

Million Dollar Pencils and Duct Tape: Some Thoughts on Prototyping

by Paul Orselli

"The more creative and flexible an organization is, the cheaper, simpler, and more numerous are its prototypes."

Michael Schrage

To be a prototyper it helps to be a great gatherer (and editor) of ideas. Developing successful prototypes can often be a systematic process, but not always! So, how can you jump-start the prototyping process where you work? A good starting point is to clearly identify the message or idea you'd like to transmit. "Mushy" ideas make for vague prototypes and even vaguer exhibits. Can you sum up the idea you'd like a component to get across to the visitor in one meaty sentence? Prototyping involves both brains and materials, but the more brains you use at the beginning of the process, the less materials you'll need to use later on.

"You can't just wait for inspiration. You have to go after it with a club."

Jack London

Once you've gathered an initial set of pithy and profound ideas together — RUN! Get out of your offices, or worse yet, meeting rooms! Nothing stifles prototyping creative and off-the-wall ideas more than a bunch of exhibit "experts" endlessly speculating about how visitors will act, or what is mechanically feasible. Instead, put together the two essential ingredients for testing prototypes: curious people and cool junk. And do it as soon as possible. Mixing people and junk together often produces explosive bursts of creativity in both the testers and the prototypers. Putting prototypes into real visitors' hands unearths ideas and ways of using (and misusing!) components that would never have come out in a month's worth of stuffy development meetings.

Make sure to gather together a wide demographic range of prototype testers (young and old, school groups and families, etc.) Some built-in prototype testers that are often overlooked include museum volunteers, but also co-workers from outside the exhibits department. Some of the most telling insights can come from co-workers who don't develop exhibits every day.

"To invent, you need a good imagination and a pile of junk."

Thomas Edison

One advantage that 21st century prototypers have over Edison is the Internet. Many online sites provide inspiration for prototyping tools and techniques, not to mention access to real stuff. Three of my current favorite "inspirational" websites are:

Boing Boing: <http://boingboing.net/>

Make Magazine: <http://www.makezine.com/>

Cool Tools: <http://www.kk.org/cooltools/>

As a bonus to Exhibitionist readers, I've assembled a list of Prototyping and Exhibit Resources and Supplies, divided up into categories. Go to: <http://www.orselli.net/sources.htm>.

Beyond "virtual junk" any good prototyper needs ready access to duct tape, tools, wood, and mechanical bits and bobs to give form to initially formless exhibit ideas. CAD programs and computer-generated elevation drawings are great, but it's hard to beat the timeliness of duct taping a panel to the back of a chair to try out the placement of an exhibit button or label with a real live visitor.

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"'Mushy' ideas make for vague prototypes and even vaguer exhibits."



A young tester tries out a simple duct tape and plywood prototype.

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(continued from page 83)

"Plan to throw one away — you will, anyhow."

Frederick Brooks

One danger of the curious admixture of imagination and junk is the tendency for a prototyper to start falling in love with their clever solutions for shaping ideas into exhibit components. Make sure that your prototyping solutions are really providing the best platforms for the main ideas of the exhibition or component you're working on. It is very easy to get seduced by the siren song of technology. Do you really need a computer-controlled device when a simple mechanical interactive might be more effective? Remember that during the heyday of the Space Race to the moon NASA spent millions of dollars developing writing implements that could function in zero gravity. The Russians, on the other hand, merely gave their cosmonauts pencils!

Good prototyping should be both an iterative and reductive process. If your initial ideas don't keep getting better and simpler—elegant, in both the scientific and artistic senses of that word—then something is wrong. Clever prototyping ideas never really go away, but it's important to know whether you're creating carefully crafted solutions that dovetail nicely with exhibition content, or merely making million dollar pencils.

"It isn't that they can't see the solution. It is that they can't see the problem."

G.K. Chesterton

How do you know when your prototyping is finished? The prosaic answer is that prototypes, like exhibits themselves, are never truly "finished". The practical answer is that the **initial** prototyping is complete when the project schedule and/or budget are exhausted.

However, I've found that many times prototyping solutions and exhibit improvements don't come until months, or even years, later. The advent of new materials or technologies, or just the sheer impact on your brain of informally seeing visitors use an exhibit hundreds of times, can often suggest that one little "tweak" that can push a good exhibit into that rarefied category of wonderful exhibits.

One example from my own experience taught me that the questions that visitors ask about an exhibit during the prototyping process aren't always the ones we expect.

In developing a math interactive about conic sections, I started fussing around with some simple wooden turntables, plastic bottles, and epoxy (cool junk!) to test out some hands-on ideas with visitors. We soon found out that viscous fluids created more satisfying parabolic shapes than just water. A trip to the local grocery store later, we realized that ordinary yellow cooking oil had the right color and thickness to create amazing shapes. Game over, right? Wrong!

By shifting that one variable, substituting oil for water, visitors suddenly became much more concerned about discovering what the "magic

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fluid” inside the containers actually was, as opposed to studying the shapes that they were making. In a moment of both desperation and serendipity (pushed along by a looming deadline) we tried epoxying an actual clear plastic bottle of cooking oil (with the label removed) onto our turntables.

Because of the distinctive shape of the cooking oil bottle itself, as well as the now familiar amber color of the oil inside, visitors became even more delighted to find that a material that they were familiar with could be used to produce such cool mathematical shapes.

The final version of the “Parabolic Spinner” exhibit with the cooking oil bottle. © Paul Orselli



So, focus your ideas, gather together your junk, and keep prototyping! If you feel the need for inspiration, get out your Sharpie marker, and write this quote from Edison on a piece of duct tape to stick above your work space:

“Just because something doesn’t do what you planned it to do, doesn’t mean it’s useless.” ✨

Prototyping on the street at a recent Association of Science-Technology Centers (ASTC) Conference. © Paul Orselli

