very interested. Furthermore, interviewees were mixed in their preference for a bracelet or card to be worn around the neck—either device should work well in the exhibition. The challenge for the exhibit developers will be to help visitors understand how the technology used in the Smart Museum illustrates the potential of the Internet, not just high-tech gadgetry.

The three exhibition ideas for the "anything to anything" concept—the Tree House, Grand Canyon, and Grocery Store—were all very well received even though they only helped interviewees partially understand the concept. The examples were successful in showing how information could be portable, but less successful at demonstrating what the Internet has to do with sensing your presence and responding to you (as previously discussed).

The three exhibition ideas for the "many to many" concept—the Avatars, Painting Online, and the Nupedia—were appealing to interviewees and illustrated the concept well. Nevertheless, interviewees tended to associate the Avatar example with game playing rather than collaborative work or problem solving. If this is not the intention, consider devising an Avatar exhibit with real-life applications.

Notably, with each exhibition idea, there were a few interviewees who raised concerns or questions, indicating issues that should be addressed in the exhibition. For instance, some adults and children had questions about security and privacy when it came to the smart bracelet and the "anything to anything" exhibition ideas. Some interviewees had concerns about safety and lack of real, face-to-face relationships when thinking about the "many to many" concept. Although interviewees were asked about these and other issues in a separate part of the interview, it became clear that to discuss them within the context of an exhibition idea was more meaningful.

RECOMMENDATIONS

- The exhibition will need to help visitors *come to an understanding* of what the Internet truly is—a massive networking infrastructure. It will not be enough to simply provide visitors with a definition. Developers will need to integrate an accurate definition of the Internet throughout the exhibition, reiterating it and making it concrete and understandable through interactive experiences.

  As a first step, consider adding a new main message to the Exhibit Concept document that states, "The Internet is a massive networking infrastructure that connects millions of computer devices together globally, allowing them to communicate with one another."

  Furthermore, consider explicitly addressing the misconception that the Internet and the Web are one and the same. Raise this distinction as a question for visitors to ponder and come to understand.

  Consider giving the exhibition a name that immediately inspires visitors to think critically about the Internet and question their own limited understanding of it.

- For the purposes of exhibit development, consider rephrasing the "many to many" and "anything to anything" messages using language that is user-friendly and visitor-centered. For instance, what will it mean, in a layperson's terms, for the average individual, when "anything to anything" is a reality? Work this concrete language into the current messages so that it drives visitor-centered exhibit development.

- So as not to present it as "magic," the wireless technology used in the exhibition must be made explicit, both in the language used to describe the "anything to anything" concept and in the way the exhibits are designed. Develop exhibits that help visitors "see" and think critically about wireless technology and its implications for the Internet.

- Help visitors move beyond the traditional idea of what a computer is to understand how any person, place, or thing can be connected to the Internet. As with the "hidden wireless" technology, help them "see" and examine the computer devices inside the smart bracelet, or Tree House, for example.

- In general, assume that visitors have very little technological knowledge. Whenever possible, integrate the technology with the exhibition ideas. For instance, make the connection between the observed phenomenon (such as the visitor's photograph appearing in a frame in the Tree House) and the technology explicit. Help visitors *come to an understanding* of how the technology works rather than telling them how it works.

- Move forward with the plans for the Smart Museum, as few interviewees expressed any reservations. Although interviewees do have general concerns regarding social

issues of the Internet (as addressed below), they tend to express a level of trust in how The Tech would use their information, and the benefits seem to outweigh any worries.

- Of the information you ask visitors to provide to the smart bracelet, consider making most of it optional, particularly the photograph and e-mail address.

- Interviewees varied in their preference for the "anything to anything" exhibit ideas, indicating they all have potential for success, given revisions that have been addressed thus far (see above). Follow through on whichever idea The Tech staff feels most passionate about, keeping in mind all the problems that have been raised and all the outlined recommendations.

- Consider developing an Avatar exhibition with real-life applications while maintaining its playful tone.

- Rather than developing separate exhibition components that address social issues, integrate these concerns throughout the exhibition. For instance, since the Smart Museum naturally raises questions of privacy and security for adults and children, address these issues within the Smart Museum orientation area. Do the same for issues raised by the "anything to anything" concept (such as privacy) and the "many to many" concept (such as safety and copyright).

Appendices
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