



"Mark's book is pitch-perfect on why the
Maker Movement is so important for our collective future."

—BETH COMSTOCK, CMO AND SVP, GE

**RULES FOR INNOVATION
IN THE NEW WORLD OF
CRAFTERS, HACKERS, AND TINKERERS**

THE

M **A** **K** **E** **R**

MOVEMENT

MANIFESTO



MARK HATCH
CEO, TECHSHOP

THE
MAKER
MOVEMENT
MANIFESTO

RULES FOR INNOVATION
IN THE NEW WORLD OF
CRAFTERS, HACKERS, AND TINKERERS

MARK HATCH

amazon.com



Available on the
iBookstore

BARNES & NOBLE .COM
www.bn.com

Mc
Graw
Hill
Education

New York Chicago San Francisco Athens London Madrid
Mexico City Milan New Delhi Singapore Sydney Toronto

Contents



Acknowledgments	vii
Maker Movement Manifesto (Short Version)	1
Introduction	3
1. Maker Movement Manifesto	11
2. Free Innovation!	33
3. Communities of Practice	51
4. Knowledge, Learning, Control, and Intelligence	69
5. Fueling Innovation	91
6. Democratization of Tools and Information	111
7. Rise of the Pro-Am	129
8. Distributed and Flexible Manufacturing	147
9. Accelerating Innovation	167
10. Changing through Participation	185
Conclusion	199
Notes	205
Index	207

Maker Movement Manifesto

MAKE

Making is fundamental to what it means to be human. We must make, create, and express ourselves to feel whole. There is something unique about making physical things. These things are like little pieces of us and seem to embody portions of our souls.

SHARE

Sharing what you have made and what you know about making with others is the method by which a maker's feeling of wholeness is achieved. You cannot make and not share.

GIVE

There are few things more selfless and satisfying than giving away something you have made. The act of making puts a small piece of you in the object. Giving that to someone else is like giving someone a small piece of yourself. Such things are often the most cherished items we possess.

LEARN

You must learn to make. You must always seek to learn more about your making. You may become a journeyman or master craftsman, but you will still learn, want to learn, and push yourself to learn new techniques, materials, and processes. Building a lifelong learning path ensures a rich and rewarding making life and, importantly, enables one to share.

TOOL UP

You must have access to the right tools for the project at hand. Invest in and develop local access to the tools you need to do the making you want to do. The tools of making have never been cheaper, easier to use, or more powerful.

PLAY

Be playful with what you are making, and you will be surprised, excited, and proud of what you discover.

PARTICIPATE

Join the Maker Movement and reach out to those around you who are discovering the joy of making. Hold seminars, parties, events, maker days, fairs, expos, classes, and dinners with and for the other makers in your community.

SUPPORT

This is a movement, and it requires emotional, intellectual, financial, political, and institutional support. The best hope for improving the world is us, and we are responsible for making a better future.

CHANGE

Embrace the change that will naturally occur as you go through your maker journey. Since making is fundamental to what it means to be human, you will become a more complete version of you as you make.

In the spirit of making, I strongly suggest that you take this manifesto, make changes to it, and make it your own. That is the point of making.

1

Maker Movement Manifesto



In the spirit of making, I strongly suggest you take this manifesto, make changes to it, and make it your own. That is the point of making.

MAKE

Making is fundamental to what it means to be human. We must make, create, and express ourselves to feel whole. There is something unique about making physical things. Things we make are like little pieces of us and seem to embody portions of our soul.

Make. Just make. This is the key. The world is a better place as a participatory sport. Being creative, the act of creating and

making, is actually fundamental to what it means to be human. Secular philosophers like Georg Wilhelm Friedrich Hegel, Carl Jung, and Abraham Maslow all came to the conclusion that creative acts are fundamental. Physical making is more personally fulfilling than virtual making. I think this has to do with its tangibility; you can touch it and sometimes smell and taste it. A great sentence or well-written blog is creative and makes you feel good about what you have accomplished, but it is not the same as the satisfaction that comes from the physical labor involved in making something physical.

If you come from a Judeo-Christian religious background, whether Jewish, Protestant, or Catholic, then you know that the first book of the Torah or Old Testament is the book of Genesis. Read Genesis Chapter 1 closely. Whether you believe in the literal interpretation of Creation or not, we can probably agree on two things coming out of this chapter. God is a maker, and he made us in his image. It is a very powerful introduction to God and who we are as humans. What do you know about humanity by the end of the chapter? It says, “God made” (or “let,” or “created”) some 15 times and ends with making people in his image. At the end of Genesis 1, we may not know much about God or humans, but we do know one thing for sure: we were made to make.

There is nothing that can replace making—philosophers, religious scholars, and personal experience make that clear. Wars have been fought when the common people thought they were going to lose access to ownership of their own productive tools. So the first thing we must do is make. The do-it-yourself (DIY) home improvement industry in the United States is worth over \$700 billion. The hobbyist segment is worth over \$25 billion. The most valuable segment of the \$700 billion DIY is the perpetual remodeler, specifically those who have enough money to let business professionals do the work for them, but

don't. You might know or even be one of these people. In your heart of hearts, you know you don't really *need* to redo the bathroom, or certainly not the way you plan to do it, yourself. But you do it anyway. This is because there is more satisfaction in completing the remodel yourself.

A makerspace is a center or workspace where like-minded people get together to make things. Some makerspace members are designers, writers, practitioners of medicine or law, architects, and other white-collar types who come in and start making things for themselves, their families, and friends. They spend time in makerspaces because they just love to make things. They don't *need* to make Christmas presents; they *want* to.

Tina Albin-Lax had made a New Year's resolution for 2012. She was going to learn how to make something. She signed up for TechShop's basic laser cutter class and has never been the same since. For \$60, she learned how to use a laser cutter. Then she booked it for the next day so she could practice what she had just learned, but she needed a project to practice on. As luck would have it, that evening Tina's sibling called and invited her to attend her nephew's birthday party that weekend. With a flash of brilliance, Tina asked for the names of all the children who would be at the party.

The next day Tina used her new training to make cupcake toppers for each of the party attendees. Using the laser cutter, Tina cut out the name of each child and etched in some nice patterns. She finished them with a nice glossy coat and that weekend put one on each child's cupcake. What child doesn't love to see his or her name emblazoned on something? Particularly something chocolaty and sweet? Not surprisingly, the parents wanted cupcake toppers for the rest of their children and then wanted them for their children's parties. It snowballed.

Soon Tina had an online store (www.etsy.com). Then she began teaching classes on how to launch a business and had a great mention in Martha Stewart's magazine, *Martha Stewart Living*. Her phone couldn't make it through the day from all the order notifications she was getting. Last I heard, she was working on a book.

This all came about from a simple desire to make something for the first time since sixth grade. An accidental entrepreneur was born. And what was Tina's background? She was a labor organizer.

I grew up playing neighborhood football with a kid named Ben Parks. His dad was a ceramic artist and had throwing wheels, clay, and amazing glazes around his house. One day his dad invited us all to come out and throw a pot. What a great afternoon. I attempted to make a large vase—and after what seemed like dozens of attempts and lots of help and encouragement—I ended up with a sad-looking, lopsided, very small coin holder. It will hold a couple of dollars' worth of quarters. I glazed it beautifully with help from Ben's dad. A couple of days later, after it had been fired, I got to take it home.

This thing is an ugly duckling that will never grow up, but guess what . . . I still have it. It's small enough that I've taken it everywhere I have moved. Its only value is that I made it and it is some kind of memento from my childhood. Looking back, I realize now that I was not the target of that day of making, though I still appreciate the gift it was. Ben eventually became a ceramic artist himself, following in his father's footsteps. There is something fundamental about making.

SHARE

*Sharing what you have made and what you know
about making with others is the method by*

*which a maker's feeling of wholeness
is achieved. You cannot make and not share.*

We make to share. Each of us is wired to show off what we have made. We get a lot of satisfaction out of the making, but the real payoff is in sharing. Some people are coy about showing their work off. Others are just terrified. One of the reasons we may have stopped making is that what we set out to make and what we ended up with may not match very well. Or others may have ridiculed us for our attempts. “I’m not good at making anything,” need never be said again. We were born to make. It may take some practice to get good at some kinds of making, but technology has begun to make creating easy enough that everyone can make.

My favorite question to ask at any makerspace is, “What are you making?”

People open up like flowers when asked that question and given any kind of positive encouragement. In this regard, we are all still five years old.

Interestingly, after six years of working in a creative space, I’ve been told, “I can’t tell you everything, but . . .” probably hundreds of times, maybe thousands of times, but I’ve never been told, “I can’t tell you.”

Why? We want others to see what we have done.

When I worked at Avery Dennison, we used to let the newest junior product managers help work on the back panels of our product’s packaging. They had to work off templates that had been approved and developed for the line, and they had to have all the appropriate approvals; nonetheless, the back panel was “theirs.” The young managers would jump into this with gusto, argue over font choices, the kerning of apostrophes, the shade of loam green. I repeat, they cared about the kerning of an apostrophe—the space between a letter and

an apostrophe. Look at the space they had to work with here: 's. Can you see it? On a high-resolution computer screen, this is about the distance of two or three pixels, and they removed one! Yet, they would protect their design turf like a pit bull protects its bowl of food, growling when someone tried to mess with their back panel.

Let me put this into context. To be a junior product manager at any Fortune 500 packaged goods company, you have to graduate from a respected MBA program at the top of your class. You have to work between your bachelor's degree and your MBA at another major company with consumer facing interactions. You are among some of the "best and brightest" our schools and companies produce. You will almost always make senior director, VP, SVP, or CEO if you choose, or you will go out and start your own company. If you are a junior product manager at this level, you are a very intelligent, type A, hard-charging, competitive professional.

That said, once the aforementioned products were launched into the channel and we all went to an Office Depot or Staples to see what the final product packaging and shelf positioning looked like in the stores, the junior product managers would rush like little kids to the stacks of "their" products. They would stand in front of them, momentarily admiring the way the products looked on the shelf and then pull a package off the shelf, turn it over, and examine their handiwork. A sense of satisfaction visibly rolled over them as they saw that the typesetters had taken their ideas into final production and the s was just a little closer to the apostrophe because it had been manually kerned. Invariably, these talented, impressive, type A young professionals would turn and say something like, "I did this."

"I did *this*."

“See the space between the apostrophe and that s? I did that.”

The glow on their faces was like a new mother’s when holding her child for the first time. Complete satisfaction. The need to show others one’s new, beautiful child is embedded in the human psyche.

What is going on here? First, while the contributions that these professionals were excited about might seem insignificant—after all, the difference, distance-wise, between the spacing of an apostrophe that has been automatically kerned and one that has been manually kerned is negligible—but the end product is something that can be bought, taken home, and shown to a significant other. Second, it is public. Hundreds of thousands of these packages are shipped all over the world. Third, it is often the first tangible and public representation of years, if not a decade, of work. It isn’t the size of the impact that is significant; it is that there was impact and it was made tangible, and tens of thousands of people would “see” their work. That really is powerfully satisfying, even if it is only the amount of nothing between an apostrophe and an s.

If you make something and don’t share it, was it made? If you make something, even something as small as a one-pixel space modification on the back of a package, and share it, you have made something, and it must be shared.

Another aspect of sharing is sharing knowledge and know-how. The best attribute of a well-run makerspace is the sharing of skills and knowledge. It starts with the formal instruction, but the best learning takes place while one person is building or designing and someone else with just a little (or sometimes a ton) more experience lends a helping hand and the project gets upgraded in the process. The sharing philosophy gives a makerspace its magic. People show off their creations knowing

criticism was left at the front door, and everyone feels comfortable asking for help, guidance, and input into projects as they go through the build process. Sharing makes a maker-space a community.

GIVE

There are few things more selfless and satisfying than giving away something you have made. The act of making puts a small piece of you into the object. Giving it to someone else is like giving that person a small piece of yourself. Such things are often the most cherished items we possess.

One of the most satisfying aspects of making is giving away what you have made. Wonderfully, most people still value gifts made by the giver more than gifts that were bought off the shelf. If you do nothing else this year, make one Christmas present to give away. And reflect on the level of satisfaction you get and the recipient receives in that act. It is immeasurable.

If your parents are still alive, they probably are still hanging onto craft projects you made for them when you were a child. Quilts are often handed down for generations. A well-made item, meeting a real need, made by and for a loved one, is among the greatest of gifts.

There is another type of giving, that of your creativity or intellectual property. Embrace Global is a wonderful non-profit that used TechShop for some of its development work. Naganand Murty was one of the design engineers who came to our space, under Embrace cofounder and CEO Jane Chen's direction, to address the problem of infant thermoregulation in developing countries. Babies who are born even a few weeks prematurely are unable to thermo-regulate, or maintain their

body temperatures on their own, and consequently must be incubated within one hour of birth or risk death or serious permanent disabilities. For the hundreds of thousands of these babies who are born around the world every year without quick access to incubators (because they are born in rural areas where the nearest hospital with incubator equipment may be several hours, if not days, away), the problem is especially critical.

The question that Naganand Murty and his team had (you'll meet cofounder Jane Chen in Chapter 3) was fairly simple: Would it be possible to design a simple, affordable "blanket" that could maintain a baby's body temperature at a constant level for an extended period of time? And that was not dependent upon a continuous supply of electricity? Well, it turned out the answer was yes. The Embrace portable infant warmer, which looks like a mini sleeping bag and costs a fraction of the price of other baby warming devices, uses some fancy chemistry and design to make it work.

But here is the most amazing thing. Portions of Embrace's core technology were donated to the organization through interactions with other members of the TechShop community. These community members gave their ideas away freely. And as a result, General Electric has signed on to help distribute the blanket, and Embrace is on track to save the lives of 100,000 babies in the next five years. Jane has been recognized by the World Economic Council as one of the top social entrepreneurs in the world.

LEARN

You must learn to make. You must always seek to learn more about your making. You may become a journeyman or master artisan, but you will still learn, want to learn,

*and push yourself to learn new techniques, materials,
and processes. Building a lifelong learning path
ensures a rich and rewarding making life and,
importantly, enables one to share.*

Making brings about a natural interest in learning. It brings out the natural four-year-old in all of us. “Why is the sky blue?” “Where does milk come from?” “How are babies made?” This natural inquisitiveness seems to be beaten out of most people in school or at home. I’ll let the educators in this community help figure out why “project”-based learning seems to fit some learning styles better than others, but it certainly feels more natural. I always found the order we did things in physics class backward. Instead of being taught the formula for determining the ratio of the required output force to the input force and then trekking to the lab to see how a lever works, it makes more sense to first observe the lever in action and then learn the formula for it. This is how the principle was figured out in the first place, through observation. You observe an effect, then build a theory to fit the observation. It may be faster to memorize facts than to experience them, but then I would argue you don’t really own that fact. “Hot” is a pretty abstract concept until you’ve burned yourself.

The world is such a fascinating place. How do you design and build a table? What kind of joints can be used to join the legs to the table? Which are the best ones for what I’m trying? What periods in history used different technics? What glues should I use, and when do I use a screw or a nail, or a brad, or a staple, or a rivet? What woods have which characteristics? What style do I want? What tools should I use? The options go on and on. They don’t have to; you can jump in and just do it. Or you can plan and plan and plan. The key takeaway, though,

is that you are going to learn something. And no one can take it from you.

Learning is fundamental to making. The more time you spend familiarizing yourself with and practicing in a field, the better you will get in it. Very quickly, you will be able to share what you have learned with someone else who is newer to it than you are. There is a different kind of satisfaction that comes from teaching, but it is very real. Watching people you have been teaching become facile and expert in what you have taught them is extremely satisfying.

Learning is fundamental; it is why we have books, libraries, schools, the food channel, the DIY channel, and shows like *How It's Made*. These days, the DIY magazine rack at a local newsstand often constitutes 15 to 20 percent of the total space.

From an educational perspective, we live in a sad time for making. When I was growing up, woodshop and metal shop were required courses for middle schoolers. Every middle school I was aware of had a woodshop instructor. I still have the things I made in middle school woodshop, and many of you do too. Today, it can be hard to find a shop in an entire school district. This makes no sense at all. In our “race to the top,” school systems tend to focus only on the students who are headed to college, ignoring the 50 percent of those who aren’t, depriving all students of skills that they could use the rest of their lives.

Just as badly, right as we are on the cusp of the largest explosion of new products and development of physical goods through breakthroughs in materials science, 3D printing, bioengineering, nanotechnology, design, and engineering, American institutions are failing to graduate enough engineers, scientists, and production workers. Economically, this is insane. It is time to reengineer our schools and reintroduce

shop class. Oh, and by the way, through cheap and powerful design computers and 3D printers, we can make these courses exciting, engaging, and transformative.

With access to the right kind of tools, you can experience your own industrial revolution in a matter of weeks. It's possible. It really happens.

Let me give you an example. A couple of years ago, some of our TechShop staff members encouraged me to meet one of our newer members. He was the first I'd met who was taking an extended "maker vacation." This member had saved up his money for a couple of years working odd jobs as a security guard and janitor, and once he had accrued enough money, he quit his job and took the first vacation he had taken in years.

This man was committed. He had the bug. He wanted to learn how to make things. He was good with the hand tools, but he had never taken welding, machine shop, woodworking, textiles, 3D printing, computer-aided design, or any number of other classes.

To stretch his funds, he didn't stay at a hotel or rent an apartment. Instead, he used couchsurfing.org to find free places to stay every night. A few times, he couldn't find a couch, so he just slept in his car. Couch surfing turned out to be a great tool for him to help us find new members. He was so focused and excited that he would go "home" at night and tell his new couch surfing host all about what he was doing at the shop. We picked up half a dozen or so new members that month. We actually kicked around the idea of turning him into a sales representative by having him couch surf through the Bay Area for a couple of months.

But even better, he became a maker that month. He took every class he could schedule and went from hand tools to power tools to computer-controlled advanced manufacturing

tools. He could weld, lay out carbon fiber, CNC mill, lathe a bowl, and spin a lighting fixture. He even picked up a little electronics in that 30 days. His desire to learn was so powerful that he quit his job, stayed at strangers' houses, and created other new makers in his enthusiasm. What is holding you back?

TOOL UP

You must have access to the right tools for the project at hand. Invest in and develop local access to the tools you need to do the making you want to do. The tools of making have never been cheaper, easier to use, or more powerful.

I had to use a phrasal verb as a heading to this section so it would be consistent with all the other one-word headings in the manifesto. I like manifestos heavy with verbs.

You and I are living through the most amazing age in all of human history. Whenever someone asks me which time period I would like to be living in, I always say “right now.” Tools are getting easier to use, they are more powerful, and they are cheaper to acquire than at any other time in history. Materials are becoming more accessible, more sophisticated, and more fun to work on and with.

Odds are, you cannot possibly afford all the tools you may want or need. So join a makerspace. What I have learned is that a community of makers does not fully emerge until a complete makerspace is provided. The advantage of a well-equipped makerspace is that it attracts people with a widely diverse selection of projects, creating a beehive of activity, passion, knowledge, and sharing. When a large and diverse set of tools is provided, a large and diverse group of makers comes out to live, work, and play. The following is a general list of

what a well-equipped makerspace needs in order to meet the needs of a community. There may be a few more or different tools on your list, but this is a good start:

- Laser cutters
- CNC milling machine(s)
- Manual milling machine(s) with digital readouts
- Manual lathe(s) with digital readouts
- 3D printer(s), consumer and commercial grade
- 3D scanner
- CNC (computer numerical control) waterjet cutter (4 × 8 foot)
- Vacuum forming system
- Heat strip bending system
- Injection molding system
- Commercial grade sewing machines
- Overlock sewing machine (also known as a serger)
- Quilting machine (preferably CNC)
- Computer-controlled vinyl cutter
- Powder coating system (and large oven)
- MIG (metal inert gas) welders
- TIG (tungsten inert gas) welders
- Handheld plasma cutter
- Sheet metal spot welder
- Sheet metal brake (16 gauge × 50 inch)
- Rotary sheet metal punch
- Sheet metal corner notcher
- English wheel and planishing hammer
- Sheet metal shear (6 gauge × 50 inch)
- Sheet metal roller (16 gauge × 50 inch)
- Sandblast cabinet

- Metal grinders and sanders
- Metal chop saw
- Metal horizontal band saw
- Metal vertical band saw
- Electronic testing and soldering equipment
- Large format color printer
- ShopBot CNC wood router saw (4 × 8 foot)
- Panel saw
- Wood planer
- Wood jointer
- Wood band saw
- Wood sanders
- Wood scroll saws
- Wood lathe
- Drill presses
- Granite surface plate with digital height gauges
- Compressed air throughout shop
- Compressed air hand tools
- 30 or more design computers
- 30 or more copies of or licenses for Autodesk Inventor, Maya, 3D Max, 123D Make, AutoCAD software
- 30 or more copies of or licenses for Adobe Illustrator, Photoshop, Acrobat
- 30 or more copies of or licenses for National Instruments LabVIEW Professional development system
- 8 or more National Instruments multifunction data acquisition devices
- Member storage
- Private studios for rent
- Meeting rooms and/or classrooms
- 12 large work tables

- Wi-Fi
- Retail store
- Free coffee and popcorn

And, of course, the local makerspace must then have staff to teach classes and manage this great space.

I'm not going to apologize for the size, breadth, or depth of this list. This is, in fact, what is required to foment a maker revolution. Without the tools and community it is impossible to maintain a movement. Revolutions are fought and won with arms. These tools are our "arms." Without access to them, nothing has changed. They may be easy, cheap, and powerful, but they are useless if *you* can't use them.

PLAY

Be playful with what you are making, and you will be surprised, excited, and proud of what you discover.

The most productive environments I have operated in are often the ones where there is a lot of laughter. We joke about the craziest things. We are playful with the ideas, stretch them to extremes, and morph them ridiculously. Even in the military with the Special Forces unit I was a part of, we were constantly exploring ideas, trying new ways of working, and even goofing around.

One day we learned that the quickest way to cut down a tree was with a detonation cord (det-cord) and plastic explosive. The number of wraps and the amount of plastic varied depending on the size of the tree we were trying to "cut down." The det-cord cut the tree, and the plastic would kick it out in the direction we needed it to fall. If just the det-cord was used, the tree might randomly fall on a nearby object by

accident. This became a feature once we figured out how to control the direction of the fall. By using the plastic as well, we could drop the tree on something on purpose. That was a great day, or, it was until we started a small fire. Live and learn. No, actually, play and learn.

We have artists and engineers (among many other categories of users) in our space. What is interesting is that the engineers typically come to a machine with a set of things they are trying to accomplish. The artists, often enough, come to a machine to experiment and see what it can do. (They also tend to break the machines a little more often, and not because they don't know how to operate them; they are just pushing the equipment to do something beyond its normal operating environment.) When the two are combined, watch out. Have you ever heard a CNC milling machine play a tune?

Blocks, LEGO, and Erector sets are what I grew up with. Kids now have LEGO Mindstorms, radio-controlled robots, and Arduino microcontrollers. Soon, the home 3D printer will be the PC accessory of choice. Playing with these toys is a lot of fun and will help to raise up another generation of makers.

Recently, I received a note that one of my sons had updated his Facebook page with a video titled "Hovercraft." I was on the road and had no idea what this referred to, so I clicked through to YouTube and watched him floating around our garage on a homemade hovercraft. He had found instructions on the Internet, gone to the hardware store and bought the pieces he needed, and in an afternoon he had built a poor man's hovercraft using an electric leaf blower as the drive. He now has a hovercraft, and I've got a leaf blower. He was playing around, but he learned how to use a couple of saws he had never used before. I built a trebuchet with my other son and had a blast getting the cats to chase flying paper balls around the house.

Building is a form of play. There are times I have a hard time distinguishing the difference between work and play. I hope you will have the same experience in your work life.

PARTICIPATE

Join the Maker Movement and reach out to those around you who are discovering the joy of making. Hold seminars, parties, events, maker days, fairs, expos, classes, or dinners with and for the other makers in your community.

We are not islands. Though there is a time to work in solitude, to focus, to push oneself without distractions, there is also a time, and I daresay most of the time, where it would be better to be working together, or at least sharing a creative space. The warmth of another human in the room or workspace is preferable to working in solitude. Many artists, engineers, and inventors work alone in their labs and studios, but just as many or more collaborate. Even if they don't collaborate directly, they will seek out the comfort of a peer group to hang out with. Writers form writing clubs, others form co-ops to share tools or workspace. Many go into business with friends or collaborators, not just because they need to, but because they want to. We are social creatures. It is great to be able to build up your shop in the garage or barn, but it is sad to work in it alone day in and day out. It is more fun to work together.

Participation takes many forms: working directly together; attending events; and participating in societies, clubs, and parties with others who care about the work we do and share. One such event, designed specifically for makers by the editors of *Make* magazine, is the Maker Faire. Held in various locations around the world, Maker Faires are annual events where thousands of makers come and hang out together to look at,

participate in, and experience a wide range of fun projects that makers are working on in the area. The primary Faire is held in Northern California and attracts over 100,000 attendees over the course of a weekend. Smaller, local versions, called Mini Maker Faires, draw up to a thousand people to see a hundred or so projects, booths, and exhibitions.

The sense of wonder and amazement on the faces of the kids (both young and old) at these events makes all the effort and expense that go into the Faires well worth it. Watching the performance group, ArcAttack, rock onstage inside a Faraday suit while making a 500,000-volt Tesla coil “sing” along with 15-foot-long bolts of electricity striking the suit is unforgettable. Nor will one easily forget the 40-foot-long, fire-breathing, heavy metal–playing metal dragon. Or Colossus, the 70-foot-tall, 25-ton flying boulder merry-go-round where little kids can pull on a rope attached to flying multi-ton boulders hanging over their heads. These engineering entertainment devices thrill and amaze thousands every year. Engaging young people and getting them excited about science, engineering, technology, and math is a key driver of the Maker Movement.

SUPPORT

This is a movement, and it requires support. Emotional, intellectual, financial, political, and institutional support are needed. The best hope for improving the world is us, and we are responsible for making a better future.

Governments have spent billions, if not trillions, of dollars building institutions of learning, research, development, and experimentation. Almost none of them open their labs up to the public. Actually, I’m hedging here, I haven’t found any yet

that do, but I'm sure there must be one somewhere. We have spent hundreds of billions of dollars on building research institutions across the United States and the world—and within them very little self-directed, self-interested research is taking place. All of that research requires approvals and funding from third parties, a general manager's approval, a budgeting committee's approval, progression through a stage-gated new product process, and the receipt of a grant from a foundation or government.

Instances of access to the tools of research and development outside of institutional direction are exceedingly rare. Why? It is a fact that the tools of the industrial revolution have been exceedingly expensive, hard to use, and of limited power—until now. They are now cheap, easy to use, and powerful, yet we have not made any changes to how we organize access to these tools. This must change. Those countries that change the fastest in this regard will have a serious competitive advantage.

What can you do? Support policy changes at your institution that open up the labs to others in the institution and to those in the local community who don't have access. Help allocate new funding to set up open access fabrication studios. Pressure universities, government research labs, and large manufacturing companies moving into your community to set up open access fabrication studios.

We live in a world now where computers are everywhere. We carry them in our pockets and call them phones. Similarly, the software tools to design and produce things will be coming to your preferred screen; yet without access to a Kinko's for making things (a fabrication studio), you are no better off than before.

Please do what you can to support your local maker community. We have seen a number of technologies come out of makerspaces that have already changed the world. These

innovations were created cheaply, quickly, and easily by small teams and, in most instances, by people from outside the domain they were disrupting.

CHANGE

Embrace the change that will naturally occur as you go through your maker journey. Since making is fundamental to what it means to be human, you will become a more complete version of you as you make.

Whenever one joins a movement, one changes. This is a good change. Embrace it. Participating in the Maker Movement is a personal journey. Each will look different. No two makers are exactly the same. No two paths will be the same. But you will change. You will begin to see the world through the eyes of someone who participates in creating. You will look with wonder again at great artisanship. You will wonder how someone was able to design this or that, and you will begin to appreciate local artists, designers, architects, and artisanship in your community. You will wonder where something was produced and who made it—you will look for the story behind the artisanship. You will ask about local talent and local sources for things you never dreamed you cared about before.

Joining the Maker Movement and participating in it locally will open up your life to the highest concentration of creative people in your community. You will meet poets, laser etching their words on oak panels, you will meet a financial planner building sets for her children's play. You will see someone start a hobby that leads to an avocation and then a business employing a dozen locals. You will enjoy the excitement and joy of giving those you love a piece of yourself through gifting to them something you made just for them. Join me, join us, join the movement—it will help you become you.

About the Author

Mark Hatch, CEO and cofounder of TechShop, is a former Green Beret and has held executive positions focused on innovation, disruptive technology, and entrepreneurship at large and small firms alike. At Avery Dennison he launched Avery.com and then helped to drive global technology business development; at Kinko's, he launched the eCommerce portion of Kinkos.com and ran the computer services section inside Kinko's stores across the United States; and as the COO of Health Net's health benefits ASP, Mark helped to launch one of the early integrated health benefits portals.

A recognized leader in the global maker movement and a sought-after speaker and consultant on innovation, advanced manufacturing and leadership, Mark has spoken to groups from GE, Ford, P&G, ExxonMobile, Kraft, and other Fortune 500 firms. He has presented at universities like UC Berkeley and Harvard, as well as events such as TEDx, The Clinton Global Initiative, the Council on Foreign Relations, and Singularity U.

Mark has appeared on *ABC, CBS, NBC, PBS, Bloomberg, CNN, and Fox*, among others. He has been quoted in publications, including *Bloomberg Business, FastCompany, Inc, Forbes, The New York Times, The Wall Street Journal, The LA Times,*

The San Francisco Chronicle, and he has published a number of articles, including an opinion piece for the *Washington Post*.

Recently, *The San Francisco Business Times* presented Mark with a “Bay Area’s Most Admired CEO Award.” *Fast Company* has recognized him in its “Who’s Next” column, and TechShop received the EXPY Award, given to the “experience stager of the year.”

TechShop, a do-it-yourself workshop and fabrication studio with six locations open and hundreds more planned over the next decade, is the largest public access tools and computer enabled manufacturing platform in the world. Through TechShop, Mark is focused on radically democratizing access to the tools of innovation by providing the lowest cost access to tools the world has ever seen. With partners like Autodesk, Ford, GE, and Lowe’s, along with governmental agencies like DARPA (for advanced manufacturing) and the Veterans Administration (for veteran training), TechShop is poised to help reshape how the world does innovation and manufacturing and has already begun to have a significant impact on the economic development opportunities in the communities where it is built.

Mark holds an M.B.A. from the Drucker Center at the Claremont Graduate University and a B.A. in Economics from the University of California at Irvine.

Copyright © 2014 by Mark Hatch. All rights reserved. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

ISBN: 978-0-07-182113-1

MHID: 0-07-182113-9

The material in this eBook also appears in the print version of this title: ISBN: 978-0-07-182112-4, MHID: 0-07-182112-0.

E-book conversion by codeMantra
Version 1.0

All trademarks are trademarks of their respective owners. Rather than put a trademark symbol after every occurrence of a trademarked name, we use names in an editorial fashion only, and to the benefit of the trademark owner, with no intention of infringement of the trademark. Where such designations appear in this book, they have been printed with initial caps.

McGraw-Hill Education eBooks are available at special quantity discounts to use as premiums and sales promotions or for use in corporate training programs. To contact a representative, please visit the Contact Us page at www.mhprofessional.com.

TERMS OF USE

This is a copyrighted work and McGraw-Hill Education and its licensors reserve all rights in and to the work. Use of this work is subject to these terms. Except as permitted under the Copyright Act of 1976 and the right to store and retrieve one copy of the work, you may not decompile, disassemble, reverse engineer, reproduce, modify, create derivative works based upon, transmit, distribute, disseminate, sell, publish or sublicense the work or any part of it without McGraw-Hill Education's prior consent. You may use the work for your own noncommercial and personal use; any other use of the work is strictly prohibited. Your right to use the work may be terminated if you fail to comply with these terms.

THE WORK IS PROVIDED "AS IS." MCGRAW-HILL EDUCATION AND ITS LICENSORS MAKE NO GUARANTEES OR WARRANTIES AS TO THE ACCURACY, ADEQUACY OR COMPLETENESS OF OR RESULTS TO BE OBTAINED FROM USING THE WORK, INCLUDING ANY INFORMATION THAT CAN BE ACCESSED THROUGH THE WORK VIA HYPERLINK OR OTHERWISE, AND EXPRESSLY DISCLAIM ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. McGraw-Hill Education and its licensors do not warrant or guarantee that the functions contained in the work will meet your requirements or that its operation will be uninterrupted or error free. Neither McGraw-Hill Education nor its licensors shall be liable to you or anyone else for any inaccuracy, error or omission, regardless of cause, in the work or for any damages resulting therefrom. McGraw-Hill Education has no responsibility for the content of any information accessed through the work. Under no circumstances shall McGraw-Hill Education and/or its licensors be liable for any indirect, incidental, special, punitive, consequential or similar damages that result from the use of or inability to use the work, even if any of them has been advised of the possibility of such damages. This limitation of liability shall apply to any claim or cause whatsoever whether such claim or cause arises in contract, tort or otherwise.