hand to hand

ASSOCIATION OF CHILDREN'S MUSEUMS

Incorporating digital technology in high-energy, hands-on, immersive environments like children's museums can be a double-edged sword. A cornucopia of products such as wearables, augmented and virtual reality, information visualization, networked objects, and more are being rapidly integrated into daily life and can be overwhelming. Many technologies potentially allow for richer experiences and permit explorations into topics that would otherwise be difficult to explain. However, they also carry concerns: not only about time and monetary costs to establish and maintain these technologies, but also about screen time, less authentic experiences, privacy issues and distracting visitors from the essential interactive nature that permeates and defines most children's museums.

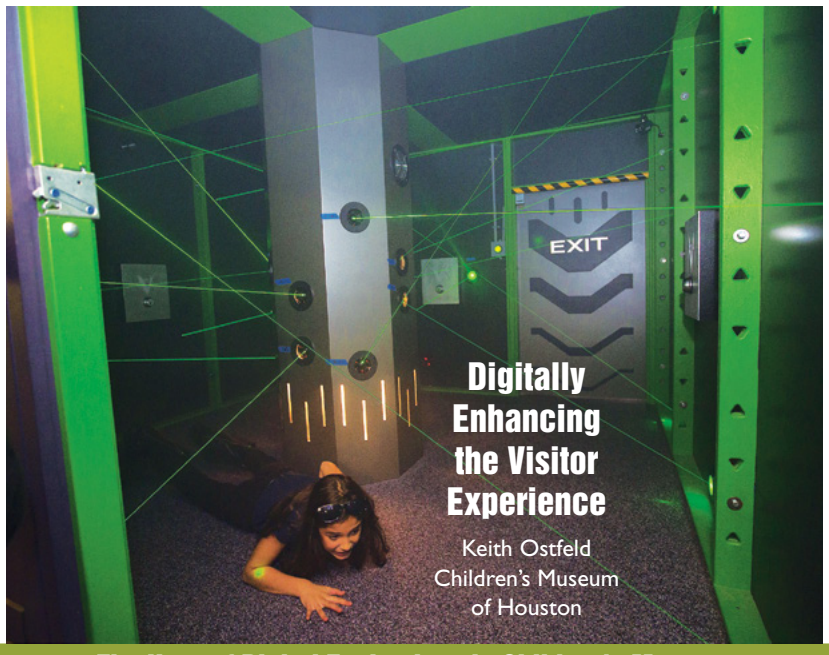
Digitally Enhancing the Visitor Experience

Keith Ostfeld
Children's Museum of Houston

At the Children's Museum of Houston (CMH), there are three basic tenets we follow when deciding whether or not to implement a digital product:

- **Family interaction is essential.** A digital experience should strengthen engagement between family members, not isolate them from each other.
- **Face-to-face time is irreplaceable.** A digital experience should enable better facilitation, not replace facilitators.
- **Hands-on experiences are sacrosanct.** A digital experience should enhance and deepen interactions at our exhibits, not encourage abandonment in favor of the digital.

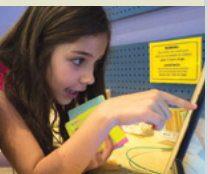
With these three values in mind, CMH has developed a variety of digitally-based projects, each utilizing technology to different degrees to meet specific visitor experience goals. There are four common themes to much of CMH's technology work: introducing concepts and providing skill-building, improving facilitation, engaging parents, and creating unique experiences.

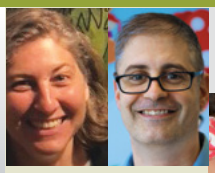
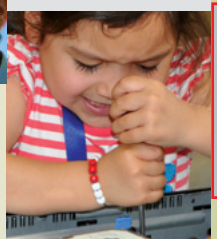


Introduce Concepts/Build Skills

There are some concepts and skills more easily introduced and practiced using digital technologies. This is the most common use of technologies in museums, traditionally implemented through videos, push-button interactives, and purely digital experiences via touchscreens. But, the merging of a digital interactive with hands-on manipulatives can provide a much richer experience than digital alone.

One of CMH's newest additions is the Element Assembly Station in our *Matter Factory* exhibition, replacing the Stuff Sorter installed there in 2009. This game-based exhibit asks kids to help take an "inventory" of elements in the *Matter Factory* while introducing them to the concept of elements, properties of different elements, basic atomic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Association of Children's Museums
2711 Jefferson Davis Highway, Suite 600
Arlington, VA 22202
Email acm@ChildrensMuseums.org
Website www.ChildrensMuseums.org

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Editor & Designer
Mary Maher
908 East High Street
Charlottesville, Virginia 22902
Phone (434) 295-7603
Email Mary.Maher@ChildrensMuseums.org

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structure, and the periodic table. Element "pucks" with RFID tags (radio-frequency identification tags that use electromagnetic fields to identify and track tags embedded in them rotate on a conveyor past four interactive stations. At each station, players are given a task and clues to help them determine the correct elements they need to find. Kids can check the elements for key information on an "Element Analyzer" that gives them basic information about each element from atomic structure to common uses. The tasks get progressively more difficult the further players progress in the game.

Since its installation, CMH has found that the more sophisticated interface is more attractive to older kids than the Stuff Sorter, which typically has attracted those six and under. We also confirmed the game itself is straightforward enough that younger kids, with adults helping them, can do a simple search for element pucks, focused on looking for colors and letters, while older kids can delve into higher-level concepts, developing an initial scaffolding of understanding that will benefit them when they encounter this information again in school.

In the game-based exhibit Matter Factory, *kids are introduced to the concept of elements and their properties, basic atomic structure, and the Periodic Table. The exhibit's Element Assembly Station uses RFID-tag-embedded "pucks" to help players identify the correct elements they need to find. Kids can check the elements for key information on an "Element Analyzer" that provides basic information about each element from atomic structure to common uses.*

Improve Facilitation

In multiple facilitated locations such as our Power Science Lab, families do life science-based experiments from nutrition testing to DNA extraction, In the Inventors' Workshop, kids and their parents can engage in maker-based activities, including electric circuits, basic coding, and engineering. But, with more than 817,000 visitors a year, these spaces quickly become unmanageable for a single facilitator to assist multiple families through complex instructions while helping them dig deep into concepts and encouraging them to think creatively about a topic.

The Made In Your Mind project, open from January to May, 2016, provided families with experiences that help build basic making skills such as measurement and creative uses of materials. Using homemade toys as a common theme, visitors to the exhibit were encouraged to build one of forty-eight different projects and then try to improve upon it. For example, one project was to create a rocket that launched using a slingshot. Kids were challenged to test how different rocket designs (more/less weight or changing the shape/location of the fins) might improve flight. Another toy used elastic material to launch a fabric ball out of a cup and the player had to catch it back in the cup. Families were encouraged to test other designs to make the game easier or harder.

In order to help one facilitator manage the sixteen stations spread through the roughly 1,400-square-foot gallery, we developed a digital platform that provided families with written directions, still images, and video instructions for each project, broken down into easily completed step-by-step segments. Families could select the project of their choice from a menu that also provided parents with age appropriateness, approximate completion time, and level of difficulty to help them guide project selection.

After the project's implementation, facilitators reported being able to provide ample support and encouragement to families in the space. About 90 percent of families reported high or very high levels of satisfaction with the Made In Your Mind interface in conjunction with the single facilitator and, compared to other facilitated spaces,

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Digital Technology: Use it or Not—One Museum's Guiding Principles

Carol Tang
Children's Creativity Museum

The Children's Creativity Museum's (CCM) approach to using technology stems from its unique location in San Francisco—blocks from some of the most famous internet companies in the world—and also from its origin as an art and technology studio for underserved youth.

When CCM was founded as "Zeum" in 1998, relatively few low-income children or teenagers had access to computers and other digital media. That has changed, but digital arts continue to be an important part of CCM's identity. Even when Zeum became the Children's Creativity Museum in 2011 (in response to changing neighborhood demographicsm such as more residential housing, more young families with young children), it did not abandon its core digital arts exhibitions such as the ClayMation Studio and Music Studio. Along with the name change, the museum became more focused on making a long-term impact on the lives of children, realizing that experiential learning and inspiring children to be creative should start at younger ages.

Now, in 2017, as we refine our strategic plan and look ahead to the museum's 20th anniversary, we have become more committed to a targeted embrace of technology and intentional decision-making.

We have developed a few guiding principles to use as a lens for planning exhibitions and educational programming involving digital technology:

Appropriate technology can be used if it taps into a child's imagination and storytelling abilities better than other methods. For example, although they can draw, most five-year-olds do not have the dexterity or writing abilities to capture all of their stories with a pencil and paper. But perhaps their stories can be told through a stop-motion animation digital studio using clay, wire frames, painted backgrounds, a digital camera, off-the-shelf software, facilitated interactions, and guidance about character development and storytelling.

All screens and digital technology should be paired with analog and tangible elements. To avoid making the screens themselves the focus of museum exhibits or programs, there is always something physical to look at and manipulate nearby. Some examples include:

- **Augmented Reality Sand Box:** A projection of colors onto the sand's surface encourage visitors to interact with and manipulate the material.
- **Sketch Town:** Children create their own buildings and vehicles using paper and markers. These paper creations are then scanned and projected into a digital city. Children can even interact with the buildings on the projection and make them move and spin.
- **Robot Coding:** Children learn to code using tablets, but their main focus is using the code to move real robots and solving directional challenges.
- **Making Video Games:** We've created workshops and drop-in programming around a product called Bloxels. With Bloxels, kids arrange small blocks onto a grid and then import photos of their grids into a video game platform. The physical manipulation of placing the small plastic blocks into a grid pattern precedes anything done with the screen itself. This gives them time to think about character development and storytelling in their own video games rather than just frantically pushing buttons.

Digital products should be available outside the museum. We use off-the-shelf apps and products so that families can continue their experiences at home. In this way, we try to show parents that screen time can be productive, educational, and interactive if used appropriately.

Experiences should last for at least twenty minutes, and may be deep enough for even more extended engagements. Although screen time does need to be limited for children (and adults!), many studies indicate that "getting in the flow" is an important element for creativity and skill mastery. Thus, all of our experiences aim to be fun yet challenging enough to keep a child's attention.

All activities must have an element of collaboration and/or sharing. For videos and films, we email finished projects home so that family members can review and discuss the stories and the creative process soon after their museum visit. We also encourage sharing with grandparents and on social media to build children's creative confidence. We encourage children to play each other's video games during our workshops. They are also able to share their playable video games with a virtual online community created by Bloxels (in compliance with online child safety laws).

Activities built around screens should most often be situated in separate rooms, allowing parents to choose to avoid them. For example, robot coding, the most tablet-focused activity in the museum, is tucked away on the second floor in a room that used to be a computer lab. While digital technology is used in the first floor galleries, the images are mainly projected onto surfaces and not flat screens (i.e., the sandbox and on the curved SketchTown walls). Surprisingly, in a very tech-savvy city, many parents want to see no screens at all in the museum. They want their children to take a break and play or create in old-fashioned ways.

In addition to these guidelines, we are also paying more attention to how we message what technology we employ in the museum—and why. Through signage and floor staff we aim to help parents become more intentional and strategic in their screen use with their children. Our struggles as a museum—and as a field—to make decisions about how best to use (or avoid) technology is a reflection of the struggles parents and children experience on a daily basis. By sharing our thinking and strategies, we hope to start conversations with the families we serve about how all of us can do our best with our children.

Carol Tang is the executive director of the Children's Creativity Museum in San Francisco, CA.

Bruce Silcox for Minnesota Children's Museum

Same Message, New Channel: Minnesota Children's Museum's Text Messaging Program

An Interview with
Barbara Hahn and Bob Ingrassia, Minnesota Children's Museum

Mary Maher, Interviewer

INTRODUCTION

During the six-year planning process for the major renovation and expansion of Minnesota Children's Museum, museum leaders engaged in research and discussion about every aspect of the new museum. This included a complex issue that barely stays in one position long enough to be studied: technology. With the support of an Institute of Museum and Library Services Sparks grant, the museum worked with Fathom Consulting (formerly Evantage Consulting) to develop the *Museum Technology Scan,* a survey and analysis of digital technologies currently used in museums and cultural organizations across the country.

During the redesign, the museum made key decisions about which digital technologies would be added to help their visitors understand the benefits of play and how to support playful learning. They were guided by data from the *Museum Technology Scan* and Let's Play, the museum's initiative to provide information and inspiration to parenting adults.

With a clear understanding of the needs and habits of their primary audience—millennial parents and caregivers—the museum has created a simple text messaging program that visitors may chose to receive on their smartphones. Messages include tips on how to recognize and support their children's play in the museum and at home and related facts about play itself.

In this interview, two key members of the museum leadership team involved in both the *Museum Technology Scan* and developing the text messaging program (to be launched when the museum opens its new facility this summer) talk about what guided their decisions: Bob Ingrassia, the museum's vice president of external relations, and Barbara Hahn, vice president of learning innovation.

Bob, a marketing and communications professional with extensive experience in writing, editing, public engagement, brand development, public relations, content strategy, and digital media, joined the museum in 2014 after working at an integrated marketing agency in Minneapolis. Prior to that, he spent twenty years as a news reporter and editor.

When Barbara joined the museum in 2012, she brought broad industry experience in the experiential education, nonprofit, technology, and financial services sectors. In her previous twenty-five years working for a range of organizations, she focused on developing strategic goals and delivering on key business initiatives.

—Mary Maher

This new text messaging component falls under a broader umbrella, the Let's Play framework that guides the museum's comprehensive play-focused strategies and initiatives. Our goal is to help parents and caregivers embrace playful learning by increasing the time, space, and freedom to play as well as providing relevant information and knowledge for adults to confidently support their child's own playful learning. People learn and receive information in different ways. Texting is another channel to deliver content and engage visitors.

What prompted the *Museum Technology Scan?*

BARBARA: As part of the expansion and renovation project, we looked for ways to increase our efforts to champion the power of play. We wanted to more strategically and effectively engage caregivers in understanding the benefits of play and the ways they can support playful learning with their children both in the museum and at home. With funding from IMLS, we sought to both share best practices among children's museums and to conduct a broader scan of how museums use technology to engage visitors. Although technology changes rapidly and many institutions have tried lots of different things, we wanted to get a good current overview of what's working and what's not, and the relative costs associated with various technologies.

The *Scan* includes a review of the "Tech Landscape," a menu of the various digital technologies currently used in museums. Which technologies interest you most in working with visitors?

BOB: Many examples in the *Scan* are focused on using technology to enhance the visitor experience, a secondary goal for us. We're not anti-technology, but we don't promote technology as the primary focus of the experience. We prefer to use it to enhance a larger immersive or interactive experience. So when we dug into the results of the *Scan,* we honed in on technologies used to engage with parenting adults to deliver timely, meaningful, and relevant content in the moment.

How does this philosophy guide the museum's forthcoming text-messaging program?

BOB: When we open the new museum (summer 2017), we will launch an opt-in text-messaging program that will deliver a limited number of helpful tips for parenting adults to enhance play while they're at the museum as well as how they might interact during playful moments at home. These short messages won't put the phone between the parent and child when they're doing hands-on activities inside the galleries. Instead, they will give them ideas for things they might say to the child or look for during the experience. Furthermore, these text messages are supplementary to gallery signage, an entire layer of which is directed toward adults. The combination of gallery signs and text messages will offer a variety of messages, from practical tips, such as how to ask open-ended questions or specific things to look for in an exhibit, to inspirational quotes or pertinent facts. Especially during moments of reflection or transition in the museum, they can help adults support the play that's happening around them.

BARBARA: This new text messaging component falls under a broader umbrella, the Let's Play framework that guides the museum's comprehensive play-focused strategies and initiatives. Our goal is to help parents and caregivers embrace playful learning by increasing the time, space, and freedom to play as well as providing relevant information and knowledge for adults to confidently support their child's own playful learning. People learn and receive information in different ways. Texting is another channel to deliver content and engage visitors.

Aside from using text messages to increase engagement—both in the museum and later on—are there any ancillary goals, such as audience development?

BARBARA: The goal isn't to increase the number of messages, but to change attitudes and ultimately behaviors. The messages are a means to make the experience more relevant, more contextualized—helping to scaffold the parents' learning in order for them to scaffold their children's learning. Parents don't always know how to do that and have requested some help. We've heard comments like "What you mean when you say open-ended questions? Give us an example." or "How can I replicate the essence of the museum and duplicate the skills I've learned here that support my child's development when I'm at home?" As a result, all of the text messages are geared to demystify what we mean when we say, "support playful learning." Here are some examples:

- Ask kids lots of questions. Especially ones without a yes or no answer. Like: "Why do you think that happened?" or "What do you think will happen next?"
- Questions are often more helpful than answers. When a child asks, "How do I do this?" respond "What have you tried so far?" and "What will you try next?"
- You know what gets kids thinking? Saying, "I wonder..." "I wonder what would happen if..." and "I wonder why..."

Bruce Silcox for Minnesota Children's Museum

The combination of gallery signs and text messages will offer a variety of messages, from practical tips, such as how to ask open-ended questions or specific things to look for in an exhibit, to inspirational quotes or pertinent facts. Especially during moments of reflection or transition in the museum, they can help adults support the play that's happening around them.

Is there a similar text message program for children?

BOB: We did not create any kind of mobile experience that would motivate the parent to give the phone to a child while they're in our museum.

In your research what did you learn about what adults and caregivers want?

BARBARA: The *Museum Tech Scan* data on millennial visitors to cultural organizations—not just children's museums but other types of cultural organizations as well—revealed growing expectations for enhanced technology experiences. We also know from our visitors and the museum's "play ambassadors" (see *Hand to Hand*, Winter 2015/2016) that parents want the practical tips I mentioned earlier. One survey conducted with our visitors as well as a broader, metro-wide audience of parents of children ages three to ten showed a strong majority of parents recognize, and lament, the overall decline of unstructured playtime today. There is a need or a void for play, and parents are looking for information about how to fill it.

People often lament the loss of unstructured, open play where kids just did things on their own, outside or inside. But there's a lot of open time in that concept. Are people comfortable with non-directed play, with no obvious goal or context, especially in the context of a museum visit for which they've paid admission?

BARBARA: Well, that is the challenge. Parents feel an awful lot of pressure. There's a lot of academic push and many reasons why free play has declined resulting in a lack of comfort with open-ended play. Our challenge is to create and strengthen that connection between open-ended play (we call it "powerful play") and learning.

BOB: Play is more than just fun. You often hear, "they're just having fun." That

SAMPLE TEXT PROMPTS

Throw plot twists into their play. Like "What would happen if___?" The lights went out? A gorilla showed up? Everyone had wings? You get the idea.

Talk about what you see a child doing. Be a play-by-play announcer. You'll notice "little things" that reveal how a child is learning. It works, I promise!

Quick challenge for you: Spend a minute looking at HOW a kid is doing something instead of WHAT they're doing.

Try focusing on the way a child is playing—the process and the doing—and a bit less on the outcome. You know, the whole "journey vs. destination" thing.

TEXT FREQUENCY

In addition to a few welcome and informational messages, visitors can expect to get three or four prompts over ninety minutes.

TEXT MENU OPTIONS

The program will launch with five sets of messages. Visitors may request more prompts during their visit, in addition to the introductory three or four texts. Adults who visit more than once will be able to send a text stating that they have returned and want to receive more and perhaps different messages.

MEASURING PROGRAM SUCCESS

A specific percentage goal for adult visitor opt-in during the launch phase has not been established yet. The museum is still developing plans for how to let people know about the texting program before and during their visit. How well visitors are informed about its existence will heavily affect adoption rates.

sounds dismissive. Then, "…and now let's get to work and do some learning." We've tried to build a framework that lets us engage with our audience to talk about how important play is for nurturing the lifelong skills that kids need to thrive, at home, at school, and everywhere else. Parents can make play even more powerful for their children, and it's not hard to do.

The big picture? We're trying to add momentum to the movement that establishes

Bruce Silcox for Minnesota Children's Museum

No one wants technology to be the primary focus of the experience; exhibit staff don't want to put technology between the parent and child. We're all on board with doing whatever we can to increase parentengagement, including leveraging smartphones.

play in its rightful place as a critical way for children to develop. So when there is pressure against playtime, play doesn't go by the wayside because it's seen as less important. "Now we have to get ready for school so cut the playtime." We want more adults to recognize that playtime, and especially the unstructured and open-ended, child-directed playtime, is at least as important, and oftentimes more important, than some of the organized activities that are taking precedence.

Parents coming to children's museums, in particular, might say they don't want to see any technology in the museum because, "We get enough of this at home. I want my kids to do something in the museum that doesn't involve screens." In planning for the new museum, did you talk about anti-technology biases and fears that technology interferes with rather than enhances people connecting with their kids and experiences in the moment?

BARBARA: We're being very intentional and strategic about aligning our technology use with our beliefs and principles. There's a little bit of a "if you can't beat 'em, join 'em" element to it. Not everybody is on their phones, but over half of our adult visitors are millennials, and smartphone adoption among this group is very high—they're used to engaging with content on their phones.

Text messaging is an effective way of communicating content. In addition to the *Tech Scan* results, our work was further informed by the signature Stanford study, Ready4K (2014), that showed promising results for using text messaging to help parents of preschoolers get ready for kindergarten. Stanford researchers found that parents prompted with only three text messages per week engaged more actively in literacy activities with their children. This ultimately had a positive impact on learning. In two text messaging pilot studies we conducted, in which adults received texts to support literacy (Text2Learn) and healthy lifestyles (Healthy Bodies & Minds), we found that people liked the reminders and how easy and quick it was to skim them. In many cases they said, "We know what to do, but it's just so nice to be reminded, because it reinforces our natural instincts."

Do you tailor texts for specific audiences? Can message streams be designed to go to teachers, community leaders, or daycare providers, for example?

BOB: The technology we're using, Guide by Cell, which is fairly inexpensive and not difficult to use, has the capacity to do that. But we don't plan to tailor message streams beyond museum visitors at this time. We are thinking about tailoring the content streams so that people could opt into different types of messages. Maybe they want tips or information related to a child's age, or to specific exhibits in the museum, or even a parenting goal or challenge. For example, "I want to help build confidence in my child," so they could opt into a confidence-themed channel. Or, "I'm a grandparent. What can I do with a three-year-old?" We are thinking less about carving off different audiences, and more about allowing the audience pick the content they want.

Will everyone who opts into the text messaging program get the same messages?

BOB: During the launch phase, a single message stream will include a variety of messages—not everyone will get the same ones. We will do some A/B-type testing to see which messages do better. We want to grow into it, see how people use it, and how well we can handle the technology and the

content demands. And then, depending on resources, we hope to add different content streams.

How have different museum staff members contributed to the thinking behind this text message program? For example, how does exhibit staff see text messages meshing with what they're trying to achieve?

BARBARA: No one wants technology to be the primary focus of the experience; exhibit staff don't want to put technology between the parent and child. We're all on board with doing whatever we can to increase parent engagement, including leveraging smartphones. The *Forces at Play Gallery,* for example, encourages children to test out ideas with the blower build stations, launching ping pong balls, creating their own targets and figuring out how to hit those targets. The texting program cues parents and caregivers that there's no right or wrong way to do it—a message we reinforce through in-gallery messaging as well. We want parents to understand the learning goals of open-ended play: their child will use their critical thinking skills to figure out what works. That peels the experience back to its essence.

Some museums are concerned about parents overly distracted by devices. And it's usually the floor staff who have to figure out ways to coax people back into being engaged in the visit or paying attention to their kids. How does your floor staff feel about this texting system?

BOB: Encouraging parents to interact with their children is one of the key drivers of the design of the new museum and its experiences. Over the years, it has been disheartening to see more and more adults using their phones in the museum. Parents disengage. The child is off having fun and the parent is using the time to catch up on email or check in at work or whatever. The new museum is designed to heighten parents' engagement with their children while they're there.

That said, phone usage is here to stay. The vast majority of adults walking into the museum have a smartphone, and many will, at least occasionally, use it during their visit. We want to be part of what they're doing on their phone. Instead of shaming adults or somehow trying to drive people away from their phones, our focus is to connect them back to what's happening in front of them with their child in a way that's as interesting and as compelling as possible.

Bruce Silcox for Minnesota Children's Museum

In Forces at Play, *text messages prompting adult visitors about ways to deepen playful learning, complement exhibit signage. For example, the sign in the exhibit above says, "Wait...Wait...Don't tell them! Ask open-ended questions. Here's one: What have you tried so far?"*

Sometimes parents need a break. So they go off and look at their messages for five minutes rather than being completely focused on their kids all the time. If I read an interesting fact—either on a sign or a text message—about an experience I'm in the middle of, I'm a lot more tuned in, engaged in what's going on.

BARBARA: All parents want their kids to be happy and healthy and to succeed. Just bringing them to the children's museum makes them feel like good parents. So when they're here, we want to take that one step further and show them exactly how play makes their children happier, healthier and more likely to succeed. In this moment, we want them to look for it, notice it. They're not just launching ping pong balls. They're problem-solving. All these things are there but may be under the radar. When you get people to notice them, it can be very compelling.

A lot of people don't really understand how children learn. Simply understanding how hard it must be for a toddler to distinguish colors, or why a child does x and y before they can do z, is eye-opening for many parents.

A big challenge for museums interested in adopting digital technologies are costs and rapid obsolescence. How do you budget or plan for these variables?

BARBARA: This is one reason why we took the direction we did. Our objective was to use an existing mobile engagement platform—smartphones—with museum-customized applications. We aren't building the text program ourselves; we don't have to manage upgrades or get involved with coding and other technical details. We just create rich and engaging content. The system is remarkably inexpensive and very scalable.

BOB: A lot of institutions have tacked on some very resource-intensive projects involving building and maintaining native apps or investing in beacon or near-field technology, all of which require a fair amount of hardware, installation, and technical knowhow. We made a decision to go with the solution we can a) afford, b) manage, and c) will be around for a while. Text messaging is not a new technology, and with mobile web people are using their own devices.

We're not getting all the features that we would like to have, but we're getting enough to start. For example, we won't have tracking ability—knowing where our visitors are in the building. We would love to be able to text someone and say, "Hey, we see that you just spent five minutes at component A in an exhibit. Did you know that…" and provide some key facts related to that component. Many technologies do that, but they can be expensive, tough to maintain, and quickly outdated. It can also be tough to get people to adopt them: people don't always want to be tracked. At this point, we just decided not to go down that road.

A lot of institutions have tacked on some very resource-intensive projects involving building and maintaining native apps or investing in beacon or near-field technology, all of which require a fair amount of hardware, installation, and technical knowhow. We made a decision to go with the solution we can a) afford, b) manage, and c) will be around for a while.

Will you collect data on the text program to gauge its effectiveness or refine its next iteration?

continues on page 13

In a children's museum, the role of media mentor does not require a new job title or positon. Instead, strategies for media mentorship and modeling can be included in the roles and responsibilities of museum staff and docents who work directly with children, parents, and families.

Media Mentor: A Digital Age Role for Children's Museum Educators

Chip Donohue
Technology in Early Childhood (TEC) Center at Erikson Institute

As the pace of technology innovation continues to move at breakneck speed, a new role is emerging for early childhood educators in informal and formal learning environments. "Media mentors" address parent concerns about screen time and the negative effects of technology use on young children, while helping them take full advantage of the technology and digital media that have become a part of everyday life.

Parents, caregivers, and families need information, resources, and guidance from trusted sources, and they are looking for support and encouragement to help themselves and their children safely navigate the digital age. They need enthusiastic digital tour guides who model appropriate and healthy use of technology and digital media for both adults and children. They need mentors who empower them with the knowledge and tools to make the best decisions about when to use, or not use, technology to support healthy development and learning in the early years.

What Is a Media Mentor?

This term "media mentor" was first used by Lisa Guernsey in a 2013 TEDxMidAtlantic talk, "How the iPad Affects Young Children, and What We Can Do about It." But the idea of digital access to information, curation, and mentorship began to take shape as early as 2010, when a group of librarians who were thinking together about new media, in particular the iPad, and its place alongside print media in children's libraries, storytimes, and early literacy efforts (Campbell & Haines 2016; Campbell & Koester 2017; Campbell et al 2015).

> Media mentors actively engage with children and families interacting with digital media provided within the library context, both guiding children through positive and efficient uses of the technology and modeling for caregivers how they can support their children's digital literacy development outside the library.
>
> —From *Media Mentorship in Libraries Serving Youth,* Campbell, Haines, Koester, & Stoltz, 2015, 8

All adults who work with or on behalf of young children and families can be media mentors. This "everyone in the pool" definition includes parents, caregivers, siblings, extended family members, neighbors, and friends. Media mentors can also be caregivers, educators, and teacher educators; educators in museums, libraries, and out-of-school programs; pediatric health providers and early intervention specialists; home visitors; parent educators; media developers; policymakers; funders, and more. Lisa Guernsey and Michael Levine (2017) describe the need for a "big tent" under which professionals from all aspects of early learning, child development, and healthcare can come together as allies to provide parents and families with guidance in the digital age—from media mentors (Donohue 2017a, 2017b; Guernsey 2017).

In a children's museum, the role of media mentor does not require a new job title or positon. Instead, strategies for media mentorship and modeling can be included in the roles and responsibilities of museum staff and docents who work directly with children, parents, and families. These strategies include being mindful of visitors' device use while they are in the museum, being intentional about how technology and media are integrated into the museum experience, and being aware of how digital technology can be used as a tool to help parents reflect on their own media use and guide their children's access to and use of technology for learning. Museum staff who take on the role of media mentors empower parents and enhance engagement with families both at the museum and at home.

Why Are Media Mentors Important?

> Parents feel like they are flying blind. They have heard that apps could help their children learn the ABCs, and they believe their kids will need tech skills, but aside from feeling pressure to buy a touchscreen tablet, they are a little fuzzy on exactly what to do. Teachers are unsure too. No one has shown or talked to them about materials that could be tailored to the needs of their particular children at their age and stage of development, let alone how to use new tools to help give kids a chance at authorship.
>
> —*Building a Corps of Media Mentors: Why and Where to Start,* Lisa Guernsey, 2016

Media mentors help parents and families connect the dots between child development, early learning, and technology skills. They model appropriate and healthy media use and share research and best practice. They also provide examples and ideas for parent-child activities that leverage technology use in support of early learning and to strengthen parent-child relationships as co-explorers. Through these experiences, parents learn to navigate the digital age for themselves and become thoughtful media mentors for their own children.

> *Strengthen a parent and you strengthen a child* (Rogers 1995, 197).

Empowering Parents and Engaging Families through Digital Tools and Strategies

In the digital age, museum educators can do the following:

- **Meet parents where they are.** They made a choice to visit the museum with their child, demonstrating their interest in early learning. This creates an opportunity to encourage them and model appropriate and intentional use of technology at the museum and at home.
- **Be aware of barriers to access.** Most families have access to a smartphone, but not all have a tablet or computer at home, use email, or send and receive text messages. Choose engagement strategies that don't leave parents and families behind if they don't have access to the latest technology and broadband internet access.
- **Provide multiple pathways.** Ask parents about how they prefer to receive information and communicate with the museum. Open the door to two-way communication. After all, family engagement is something you do with families, not to them.

• **Help parents understand how their media use influences their child.** We know that parent media use strongly predicts child media attitudes and habits. Help them use media as an invitation to interact and strengthen the adult-child relationship rather than as a distraction and disruption.

• **Understand the power of "nudges."** Craft short and simple messages that affirm, encourage, and empower parents. And provide them with simple prompts for actions to take and ways to interact with their child in the context of their museum visit and when they return home.

• **Be media mentors to parents.** In turn, they can be confident and competent media mentors to their children.

Museum educators empower parents to become thoughtful media mentors for their own children. That means supporting parents as they navigate the digital age for themselves and their children and encouraging both a healthy media diet and a positive family media ecology.

When role modeling and media mentoring are integrated into digital family engagement strategies, museum educators have new opportunities to encourage parents to reflect on their own use of digital tools. This leads to feeling confident as their child's first and most influential role model for healthy media use. All children, parents, and families can benefit from the support of a media mentor to navigate the ever-changing digital landscape. Children's museums have many opportunities to identify and develop staff as media mentors for the children, parents, and families who come to the museum to explore, discover, learn, interact, and build relationships.

"The best app (or any other format) for young children is one that supports the development of a relationship with another human being. Relationships comes first, technology comes second."

—Campbell & Koester, 2017

Chip Donohue is director of the Technology in Early Childhood (TEC) Center at the Erikson Institute, where he develops digital literacy resources and professional development programs for early childhood educators. As a senior fellow of the Fred Rogers Center for Early Learning and Children's Media, he co-chaired the working group that updated and revised the NAEYC/FRC Joint Position Statement on Technology Tools and Interactive Media in Early Childhood Programs Serving Children from Birth through Age 8. *At the Rogers Center he is also helping to develop the* Framework for Quality in Children's Digital Media *and design the* Early Learning Environment.

Understand the power of "nudges." Craft short and simple messages that affirm, encourage, and empower parents. And provide them with simple prompts for actions to take and ways to interact with their child in the context of their museum visit and when they return home.

Learn more…Resources for New Media Mentors

• "A New 21st-Century Job: The Media Mentor." Lisa Guernsey (2016) www.joanganzcooneycenter.org/2016/10/24/a-new-21st-century-job-the-media-mentor

• *Becoming a Media Mentor: A Guide for Working with Children and Families.* C. Haines, C. Campbell, and the Association for Library Service to Children (2016) www.alastore.ala.org/detail.aspx?ID=11720

• *Building a Corps of Media Mentors: Why and Where to Start.* Lisa Guernsey (2016) www.newamerica.org/education-policy/edcentral/building-corps-media-mentors-why-and-where-start

• *Family Engagement in the Digital Age: Early Childhood Educators as Media Mentors.* Chip Donohue (Ed.). (2017) https://store.naeyc.org/Family-Engagement-in-the-Digital-Age

• *Family Engagement in the Digital Age: Early Childhood Educators as Media Mentors* (ACM Webinar). Donohue, C. (Ed.) & Tamara Kaldor. (2017) www.childrensmuseums.org/previous-webinars

• *Help Parents Navigate the Digital Landscape.* Association for Library Service to Children, Public Awareness Committee (2016) www.alsc.ala.org/blog/2016/12/help-parents-navigate-digital-technology-landscape

• *Media Mentorship in Libraries Serving Youth.* C. Campbell, C. Haines, A. Koester & D. Stoltz and the Association for Library Service to Children (2016) www.ala.org/alsc/mediamentorship

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National Association for the Education of Young Children, & Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College. (2012). *Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8.* Washington, DC: NAEYC; Latrobe, PA: Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College. www.naeyc.org/content/technology-and-young-children

Rogers, F. (1995). *You are Special: Words of Wisdom for All Ages from a Beloved Neighbor.* New York: Penguin Books.

Ann Arbor Hands-On Museum

From Cautious to Pragmatic: Wrestling with the Issues

Rebecca Herz and Ari Morris Talk about Digital Technology in Museums

The choice to incorporate digital technologies into visitors' experiences in children's museums elicits a range of responses, from enthusiasm, to confusion, to hesitation, and all the way to opposition. We thought the topic would be ripe for a good point-counterpoint, but it turns out, opinions are more nuanced and not clearly as black and white as that format requires. Results from an ACM membership survey on digital technology practices revealed that a few museums were totally opposed to its presence in the museum experience. But most either already used it or were more open to the possibilities but concerned about 1) appropriate application of the right technology for the right reasons and 2) the cost and maintenance of hardware and software.

In this piece, museum director and blog author Rebecca Shulman Herz and IT manager and operations director Ari Morris discuss their sometimes aligned, sometimes opposed approaches to using digital technologies with family audiences.

Rebecca Shulman Herz, director of the Peoria PlayHouse Children's Museum, began her museum career at the Solomon R. Guggenheim Museum in New York City, where she managed Learning Through Art, an outreach program that sends artists into NYC public schools, for more than a decade. She later worked as head of education at The Noguchi Museum, in Queens, NY, and has also consulted for other museums, including the Oklahoma City Museum of Art, the Tenement Museum, and the Anne Frank Center.

In addition to her popular blog, *Museum Questions,* Herz has written a number of other museum-related publications, including the book *Looking at Art in the Classroom: Art Investigations from the Guggenheim Museum* (Teachers College Press, 2010).

The mission of the Peoria PlayHouse Children's Museum is to provide children with the tools and inspiration they need to be explorers and creators of the world. It does this in part through understanding, supporting, and promoting play in the fullest sense of the word, a definition that includes imagination and creativity.

Now assistant director of operations at the Ann Arbor Hands-On Museum, **Ari Morris** joined the museum in 2001 as the retail manager. Morris now manages the museum's overall IT operations and various other projects that involve multiple departments and technology. Prior to joining the museum, he managed retail establishments, worked at an historical society and worked with adjudicated juveniles at a facility in Minnesota. Morris earned his BA in Natural History Education from Northland College.

The Ann Arbor (MI) Hands-On Museum is designed to appeal to visitors of all ages, however, the majority of visitors are families or school groups with children between two and nine years old. Core to the museum's mission is creating engaging STE(A)M experiences for its more than 300,000 annual visitors. With four floors and more than 250 exhibits, regular weekend programming, and evening workshops, the museum aims to inspire curiosity and wonder in children through activities, interaction, and play.

REBECCA

I was asked to participate in this article because, in my ACM survey response, I noted that at the PlayHouse, "We try to avoid screen time in the museum as much as possible—we figure kids get enough of this at home." I am not in any way an expert in digital technology, and fully admit that I am wary of it.

The wariness does not stem from suspicion of digital technology itself. It stems from the concern that we are using this technology to solve the wrong problems, or jumping on a bandwagon without considering the long-term challenges.

Often, we use technology to engage visitors—we know that a computer-based interactive will be a draw. A few years ago I blogged about *Multiple Exposures: Jewelry and Photography,* a fantastic exhibit at the Museum of Art and Design in New York in 2014, and their auto-selfie station, which my daughter loved:

"Charlotte…took picture after picture. It made the museum experience both memorable and exciting for her. But the auto-selfie booth neither illuminated the exhibition ideas nor added to her understanding of photography or 'selfies.' Rather, it distracted her from the exhibition, which she barely looked at."

When museums use technology to address a specific goal, sometimes we end up creating something fun and interactive but fail to address the learning goal. For example, at the Peoria PlayHouse we have a computer interactive called Corntastic, which is a matching game featuring images of items made from corn. Visitors enjoy matching the items, but most of them come away without learning that spark plugs, carpet, and crayons are also all made, in part, from corn. Certainly the challenge of matching images is educational, but the interactive has limitations in its current iteration and fails in its purported goal.

ARI

In my ACM survey responses, I shared several examples of ways we use technology to successfully enhance the visitor experience. For example, we are launching a program for field trips called DEEP (Digitally Enhanced Exhibit Program) that uses low-energy Blue-Tooth beacons worn by students.

DEEP came about because teachers, faced with ever-dwindling resources and budget cuts (field trips are often first on the chopping block), kept asking us to provide them with a tool that they could use to show sometimes skeptical administrators and school boards how a field trip to our museum helped their students master the science standards their schools are charged with teaching. So far in our testing, the response has been overwhelmingly positive from teachers and students alike.

As the students approach an exhibit, DEEP will detect their beacon ID number and will use that to determine their grade level. The system uses touchscreens that launch content specifically tailored to the student's grade. The screen itself is not the interesting thing, but it offers lots of interesting ideas to try out with the physical exhibit. DEEP also tracks what students do with the exhibit, and when the field trip is over provides them with individual reports highlighting a few of their exhibit interactions. It also provides the teacher with a report that lists all the Michigan Science Standards that the students were exposed to during their trip.

All exhibit design should begin with clearly defined goals, and only then should the design team begin looking at ways to achieve those goals. Digital technology is one tool among many that can be used to achieve an exhibit's goals. Like all tools, when it's used well it can enhance and enrich the visitor experience, but when used poorly it can get in the way. Digital screens can isolate the visitor, robbing them of the inherently social experience of a children's museum. They can distract visitors from more meaningful tactile and tangible interaction with exhibits, and they can encourage passive consumption of information rather than exploration and discovery. Even so, I contend that "technology" is not a dirty word.

The only thing that separates digital technology from the rest of the tools in the museum experience arsenal is that it is new. Because of this newness, we're still exploring and discovering its strengths and also its weaknesses. But it also offers possibilities that were never available before.

Focusing on technology makes sense, because both museum professionals and visitors are drawn to it: People love it (even when they say they hate it).

REBECCA

I agree that digital technology should simply be one tool among many, but in reality I'm not convinced that's how it works. Digital technology is still new enough to dazzle. And screens are compelling, if not addictive, in ways that we do not yet entirely understand. (Ed note: See a debate on this topic playing out in *The New York Times,* detailed in the sidebar on page 12.)

In some ways, technology poses a similar challenge to other tools used to interpret and engage visitors. For example, wall text and labels can be well used or poorly used, and in fact their use at all is sometimes controversial in children's museums. But the very fact that ACM is dedicating an issue to technology highlights that this is an area that intrigues and challenges us, and which we view as slightly separate from the larger picture of interpretive strategies.

Focusing on technology makes sense, because both museum professionals and visitors are drawn to it: People love it (even when they say they hate it). We sense that digital technology will shape our future in ways we can't even predict. And, frankly, in a world in which funders are more and more likely to call the shots, a number of funders, especially digital technology companies, are much more likely to fund a technological solution to a problem than, say, increased staffing or professional development. These factors make technology both important and problematic.

...digital technology should simply be one tool among many, but in reality I'm not convinced that's how it works.

ARI

Rebecca raises some good points. I would also add that showcasing the most modern tech wizardry is very expensive; the cost alone could easily sink many museums. When you couple that with the fact that what's new and hot today will be passé in a year, it becomes pretty difficult to try and keep up. And why should we? We're not a technology museum or an Apple store.

I'm sure all museums have experienced a donor who wants to do something that just will not work, and sometimes you have to say "no." But more often there will be ways in which you can shape the project to satisfy the funder while still creating a truly great exhibit. There isn't a funder out there who wants their project to fail. Museum professionals with valuable expertise in what works well in a museum setting have considerable leverage in steering the conversation toward a project that will make everyone happy.

As a museum with a strong focus on science, we find it much more fruitful to design exhibits about how technology works rather than exhibits about the technology itself. For example, we have an interactive exhibit that demonstrates what the binary system is, and another that shows what a switch does. You really can't understand how a computer works at its most basic level without understanding binary. (Pretty soon we'll need to figure out how to teach quantum computing, but I think we may still have a few years before that technology reaches maturity.)

REBECCA

It's important for science-focused museums like the Ann Arbor Hands-On Museum to teach children about technology, and, while I have not seen the exhibits demonstrating binary or explaining switches, it sounds like the museum has a very thoughtful and smart approach to incorporating technology tools where they perform best.

In addition to offering new forms of technology simply to help visitors stay informed about technology, museums also use technology to deliver better exhibit experiences, some perhaps impossible without some of the tech tools currently available. For example, museums might have kiosks to help with capturing visitor feedback, beacons to turn galleries into a scavenger hunt, or tablets with games intended to teach historical information.

A lot of schools and school systems are talking right now about getting tablets or laptops in the hands of students. Many already have made this leap, and I'm certain some schools have figured out how to use these effectively. But most schools have not fully developed their capacity to use tablets well. To use technology to its best advantage in the classroom requires significant investment in teacher training and planning. And to truly advance student learning, and not simply create another screen distraction, it requires ongoing investment in applications or programs. Similarly, technology might be used to solve some exhibit or programming challenges in museums, but only when the infrastructure exists to support it, including significant investment in staff facilitation.

Digital screens can isolate the visitor, robbing them of the inherently social experience of a children's museum. They can distract visitors from more meaningful tactile and tangible interaction with exhibits, and they can encourage passive consumption of information rather than exploration and discovery. Even so, I contend that "technology" is not a dirty word.

ARI

Using technology for technology's sake is not likely to advance a museum's mission much, and without the infrastructure in place to support it, it's doomed to fail. But when used well, technology can allow you to do things you wouldn't be able to otherwise. For example, our Distance Learning Department is able to reach classrooms across the United States and even across the globe through the use of video conferencing technology. But we don't want to just be a talking head on a TV screen in a classroom somewhere; we want to interact with the students to provide them with a hands-on science experience! So weeks before our scheduled connection, we send a box that includes everything the students in that classroom will need to complete a hands-on project. Whether it's making slime as a way to talk about polymers, crafting a paper penguin to talk about animal adaptations, or building an anemometer to explain wind power, the students always do something as part of their learning. We would be able to reach a classroom in Pennsylvania, let alone one in Australia, without digital technology.

UNEXPECTED PROS & CONS OF DIGITAL TECHNOLOGIES

Digital technologies are not going away: no debate on that point. But there is ongoing scrutiny of their effects on people.

Two *New York Times* articles this year highlighted research with some reassuring and then some surprising findings of particular relevance to children and teenagers.

In an article entitled "Video Games Aren't Addictive" (Gray Matter, Sunday Review, *The New York Times*, April 1, 2017), authors Christopher Ferguson and Patrick Markey shoot down many parents'—and grandparents'—commonly expressed complaints that kids are "addicted" to video games.

"We don't deny that new technologies come with some perils. We understand the nostalgia for the halcyon days of, say, the 1950s, when people were not yet bound to their personal technology and were free to enjoy the simpler pleasures of life, like stickball and climbing trees—and getting polio and having to wait in line at the bank to check your account balance.

"We doubt most people would actually want to return to the good old days. We and our children are 'addicted' to new technologies because, for the most part, they improve our lives or are simply pleasurable.

"Evidence for addiction to video games is virtually nonexistent."

www.nytimes.com/2017/04/01/opinion/sunday/video-games-arent-addictive

In another *New York Times* article (March 13, 2017), "Are Teenagers Replacing Drugs With Smartphones?" author Matt Richtel airs an unexpected and possibly good outcome of replacing a bad addiction with a good one (if indeed it is truly classified as addictive).

"…researchers are starting to ponder an intriguing question: Are teenagers using drugs less in part because they are constantly stimulated and entertained by their computers and phones?

"The possibility is worth exploring, they say, because use of smartphones and tablets has exploded over the same period that drug use has declined. This correlation does not mean that one phenomenon is causing the other, but scientists say interactive media appears to play to similar impulses as drug experimentation, including sensation-seeking and the desire for independence…."

www.nytimes.com/2017/03/13/health/teenagers-drugs-smartphones

continued from page 7

BOB: The platform offers analytics that let you know how many people opt in, how many opt out, and when they opt out within the stream. We'll know how many people click through if a text message has a link for deeper information and how long they spend with the content or if they visit other content after they consumed the initial link. By using several different streams, we'll know which streams perform better. We will gather the metrics and absolutely use them to see how effective the program is and to make improvements.

BARBARA: We can use the same technology to do quick polls, asking things like, "Did you find this text valuable?" or "Are you going to do anything differently?" We also plan to formally evaluate the texting program in partnership with the University of Minnesota's Institute for Child Development. Through surveys, focus groups, and other technical tools, we will examine pre/post behaviors looking to identify changes. In the play survey we conducted a couple of years ago, we baselined behaviors of adult visitors in the gallery. We developed a pretty simple rubric of watching, separating, interacting supportively and interacting unsupportively, which will be useful in assessing the impact as we layer in new strategies for valuing play and learning and for helping adults recognize and support it during their visits.

Are there any other museums and organizations that use digital technologies in ways you admire or might serve as a model for your program?

BOB: The collections-based Minneapolis Institute of Art has a program called Art Stories. The content is well written and it's beautifully presented. They elevate that notion of going deeper when you're on-site and see something that intrigues you. Art Stories makes going deeper to learn easy and very compelling.

Will your program allow adults to send messages back to you? Or is this just a one-way system at this point?

BOB: In the launch phase, we've added a couple simple functions whereby people can answer a question or do quizzes. Then, by sending them a text directing them to a mobile-responsive platform, essentially a microsite, we can do a lot more with social engagement. They can take a photo and contribute it to an online, user-generated photo collage, or send a text that we could display in the museum. Text prompts can drive them to other interactives where we seek their input. Museum visitors can describe their experiences, talk about the learning or highlight interesting, fun things that their kids have been doing during the museum experience. We don't have specific plans to do that at this time, but we have the technical capacity for two-way texting, which we hope to grow as we continue to refine and develop the program.

Bruce Silcox for Minnesota Children's Museum

The texting program cues parents and caregivers that there's no right or wrong way to do it—a message we reinforce through in-gallery messaging as well. We want parents to understand the learning goals of open-ended play: their child will use their critical thinking skills to figure out what works. That peels the experience back to its essence.

The museum already does quite a bit of social media sharing.

BOB: Yes, we are active on the main social media channels, Twitter and Facebook, and to a growing degree, Instagram. People take a lot of photos at the museum and often share them with us. Some end up on our website. But photos don't always fully capture the learning that's happening. With the texting program, we can begin to familiarize people with the language of learning, teaching them to recognize the deeper experiences going on during play, and hopefully capturing some of those moments to share.

Did you learn anything unexpected or surprising while doing the *Museum Tech Scan*?

BARBARA: Bob and I both agree that just seeing the proliferation of technology in cultural organizations—the extent to which it already exists—was unexpected. In the nonprofit realm, where resources are notoriously tight, the adoption of technology covers a broad spectrum. There are lots of cutting-edge uses and experimentation happening. We also were amazed at the rapid evolution of the types of technology—there are so many options out there. Cultural organizations and museums are doing their part in helping to prototype what works and what doesn't for different purposes. And they are their own guinea pigs as far as seeing how visitors react to it within the context of the museum environment.

For a complete copy of the *Museum Technology Scan,* go to mcm.org/museum-professionals/explore-our-research/.

Trying her hand at taking apart the insides of a computer in Hardware Hack.

Programming unruly robots to follow commands

Coding is more than rows of numbers and symbols; coding is doing. It's making, tinkering, problem-solving, persevering, collaborating, communicating, and creating—many of the skills children build through play. Through coding, we could also spark curiosity about computer science and how the digital world works, expose children to new vocabulary, ideas, and careers, and engage our flourishing tech community in the museum's play-based mission.

Code Play: Kids Try Tech

Pam Hartley and Hardin Engelhardt
Marbles Kids Museum

Marbles Kids Museum focuses on hands-on, loose-parts play set in rich, imaginative environments. We aren't considered a tech museum. But in 2016, we conducted a successful experiment that paved the way for us to incorporate technology through play: Marbles Kids Code.

When the museum opened ten years ago, it focused on imaginative role play, especially physical, social play. We purposefully avoided screen-based interactives in the exhibits. Most young children already had ample access to screen time at home; Marbles gave families the opportunity to play actively together. Today, when we've found a way to engage guests in tech exploration while remaining true to our play mission.

The Inspiration

Marbles is situated in North Carolina's Research Triangle, an area anchored by the cities of Raleigh, Durham, and Chapel Hill with their three major research universities. We regularly partner with the universities and the new tech corporations fueling the region's growth. Last year, Raleigh was recognized as #2 Hottest Spot for Tech Jobs (*Forbes*), #2 Area with the Highest Number of Tech Jobs (*The New York Times*), #5 Top 10 Software Hotspot (*Forbes*), and one of The 7 Hottest Start Hubs (That Aren't Silicon Valley) (*Inc.*) We're surrounded by tech professionals and their families excited to share technology opportunities with children.

In order for Marbles to engage with tech, however, it was important to remain authentic to our brand and style of play. For several years, we looked for opportunities to collaborate with tech partners, but shied away from anything that involved adding a heavy screen presence to our play-based exhibits. Then a member of our staff (which we call Team Marbles) heard representatives of two tech firms speak about the Hour of Code at the National PTA Conference. Hour of Code is a one-hour introduction to computer science, designed to demystify "code" and show that anybody can learn the basics. They also learned how corporate partners were engaging schoolchildren in coding and computer science.

Approaching tech from the angle of coding felt like a natural fit. Coding is more than rows of numbers and symbols; coding is doing. It's making, tinkering, problem-solving, persevering, collaborating, communicating, and creating—many of the skills children build through play. Through coding, we could also spark curiosity about computer science and how the digital world works, expose children to new vocabulary, ideas, and careers, and engage our flourishing tech community in the museum's play-based mission.

The Big Idea

Fueled by early inspiration from Hour of Code, we learned from our tech partners what coding entails and how to talk about it. Then it was time to figure out what we wanted to do, starting with why it was important to explore this topic in a children's museum. Here's where we landed.

While we're increasingly surrounded by technology, most of us have no idea how it works. Many jobs in the future will require a working understanding of digital technology, but only a tiny fraction of students have access to computer science classes. Exciting all kids about coding at an early age can help demystify computer science and launch an interest in the digital world and technology-related careers.

What if we could spark kids' natural curiosity and help them become actively engaged in how tech works? What if kids met computer scientists and coders who looked like them? What if we could help families from all backgrounds connect with the tech camps and school programs already available in our community? What if we could help corporate and university partners see the impact of introducing coding and computer science to children (and parents) before children have opted out of science and math?

On April 16, 2016, we pioneered our first Marbles Kids Code event. With 2,100 guests, twenty-one screen-free (unplugged) activity stations, seventeen community partners, four sponsors, and two pop-up coding workshop computer labs, playing around with coding worked. The event drew a huge and eager crowd and engaged new corporate, university, and community partners in the museum's play-based mission.

Citrix engineers help children program bee robots through a giant Lego maze.

Students from Shaw University and the National Society of Black Engineers lead families in exploring tech in Hardware Hack.

The Partnerships

The first step in exploring this new topic was to reach out to the tech community. Local headquarters of Allscripts, Citrix, ipreo and Microsoft all quickly signed on as event sponsors. We engaged ten additional corporations to join us in programming, including IBM, Red Hat, SAS, and Lenovo. Three universities pitched in, including UNC-Chapel Hill, North Carolina Central University, and Shaw University, a school with strong diversity representation. We were also joined by City of Raleigh youth programs, Wake County Public School System, and two community nonprofits focused on access to robotics and technology.

The first Kids Code event was as much about Team Marbles learning to work with coding and computer science as it was for our guests to do the same. A preliminary presentation about the project to our board of directors, which included several tech professionals, was comical, a little embarrassing, and definitely humbling.

As with all of our programs and partnership events, the key to success was to remember what we're good at: we know play, we know kids, and we know what works well in the museum day. Our partners knew coding, and they brought their expertise and passion for their field. Although they were comfortable around middle or high school students, they weren't sure how to share their interests with young children, especially preschoolers. By helping the partners prepare play-based activities for the Kids Code activity tables, we helped them realize the impact they can have with very young children.

[Kids Code] gives tech companies an opportunity to share what they do with the community. Much of their work is behind the scenes and typically invisible to consumers. Kids Code offers the museum a chance to help tech partners translate what they do into community-friendly language and playful, easy-to-understand (for kids and adults) activities.

We spent hours meeting with partners, introducing them to activity ideas, expanding beyond screens and coloring sheets to a full range of playful hands-on activities. Second only to the fun of the event itself was the fun our team had test-driving new activities, seeing how we could adapt off-the-shelf products in playful ways that help partners get their ideas across. Chasing the musical code caterpillar down the office hallway? Check. Giant Lego maze for code-your-own-mice to run through? Check. Dash and Dot basketball gadgets? Check.

Corporate partners have been enthusiastic about the partnership and have signed up to participate in the event multiple times since the first Kids Code. It gives tech companies an opportunity to share what they do with the community. Much of their work is behind the scenes and typically invisible to consumers. Kids Code offers the museum a chance to help tech partners translate what they do into community-friendly language and playful, easy-to-understand (for kids and adults) activities. Partners also reported being delighted to help inspire children to explore tech fields. Throughout the event, they're recruiting the next generation of tech workers.

The Program

The first event was held on a Saturday in April during the North Carolina Science Festival, a two-week long celebration of science across the state. For Marbles, Saturday afternoons are the perfect intersection of high guest visitation and partner volunteer availability, and three hours is the perfect length of time for most events. Any shorter, and we lose program impact. Any longer, and volunteer and crowd energy start to flag. Kids Code takes place in the middle of the museum, giving it high visibility and easy access, making it easy for every family to give it a try.

The core of the program featured over twenty hands-on, unplugged activities that took computer science exploration off the screen and physicalized the play. For example, kids learned about programming by using directional cards and action sequences to "program" a friend to follow commands as a human robot. Play-based activities introduced coding and computer science concepts and vocabulary such as sequences, loop commands, binary, and algorithms. Activities also emphasized the personal skills needed to succeed in tech industries: perseverance, collaboration, and creative problem-solving.

All activities are led by a diverse group of corporate, university, or other nonprofit partners, along with Marbles' youth volunteers. In the words of Girls Who Code founder Rejma Saujani, "You can't be what you can't see." When children and their families meet real software engineers, researchers, and computer science students who might

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staff reported much higher levels of family interactions with adults and kids working together to complete projects. As a result of these findings, CMH has incorporated this same platform into other facilitated spaces so more complex activities can be accomplished with a single facilitator who can provide more multifaceted interactions with the families in the space.

A digital platform developed for the making skills project Made In Your Mind provides families with written directions, still images, and video instructions for each project, broken down into easily completed step-by-step segments.

Engage Parents

In many museums, parents are often seen using their phones for texting, taking photos, using social media, etc., but seldom with the direct intention of finding information to help facilitate activities with their children. To this end, in 2013, the Institute of Museum of Library Services (IMLS) funded the Extending and Customizing Learning (XCL) project, with CMH, Sciencenter, OMSI, New York Hall of Science, and Museum of Life + Science. Together we wanted to see if we could turn this device of distraction into a tool of facilitation for parents. So, we developed the More app platform to experiment with organization and types of content that parents would find most valuable.

During summative evaluation, we found having an app with a strong hands-on component did not affect dwell time or overall satisfaction with the experience, which was not very surprising. Nor was it surprising to find that the app was far more useful in more isolated locations where users could take out their phones and use the app, compared to high-energy locations where most attention was focused on keeping a group together. If parents don't have the ability to take out their phone to take a photo, they don't have the ability to use an app.

However, when using the apps, parents often reported they were likely or very likely to use the app as a tool for planning visits as well as a tool for finding activities they could do at home that related to a favorite exhibit. More exciting, during interactions at exhibits, 17 percent more adults asked kids questions when using the app than without it, and the level of questioning and discussions typically went far beyond process-focused questions (how to use an exhibit). These app-facilitated discussions delved into experimenting with the ideas presented and making connections between the concepts illustrated in the exhibit and their everyday lives. CMH will be releasing the More app platform for free download starting this summer. For more information about the More app platform and the XCL project, check out the website at www.21-tech.org/xcl/ and you can download the More CMH app on iTunes or Google Play stores.

Create Unique Experiences

Similar to using digital technology to explore certain concepts and skills, digital technology also allows the creation of highly "imaginative" experiences. For example, many of you are likely unaware that during CMH's expansion in 2009, we discovered a strange vein of crystals running under the museum and emitting energy. The U.S. Department of Geosciences was called in to investigate, but were unable to identify the crystals. Rather than risk damaging them, a containment well was built to protect them, harness their energy, and explore potential applications. However, there was a leak of the information and the Ridiculously Intelligent Villainous Agent League (R.I.V.A.L.) began laying siege to CMH, attempting to steal the crystals and the data being collected on them for their own nefarious purposes.

To counter their efforts, we formed the Special Elite Crime Resolution and Espionage Team, or S.E.C.R.E.T. S.E.C.R.E.T. agents are kids, typically seven and up, who blend into the environment and avoid R.I.V.A.L. detection. With their support team (parents) assisting, they go on sixty to ninety-minute missions that take place in the interstitial places all around CMH —hallways, corridors, empty corners, etc.— where agents use observation, critical thinking, and problem-solving to crack codes, uncover clues, and outsmart the villains.

Using RFID bands, agents are tracked during each mission using networked interactives, enabling them to earn digital badges and emblems for each mission they complete. Mission events may include using decoders to find hidden messages in exhibit graphics, building tools to reach control panels, using UV lights to follow cloaked drone trails, adjusting sound waves to counter mind control technology, and traversing a laser maze to upload a virus to R.I.V.A.L. systems. Agent profiles and dossiers are stored in the S.E.C.R.E.T. database for when they return to complete additional missions.

We have had overwhelmingly positive response from parents and kids for S.E.C.R.E.T. After completing their first mission, nearly 90 percent of parents said they would be willing to bring their kids back to play another mission (the remainder were from out of town and so couldn't bring them back easily). Eighty-six percent of parents could relate S.E.C.R.E.T. to skills and concepts being learned in school. And many of the older agents playing admitted they weren't originally that interested in coming to CMH, but S.E.C.R.E.T. changed their minds. One twelve-year-old put it well, "I didn't want to come [to CMH] because I thought it was for little kids. But now I want to come back tomorrow to do another mission!" For more information on S.E.C.R.E.T., visit secret.cmhouston.org.

Final Thought

A practical piece of advice to consider before planning any technological integration: assess who you are as an institution. Not every institution will share the same values or even have the practical infrastructure and staffing to maintain certain technologies. The tenets, themes, and examples laid out above may be perfect for some museums, impractical for others, and outright against the mission of others. The most important people to consider are your visitors. Integrating technology is not about "keeping up" with technological trends; it is about how the technology enhances, expands, and deepens the experience for your visitors.

Keith Ostfeld, director of educational technology and exhibit development for the Children's Museum of Houston, has spent the past sixteen years exploring ways to integrate making, technology, and computational thinking/coding into the museum experience. Ironically, he is currently ignoring his daughters' pleas for their own iPhones.

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look like them, they have the opportunity to be inspired and to imagine themselves pursuing careers in the tech industry. Our community partners are passionate about their work, and their enthusiasm is contagious.

Picture this scene at the museum on April 16: At one set of tables, led by software designers from Allscripts, a healthcare software company, kids spell their names on bracelets using black and white beads representing binary code, illustrating how a computer represents the entire alphabet using only two options (on and off, or in the case of the beads, black and white).

Engineers from Citrix staff the The aMAZEing BeeBot station and help children program bee robots through a giant Lego maze, practicing sequence commands like go forward, forward, forward, turn left, go forward, turn right, go forward, etc. Each time the bee hits a wall in the maze, it returns to the beginning of the maze. The child must reenter the entire sequence of commands from the beginning, with the addition of the new command she figured out when the bee hit the wall. In addition to sequencing, this activity builds perseverance and helps children see that in coding mistakes aren't bad, they're just a problem to solve and try again.

Students from Shaw University and the National Society of Black Engineers lead families in Hardware Hack, a hardware take-apart zone where children take apart computers, toys, and electronic devices and build new toys from the parts.

Middle school STEM volunteers introduce kindergartners to algorithms through Lego play. An algorithm is a set of steps needed for a computer program to accomplish a task. To write one, it's important to think through the steps and to communicate them clearly and efficiently. In the Lego activity two people sit at a table with a tall divider down the center so they can't see each other's table space. Each person has an identical set of ten to fifteen Lego pieces. One person creates a structure or scene using all the pieces, and then has to figure out what commands to give her partner so the partner can build the exact same thing on his side of the table (without looking). In figuring out and communicating the steps, the child is practicing creating and communicating an algorithm.

In addition to drop-in play activities, older kids, ages seven and up, sign up for twenty-minute workshops to practice coding in pop-up computer labs provided by partner Lenovo. Workshops run on the half-hour, with each lab time serving ten kids and their accompanying adults. Microsoft leads a Minecraft Coding Workshop where kids use "drag-and-drop code" to customize their Minecraft world. (Drag and drop code enables younger children to move objects representing simple commands into place rather than writing HTML code). Lenovo also leads Scratch Coding Workshops, introducing kids to Scratch, a free educational programming language developed by MIT used to create stories and animations. Families register for these free workshops at the event welcome table in our lobby and are given a time-slot slip on a first-come, first-served basis. Finally, families take a behind-the-scenes tour of the Marbles campus with our IT team, to see how tech powers the museum and its IMAX theater.

Kids Code | **INSPIRATION AND RESOURCES**

ORGANIZATIONS

Hour of Code: teaching students to code
hourofcode.com/us

Girls Who Code: closing the gender gap in technology
girlswhocode.com/about-us/#the-problem

TED TALKS

Mitch Resnick. MIT Media Lab: benefits of teaching kids to code
www.ted.com/talks/mitch_resnick_let_s_teach_kids_to_code

Reshma Saujani. Girls Who Code: teaching girls to take risk s and code
www.ted.com/talks/reshma_saujani_teach_girls_bravery_not_perfection

CODING PLAY ACTIVITIES / PRODUCTS

Hour of Code activities
hourofcode.com/us/learn

Dash and Dot robots
www.makewonder.com/

Go Robot Mouse
www.amazon.com/Learning-Resources-Robot-Mouse-Activity/dp/B01A5YMCH4

Bee Bot
www.bee-bot.us/

Ozo Bot
ozobot.com/

Looking Forward

Kids Code was such a success with guests, partners, and Team Marbles, that we expanded coding play to a twice-a-year event and integrated the strongest activities into our ongoing STEM programming on the exhibit floor. Moving forward, we plan to expand partnership impact by connecting families to additional coding and tech workshops, classes and camps in the community.

Through Kids Code, we think about technology in the same way we do about all topics at Marbles—through the lens of play. Working with our partners, we're building opportunities for children to play around with tech, fuel their curiosity about how their digital world works, and imagine their future careers. We're helping open parents' eyes to the wide variety of topics that truly excite their children. And we're inspiring the tech sector to invest in early childhood.

Pam Hartley is vice president for play initiatives, and Hardin Engelhardt is director of community engagement at Marbles Kids Museum in Raleigh, North Carolina.

TECH BUDGET TIPS

Elizabeth Levy | Tech Impact

Tech Impact offers a comprehensive suite of products, services, and experts that focus solely on the needs of nonprofit organizations. Since 2003, they have partnered with hundreds of nonprofits, including the Association of Children's Museums, to help each one realize the potential of technology to achieve their mission and improve outcomes.

Although Tech Impact focuses primarily on back-of-house and administrative technology applications, there are similar issues to consider when purchasing software/hardware packages for use with visitors.

Review contracts and terms of service.

This might seem obvious, but it is well worth your time to very carefully review contracts before making any purchases. Many software packages or SaaS (software as a service) packages come with contract terms or a specific amount of time you are in contract to use them. This is important to note in a technology document so that you know what timelines you are working with, particularly if you are considering changing software or exploring other options.

Software contracts that are subscription- or web-based may also indicate if/how their support will help with future upgrades. For instance, if your software needs to run critical updates every six months, the contract should indicate if this is something you are responsible for (and if so, whether you can do this yourself or need outside tech expertise) or if it is included in their support. If outside upgrade expertise is needed, this should be budgeted throughout the year depending on total number of upgrades.

Review technical support that might be included in your software package.

Some contracts come with specific support that either lasts the length of the contract or a specific timeframe that starts when you sign it (e.g. one year of 24/7 help desk support).

If you are already paying for contract-provided tech support, consider developing a one-page cheat sheet of all easily accessible tech support before considering hiring outside tech support. If all of your software comes with adequate technical support, then you only need to budget for user and/or hardware tech support.

Be ready for change: current and future hardware/software requirements.

As software continues to improve and push out upgrades, software/hardware requirements may change. For instance, if Software A is upgrading in September 2017, it may no longer run on Windows 7 machines. If a museum uses Windows 7, it will need to budget an operating system upgrade in addition to software upgrades to make sure the system/software stays compatible.

Plan for hardware life cycles.

Hardware (computers and screens) have different life cycles depending on their use, but most—and especially computers—should be replaced every five to six years at least. To avoid a large budget hit every five years to replace all the museum's front-of-house machines, plan to replace one or two each year resulting in a more consistent annual budget line item.

Talk with software or other technology vendors when budget time is approaching.

They should be able to give you an idea of imminent upgrades, changes in contract terms, or other considerations that will affect the budget in the next fiscal year

If you are considering changing system software or looking to add a new feature, what is your biggest motivation? Is it lowering costs, adding features your visitors want, or just exploring the best software out there for your needs? Changing systems can be a great choice, but it is time-consuming and expensive.

Organizations can benefit from bringing in neutral and unbiased third-party tech companies that can do a technology assessment of your needs, your wants, and your budget and present best options to present to your team. These companies are familiar with the technology players, but have no allegiance to any of them, so you can get recommendations customized to your needs. This step, however, also needs to be budgeted for both time and costs.

TIPS FROM THE TRENCHES

Kim Kuta Dring | Stepping Stones Museum for Children
Ari Morris | Ann Arbor Hands-On Museum
Lucy Ofiesh | Brooklyn Children's Museum
Adam Woodworth | Children's Museum im Oak Lawn

Several museum practitioners were asked to review the tips above and offer additional insights based on their own museum experiences.

KIM

Regarding budget, in addition to hardware and software tech support, upgrades, and replacements, there are other technology-related costs. A museum may need cloud storage, charging stations for portable technology, or a system for linking apps on various tablets. Do a complete inventory of all digital technology-related items before planning any purchases.

LUCY

Equipment must be treated as a depreciable asset—but does anyone actually set aside the money for each year's depreciation expense? (spoiler: no.) So the larger budget question is, do you reasonably expect that in three to four years you will come into another source of capital funds?

At BCM now, we are about to replace all our hardware and will do so with systems that are compatible with cloud-based storage so we can get out of the Dark Ages.

Especially in children's museums, be realistic about the burn rate of your equipment. As one designer said to me, "the only time I've seen my furniture destroyed was by a rottweiler, until I put it in a children's museum."

And word of caution: when a software company tells you a systems migration will take three months, quadruple that.

ADAM

Technology is complicated enough, let alone figuring out how budgeting for upgrades and obsolescence. We need an article entitled "The Hidden Cost of Technology: Is Your Budget Ready for It?" In a small museum with a limited budget, we neither plan nor budget for tech upgrades. We rely on volunteer support for most of our technology.

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"Children's museums can play a huge role in promoting healthy relationships between parents and caregivers and their children. By encouraging families to take some tech-free time during Sundays Unplugged, Greensboro Children's Museum helped parents see a simple, yet powerful strategy they could use in their time together with their children to build a stronger connection between them."

—Dr. Christine Murray

SUNDAYS UNPLUGGED

Marian King
Greensboro Children's Museum

In fall 2015, Dr. Christine Murray contacted the Greensboro Children's Museum (GCM) to discuss interactions that museum staff had observed among visiting families. Dr. Murray, a professor at the University of North Carolina Greensboro's (UNCG) Department of Counseling and Educational Development, was working with the Phillips Foundation of Greensboro and Dallas to develop the Guildford County Healthy Relationships initiative, a local "Relationships First" movement focused on families. Then at the early stages of the project, Murray and a colleague were conducting community surveys with local agencies to gather information on family issues.

Talking with Dr. Murray, we mentioned how we were discouraged to see adults engaging with their hand-held mobile devices rather than with their children on the floor. Far too often, we saw missed opportunities for play, exploration, and interaction. Staff and volunteers struggled to encourage families at the museum to focus on their little ones (without coming across as preachy or bossy).

Murray became intrigued with ways in which the museum could help adults connect with children. She felt that an effort in this area would fit nicely into the emerging Guildford County's Healthy Relationships Initiative. GCM staff further discussed the idea and began to talk about sponsoring technology-free times at the museum. The challenge was how to make it fun.

After several months of conversations and meetings, we launched Sundays Unplugged in February 2017. Greensboro Children's Museum joined over twenty local organizations in the initiative "to infuse the local community with information, resources, and services to promote happy, healthy, and safe relationships and prevent the negative consequences of relationship distress." We chose Sundays because Sunday afternoons typically have a more relaxed feel at the museum, and family groups often visit together.

Murray became intrigued with ways in which the museum could help adults connect with children... The challenge was how to make it fun.

Ironically, we primarily promoted Sundays Unplugged through social media. The audience we were trying to reach was already plugged in and we knew this was a great way to reach them.

Each Sunday in February, the museum gently challenges adults to leave their digital devices at the front desk in exchange for free personal admission. A safe check-in system was developed, and guests who participated were given stickers to wear which read "I Unplugged and Connected." Interesting conversations took place at the front desk while guests debated giving up their cell phones—and therefore their cameras. Several even tried to negotiate leaving car keys or sunglasses instead. The staff made it fun and without any pressure, made sure the guests knew it was entirely their choice to participate or not.

Ultimately, 48.5 percent of the adults chose to unplug, and community reaction to Sundays Unplugged was very positive. And with all the high-quality adult-child interactions we witnessed this February, it's no surprise that plans to repeat the program later this year are in the works.

Marian King is the CEO of the Greensboro Children's Museum, which just wrapped up a capital campaign for museum expansion. She holds degrees from UNC–Chapel Hill and Appalachian State University and has more than thirty year' of professional experience in nonprofit management.

hand to hand
Association of Children's Museums
2711 Jefferson Davis Highway
Suite 600
Arlington, VA 22202

Nonprofit Org.
U. S. Postage PAID
Permit No. 123
Arlington, VA

The Uses of Digital Technology in Children's Museums

Tech Tips

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ARI

In terms of budget, look at what technology really costs a museum.

1) Staff

• Can staff handle basic use? As basic as on/off? If answer is yes, and everything about running the technology is obvious, then get it. If it requires more extensive training, that's an ongoing cost, because it's not once and done. Every time new staff come on board, training must be repeated.

• If a computer (or software) cannot withstand a simple on/off via breaker, then it should be on a dedicated line run by an electrician. The cost of bringing in an electrician to run the line is cheaper than the cost of ongoing staff training.

• Can staff maintain and/or modify the tech exhibit? If the content changes, can you change it? If not, it's a cost to bring in outside vendors again to make the changes.

• Avoid proprietary costs re. software, if possible. When commissioning or purchasing software, make sure the contract is written so that you own it and are able to modify as needed. Own your custom-designed software.

2) Equipment

• A lot of museums purchase off-the-shelf equipment, such as buying a TV for $150 from Best Buy for a tech exhibit installation. But those TVs are not designed to run ten hours/day, seven days/week and be pounded on by kids. They will break fast.

• Replacement costs: if you buy an off-the-shelf TV, buy the replacement parts with it at the time of purchase because by the time it breaks, the TV may be obsolete or the replacement parts may be unavailable.

• Or better, buy three TVs at same time and store two. This is a bigger up front cost (plus storage costs) but it's cheaper to buy three and store two than to rebuild the exhibit when a screen becomes obsolete.

• What is the life span of an exhibit compared to the life span of any tech components in it?

3) Other costs

• How stable is your power supply? Lightning storms, power outages, and brown-outs cause spikes in voltage when power abruptly goes off and on. Lightning can zap computers. Is your equipment adequately covered by surge protectors? Does your tech equipment in each exhibit have UPS (Uninterrupted Power Supply), aka battery backup, that automatically kicks in when voltage drops when you lose power?

• What happens to your equipment if someone just pulls the plug?

4) Can your equipment be hacked?

• Anything computer-based can be hacked. Hacking in museum exhibits is probably not malicious, but most likely kids fooling around, playing, trying things out—in itself not a bad thing.

• Isolate exhibit tech components from the internet. Exhibit tech components should be on a separate network from the main museum network to prevent hacking into museum systems. Ask IT people to set up separate network(s)—another cost.

These tech issues aren't always obvious to exhibit designers who incorporate tech into their exhibts.