

STEP INSIDE
A RECREATED
ICE TUNNEL!

FEEL THE COLD WIND BLOWING OFF THE GLACIER!

LOOK UP!

Icebergs make a process of melting at sea or
by and carrying down to create a mountain here.



Designing Durability

Best Practices for Long-Lasting Interactives

Betty Brennan, Jason Cox, Chris Brusatte, Leah Rainey, Drew Levan



fig. 1. Ice cave at Indiana State Museum.

Have you ever tapped a touchscreen, turned a “cranky-do,” or pressed a push-button only to experience...nothing? Interactivity is all the buzz in 21st-century interpretive sites, but it can also be a buzzkill when it’s not working effectively. Exhibits cannot engage visitors if they are out-of-order, and sites cannot afford to constantly repair or replace them. When designing interactives, maintenance and durability deserve as much consideration as the project’s interpretive goals – after all, fulfilling those goals presupposes that the exhibits will function.

Over the past decade, visitor-centered organizations have pioneered new modes of education and engagement through hands-on, interactive exhibits. But in their zeal to provide interactive learning, many have failed to keep pace with the durability needs of these new exhibits that – by their nature – experience more wear and tear.

This article is intended to help organizations that are considering contracting with firms to design or build interactives. Drawing on decades of experience in conceptualizing and fabricating exhibits, we will discuss the unsung benefits of designing interactives for durability and ease of maintenance. Examples are from our own case studies, but their insights have been echoed anecdotally by our colleagues and competitors working in museums, nature centers, parks, historic sites, universities and more.

Designing for Maintenance and Durability

To be successful, interactives must not only *create* powerful impacts, but *withstand* them. We encourage prioritizing durability from the start of all exhibit projects.

Put Durability Expectations in Writing

As a design-build firm, Taylor Studios reviews hundreds of RFPs (Requests for Proposals) each year to identify potential projects. We find that few interpretive sites create project goals that include durability or maintenance standards (beyond listing a required warranty term).

When soliciting bids or qualifications from design partners, it's worth considering what kind of longevity is realistic and desirable for your project. You can help designers help you by including in your RFPs:

1. how long you intend this exhibition to be open (two years? two decades?) and
2. how many visitors you serve (per day and per year).

To select an exhibit partner who can credibly meet your needs, it is also wise to require the following information about bidders' past projects/portfolio work:

1. number of change orders issued over the course of the project;
2. original and actual project schedule; and
3. original and actual project budget.

Use Data to Improve Planning

At Taylor Studios, we track a lot of metrics – including what types of interactives break, how often, and what repairs cost. The data we have accumulated and analyzed over the years has led us to the general conclusions about exhibit durability that inform this article.

Reviewing historical data also helps us avoid optimism bias – a pitfall common to our industry, but by no means exclusive to it.

As discussed on a recent episode of the social science podcast “Freakonomics,” the Planning Fallacy is the human tendency to under-forecast the time it is going to take to complete a project. Originally posited in 1979 by psychologists Daniel Kahneman and Amos Tversky, this cognitive phenomenon predicts the widespread pattern of projects blowing their budgets and schedules – and under-delivering benefits. There are several reasons for this rampant form of optimism bias, one being that human brains tend to process positive information about the future more readily than negative.

Less innocent but sadly no less epidemic is strategic misrepresentation, which stems from the belief that the most effective way to get people to undertake your project (or hire you for theirs) is to oversell.

For those involved in exhibit development, the antidote to the planning fallacy is data. If you use comparable projects as a basis for estimating the time and resources required for your project, you are more likely to be accurate.

Set Priorities and Parameters

Many interpretive sites desire one-of-a-kind interactives that “stand out from the crowd.” While every site has a unique story to tell, we should not confuse innovative storytelling with experimental *technology*. We would not drive a car that has not been rigorously tested – or that no one knows how to repair. The same logic should apply to interactives.

Studying interactives that have performed well before – both in terms of durability and educational effectiveness – can inspire better design practices and parameters. Reviewing past failures, too, can fuel creative solutions.

When setting parameters for designing interactives, here are some things to consider:

- How will users interface with exhibits?
- Can staff easily access components for maintenance and repairs?
- What are the benefits and risks of the particular technology?
- Are there custom parts or finishes that may be difficult or costly to replace or repair?
- What information should be included in a long-term maintenance manual?
- Will short-term savings on components or design result in higher lifetime costs?
- Has this equipment or technology been successful in similar applications before?
- What site conditions should be considered (e.g. location, water/utility access, space constraints)?
- Is routine maintenance within the capabilities of site staff?

Designing for ease-of-maintenance is critical. (If possible, invite your maintenance staff to provide input during design.) The up-front costs might be more expensive, but easier upkeep pays off in the long run. We recently built a large ice cave (fig. 1, p. 79) for Indiana State Museum. To create a glowing effect emanating from above, light bulbs are placed in the ceiling of the cave – bulbs that will someday require replacement. To ensure easy maintenance, a ladder and platform were embedded (fig. 2). The result? An immersive environment for the cave’s interactives that is also simple to maintain.

Also, over-engineering is almost always wise. If you think that a ½” rod is probably durable enough for a mechanical interactive, perhaps use a ¾” rod just to be safe. The additional fortification is likely well worth the minimal extra cost. Remember, good design will not sacrifice strength, functionality, and accessibility for aesthetics – it will balance them. After all, an “out-of-order” sign is never a good look.

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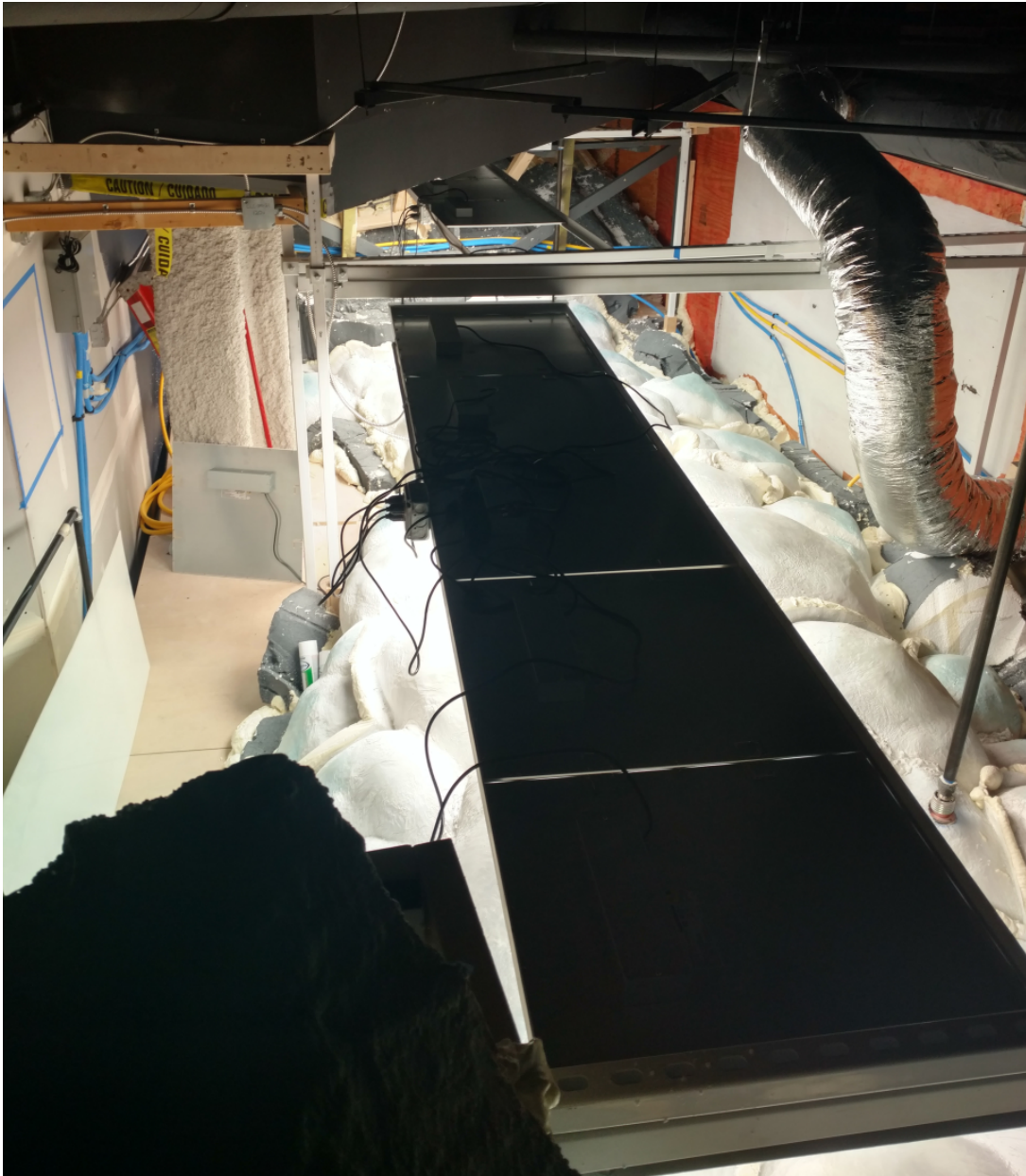


fig. 2. An access door leads to a ladder and catwalk for easy replacement of light bulbs.

fig. 3.

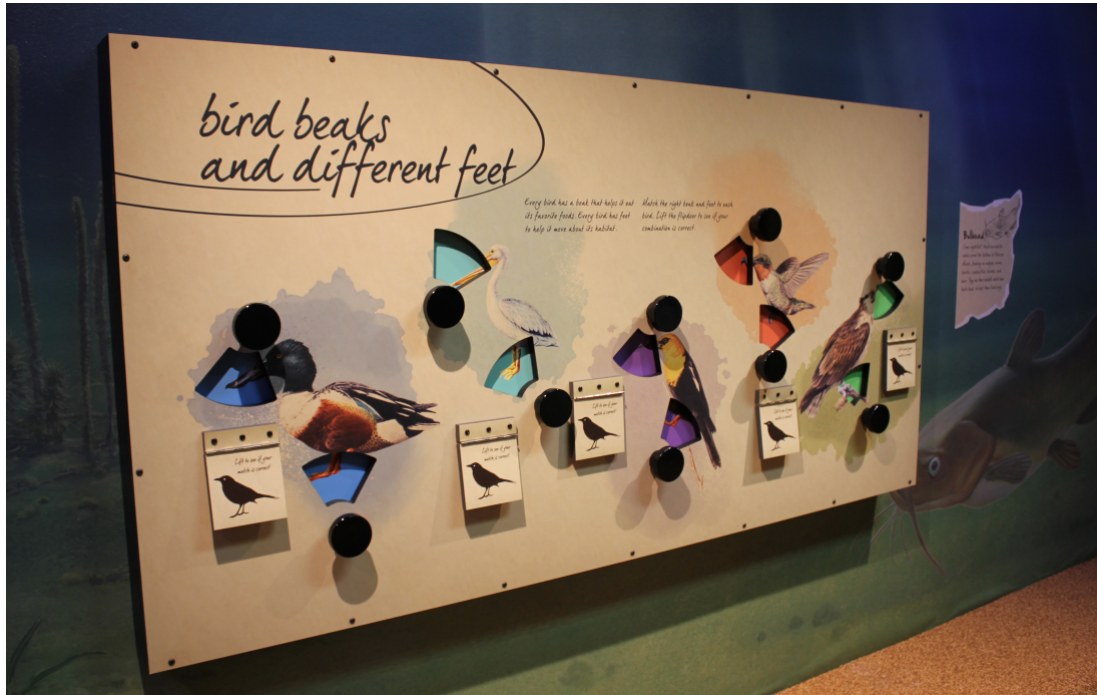
This “high-tech” A/V interactive at Horicon Marsh Education and Visitor Center explores various bird species via a digital graphic interface on a touchscreen monitor.



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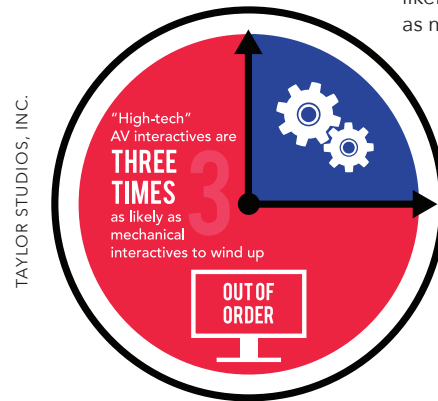
fig. 4.

This “low-tech” mechanical interactive at Horicon Marsh Education and Visitor Center explores various bird species via a matching game comprising hand-cranked spinners and flip door reveals.



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fig. 5. According to our data from warranty claims, A/V interactives are three times as likely to require maintenance as mechanical interactives.



Determine the Level of Technology

Styles and types of interactives vary greatly. Museums often crave the “latest and greatest” technology. But audiovisual (A/V) interactives – those involving electronics and digital displays (e.g. fig. 3) – often require more maintenance and trouble-shooting than mechanical interactives (e.g. fig. 4), and the fixes can be expensive. In reviewing five years of data,¹ we discovered that interactives with A/V integrations are roughly three times more likely to require maintenance than non-A/V interactives (fig. 5).

Furthermore, A/V interactives become obsolete much faster, as technology is ever-evolving. Consider ways to “future-proof” interactives. For example, monitor sizes and styles change often, so a monitor housing should be designed with flexibility to accommodate future replacements.

Keep in mind that visitors come to museums and interpretive sites to have experiences that are outside of ordinary. Touchscreens, for instance, are no longer part of that exotic domain for many museum-goers. Ask yourself honestly: how will this technology compare (and compete) with multi-media experiences your visitors can get at home – or from the device in their hand?

¹ Because we offer a five-year warranty on design-build projects, which is longer than the industry standard of one year, we are especially well-positioned to collect useful data on warranty claims.

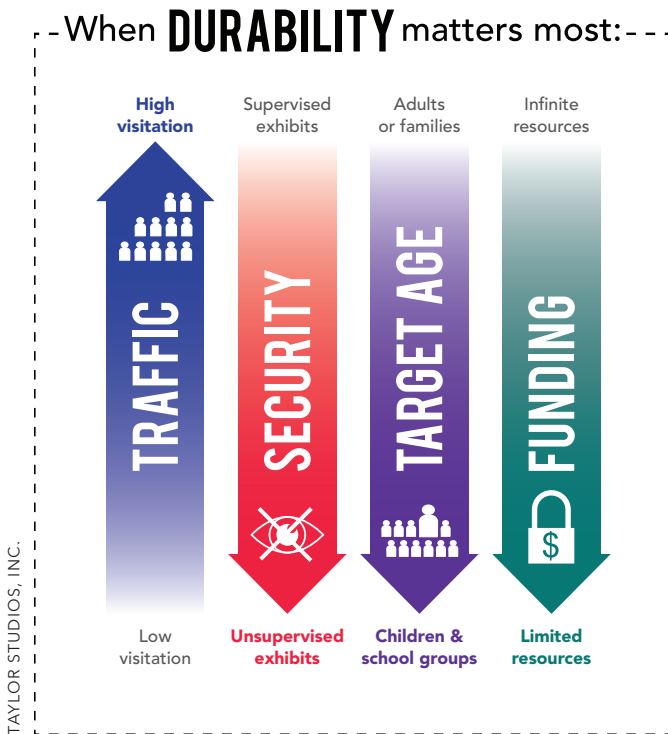
We have learned some of these lessons the hard way. Years ago, one client wanted the latest in interactive technology even though their site was remote and relatively “off-the-grid.” In a desire to please them, we overlooked some of their site’s limitations. To make matters worse, we learned too late that their staff had no technological expertise. Their high-tech interactives were essentially moot – and mute, as it were – while they struggled with power outages, a lack of in-house maintenance capability, and a remote location far from any technical support. We now understand that budget isn’t the only limiting factor when it comes to assessing interactive media choices.

Know Thy Audience

When designing exhibits in general, perhaps the most important consideration is audience. Who are your visitors, and how do they behave?

Not all interpretive sites need the same level of durability (fig. 6, p. 84). Interactives at places that emphasize hands-on learning (e.g. children’s museums, science centers, nature centers, etc.) receive more wear and tear, thus requiring more maintenance and increased durability. In reviewing warranty claims for maintenance from 2010 to 2017, we found that 67 percent came from “hands-on learning” sites that targeted children as a primary audience. Only 33 percent came from more “traditional” and “passive” museums or visitor centers.

fig. 6. High visitation, unsupervised exhibits, an audience of children and school groups, and limited resources all point to the need for increased durability.



The need for durability also increases if the exhibits are not regularly supervised by staff or volunteers. Naturally, the overall *number* of visitors (across all age groups) is also a big factor.

A successful interactive at one site might not work at another. For example, we designed a block puzzle interactive for two different sites, fabricating both with the same methods and materials. At the first site, the interactive has proven effective and durable (fig. 7). But the second site serves substantially more young visitors – with less supervision. The same exhibit that has worked so successfully for the first client didn’t hold up for the second (fig. 8). We had to reimagine the interactive with altogether different media to sufficiently increase its durability. We should have anticipated the differences in the two sites’ visitor behavior and volume (roughly 30,000 versus 200,000 annually). Past successes can be useful but should always be considered in context. We encourage interpretive sites to collect their own data by observing visitors’ behavior and soliciting their feedback. Depending on the needs and capabilities of the organization, such research can be conducted via formal or informal means, including staff or volunteer oversight, comment cards, and in-person or digital surveys.

Celebrate “Simple”

One final consideration: interactives are often overly complex, which can cause unnecessary headaches throughout the lifespan of the project and exhibits. Elegant design is simple design.

One of our favorite examples is a plate tectonics interactive we created for Stone Mountain Learning

figs. 7 & 8. This block puzzle interactive fared quite differently for two of our clients, due largely to differences in visitor volume and behavior between their sites.

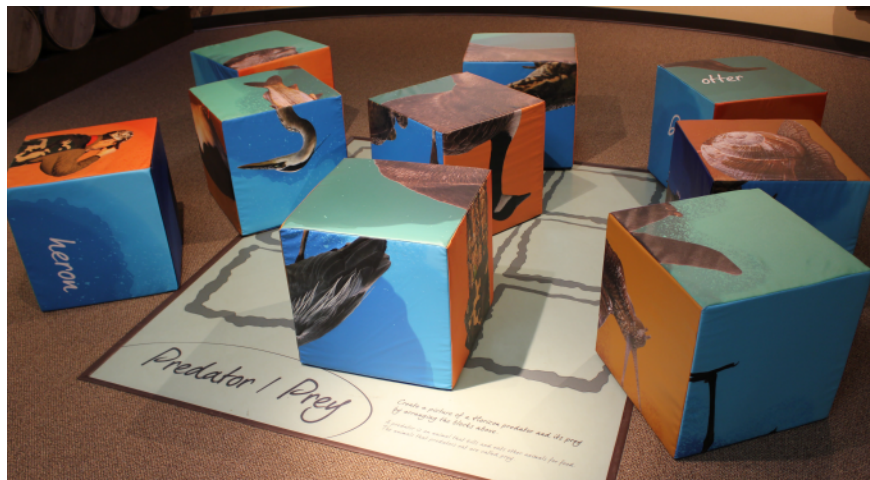


fig. 9. Our plate tectonics interactive at Stone Mountain Learning Center. The choice of simple mechanisms and durable materials has resulted in a maintenance-free interactive for 15 years and counting.



Center in Georgia (**fig. 9**), which explores different types of collisions of the earth's crust. We designed an animated visual of the three types of faults. A large cross-section of the earth showing the location of faults is animated via polar motion, a tried-and-true technology of the time (think of the flowing waterfalls in illuminated beer signs). The visuals were enhanced by adding a hands-on kinetic interactive of the faults in front of the animation: visitors could watch the plates move and then create these movements themselves by physically manipulating the blocks per controlled motions. When we designed this interactive, we were worried that we might create something too complex, and thus overly expensive and hard to maintain. So, we set parameters and went through multiple rounds of prototyping in our fabrication shop to create an interactive that was highly effective yet simple in its design. After some trial and error, we decided to keep moving parts to a minimum by simplifying the mechanics. Wooden blocks capture round rods without bearings, keeping the design simple. This interactive has been maintenance-free and continues to be a visitor favorite today – 15 years after its installation.

Summary

So, what has our company learned – and what can we offer as lessons to those embarking on their own exhibition development projects?

1. Include durability expectations in your request for proposals.
2. Set goals for durability and maintenance when beginning the conceptual planning of all interactive exhibits.

3. Collect and consult data to accurately forecast the time and resources needed to develop interactives.
4. Know what types of technology work best for your site – and your maintenance staff.
5. Base durability standards on the number, type, and behavior patterns of your visitors.
6. Remember to account for long-term maintenance and replacement cost.

The museum field excels at providing visitors hands-on, interactive learning. It is time to add maintenance and durability planning to our arsenal. With these tools, we can ensure that our investment in engaging interactives will pay off many times over – by reducing maintenance burdens, minimizing replacement and repair costs, and most importantly, by serving our visitors better, more, and for years to come.

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