a FUTURE in 3-D

The growing popularity of 3-D printing as a prototyping and manufacturing tool proves this new technology has the power to change the landscape of the toy industry forever.

by Ali Mierzejewski

Like something straight out of *The Jetsons* or *Star Trek*, the popularity and advances of 3-D printing are causing a huge shift in the future of consumer product design and manufacturing. This new wave of creation and production opens new opportunities and business models for consumers and manufacturers across all industries worldwide. The toy industry is no exception.

While some members of the industry have used 3-D printing as a prototyping and research and development tool for decades, recent advancements in both the technology of the printers themselves and the methods in which they manufacture toys could change the landscape of the industry permanently.

Three-dimensional printing is such a rapidly evolving and growing concept that it's time to familiarize ourselves with it, and be prepared for its eventual role as a commonplace form of manufacturing products in our society. Customization is a huge trend in the toy industry—kids love to make things their own. The weaving of 3-D printable files into toy lines only makes the possibilities of customization seem unlimited. This new technology also levels the playing field for inventors themselves, making prototyping easier, more accessible, and less expensive. By looking at how the industry is increasing its use of 3-D printing, companies can prepare themselves for the future—and perhaps stay ahead of this rapidly evolving trend.

The Printer, Itself, Is Not New

No matter how futuristic it seems, 3-D printing is by no means a new type of technology. Companies such as Makerbot have been producing 3-D printers for nearly 25 years. What's new about them is that now they're small enough to fit on top of your desk, making it accessible to anyone's business or even his or her home.

Makerbot makes three models of 3-D printers: an industrial size, a professional desktop size, and a consumer mini size to bring the technology and opportunity of 3-D printing to all levels of innovation and usage. At $6,499, the price of Makerbot's newest industrial-sized printer, launching this spring, is a fraction of the cost of other printers like it, allowing Makerbot to provide affordable and accessible hardware to companies of all sizes. Makerbot's printers use Makerbot PLA, a bioplastic derived from corn, in order to print products.

"We're starting to see manufacturing being done in [the toy] industry as well, but most of the time 3-D printing is used on that side for prototyping," says Jenifer Howard, director of public relations for Makerbot. "You can do prototypes and iterations really quickly and really affordably by having a Makerbot Replicator 3-D printer on your desk."

The use of 3-D printing in the prototyping process is not a new idea, either. James Knight, vice president of global construction at Spin Master, says that the company has been prototyping with a 3-D printer for decades—and that this process is very commonplace in the toy industry.

"It's as common as a pencil and a computer screen as a

Makerbot's Replicator 2 is a 3-D printer that can fit on a desktop.

Aryaball
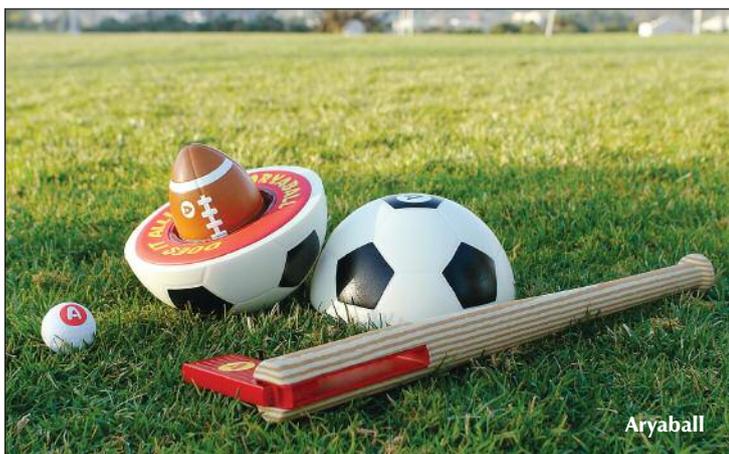
development process and that's true in nearly any industrialized design manufacturing company, be it for toys or otherwise," he says.

EZ-Robot, a robotics company that uses 3-D printing for its prototyping process, releases its design files for consumers to be able to print as well. DJ Sures, EZ-Robot's CEO, isn't worried that releasing these files to the public will cause a problem for the company's business model. Due to the quality in which 3-D printers are currently able to print, the process is better suited for prototyping than for actual production.

"We do release our 3-D printed design files for people that have 3-D printers to be able to print their own, but the quality isn't there yet," says Sures. "The creative side is there, meaning you can design something from scratch and hold it in your hand. And that's a super, super powerful statement to be able to make; years ago, it was a big deal to be able to type something on a computer and push print."

Even though having the ability to imagine a product in your mind and then hold it in your hand a few hours later seems like a futuristic fever dream, it is now a very real part of prototyping and design. Three-dimensional printed objects fit perfectly into EZ-Robot's pre-production phases, providing a sort of physical history of the product's iterations.

Sures draws the changes he wants to see on each robotic prototype directly onto the prototype itself. He can physically draw what he would like the designer to change and the designer also has a new model right in front of him to make corrections. They continue this process five, 10, sometimes even up to 20 times or more.

"What's amazing about all this is you can go back in time and pick up a revision off a shelf or out of a box and look to see how it got to where it is today. You have this physical history, this physical log of changes," explains Sures.

What It Means for Inventors

With 3-D printers, such as Makerbot's Replicator desktop printer and Replicator Mini printer—the company's 3-D printer made for consumer use—3-D printing also broadens the landscape of who can actually conceptualize, design, and prototype toys. It allows anyone with the means to own a 3-D printer to design a toy without having to pitch his or her idea to a bigger toy company.

The Aryaball, created by dad-turned-toy-inventor Babak Forutanpour, is an all-in-one ball for the park—a baseball that fits inside a football that fits inside a soccer ball. The inspiration came from playing in the park with his son and not being able to change games without lugging around all kinds of equipment.

For the small companies, such as Aryaball, 3-D printing is a vital part of survival in the industry. "The 3-D printer was crucial for me being able to actually do prototype after prototype after prototype and get it to a point when I could get it to parks and show it to people and kick it, throw it, touch it, and feel it," says Forutanpour. "Had I had that inspiration [for Aryaball] years ago without 3-D printers, I would've just said, 'Oh, someone needs to make this,'" says Forutanpour. "But knowing that 3-D printers today exist—and they're affordable and they're fast, and they're reliable—that someone could be me."

The ability to bring 3-D printing hardware into a home setting allows inventors, such as Forutanpour, not only to work independently, but also to prototype—or even manufacture—rapidly. If an inventor invests in 3-D printing, the prototyping process becomes much easier and faster. This allows them to make their products a reality and put them directly in front of consumers more quickly than in the past.

"[Progressing] from idea to 3-D printer prototyping to a professional prototype to the NBC *Today Show* as one of the hot new toys for 2014 was all done from January of one year to February of the next, and it's been amazing," says Forutanpour.

As the hardware becomes more affordable, the technology to 3-D print becomes more accessible to more people. As this happens, new creative minds, inventors, creators, and thinkers will step up to the plate and be able to create new toys and adapt old ones in unique and individual ways. They too now have the option to compete for space on the shelves.

"It's a great time to be an entrepreneur because with 3-D printers and Kickstarter, you can go from conception to prototype to getting preorders and you can launch your

business," says Forutanpour. "When new people come to the space, that's when really interesting inventions happen. As the price keeps dropping, you're just going to get a lot of people buying it, tinkering with it, playing with it—and you're going to find some really interesting new uses."

Shaking Up the Current Model

So what does this mean for the current business model of the toy industry if bigger companies not only have to focus on large competitors who have the same manufacturing equipment, but also on smaller toy start-ups? First things first, they have to figure out exactly how to use this technology.

"For every big company in the toy industry [the question is:] What is your brand; what is the right type of technology, the right type of distribution model?" says Spin Master's Knight. "Most importantly, what do consumers want that 3-D printing can give them that traditional manufacturing can't?"

Spin Master uses 3-D printing mostly in its prototyping phase of development, but it has also begun making 3-D printable files available for replacement parts and customizable helicages for its Air Hogs R/C line. Knight says that one of the benefits of 3-D printing in the toy industry now is the ability to do on-demand manufacturing, an option that would be otherwise limited for toy companies.

"For customers, when a part breaks, it's hard enough to just try to explain to somebody in the toy company what broke," he says. "In this case, you go online, click on the product, find the part that broke, click on that, and then you print it."

Spin Master also considers that there is a place for software development in this industry—sort of like an iTunes model—and that what software you develop for consumers and the accessibility of that software is an important focus.

"With 3-D printing, it's relatively quick and cost-effective for the toy company to design files for the product to be printed, without having to invest in all the tooling and industry management to make the toy available to the consumer," says Knight.

Another opportunity this provides for toy companies is a whole world of product designers working with their already established product lines to improve upon them. For example, EZ-Robot has programs within schools for kids to design different toy parts, thereby creating an entirely new generation of designers.

According to Sures, this leads to kids—or other designers

in general—directly contributing to a company's SKU count. "There's no reason why you couldn't approach that particular school or that group and say, 'We like your product. We would actually like to manufacture it and license it from you or give you some royalties off each sale.' You've crowd-sourced the world of people creating concepts for you," he says.

Companies, such as EZ-Robot, understand that although the quality of 3-D printed products is not up to mass-manufacturing standards, the 3-D printer manufacturers, such as Makerbot, will continue to develop the technology to get to a place where 3-D printed projects match the quality of those that are mass-manufactured. EZ-Robot, for one, is making sure that it is an integral part of that journey.

"What we're trying to do, strategically, is work with these 3-D printing companies to allow them to design their parts around our parts," says Sures. "Our parts are being used in the design phase for these 3-D printing companies. Not only are we helping them, we're also becoming somewhat important to their business. They want to sell more parts, we want to sell more parts, so let's work together. We call it 'giving 3-D printers life.'"

Shifting the Shelves

With the rise of such a powerful technology also comes a shift in the way traditional retailers adapt to it. Already, kiosk-type locations are popping up at schools, libraries, and UPS stores, as well as Makerbot Innovation Centers, so that anyone who has a 3-D printable file can walk in and get their product printed, as easily as if he or she were trying to make a

A modified version of EZ-Robot's Roli 3-D printed protoype
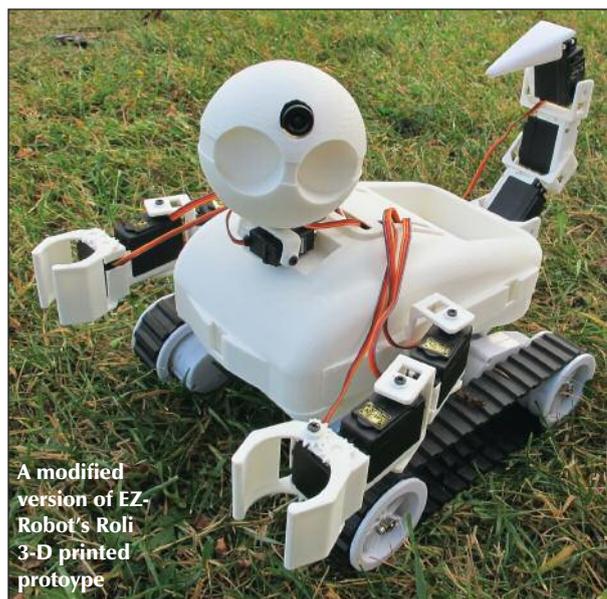
photocopy at Staples. Spin Master's Knight believes that all toy retailers, even the big ones, such as Toys "R" Us, will eventually have to cater to this concept, since a lot of things will be available as 3-D printable files.

"Theoretically, our toy shops could become more like a Kinkos, where it's a local manufacturer and it's a shop in the traditional sense," says Knight. "I think you're going to see it be a blend of both."

The rise of 3-D printing has also birthed a new way of shopping online. Websites such as Shapeways, an online marketplace where designers can post 3-D printed designs and sell the products to other people, allow a whole new slew of designers to become entrepreneurs.

"The great thing is, if you sell [a product], you don't have to do anything because Shapeways does everything from the financial transaction to the manufacturing, distribution, and customer service, and all you do is design," says Duann Scott, Shapeways Designer Evangelist. This marketplace, which has a sort of Amazon-like structure to it, provides support for other small businesses to open up in this new realm of 3-D printed merchandise.

"We become the sort of spine of the ecosystem," he says. "They do the design, they create the IP, they do all the marketing—and we do all the heavy lifting. It's a place for us to enable many entrepreneurs to run their own business with no risk on their part—no investment upfront."

Scott says that the most exciting part about a community like Shapeways is seeing the creativity that comes from the designers. The designers are not only coming up with original products, but also augmenting existing ideas and products—think new accessories for popular action figure lines, etc. This allows for new parts to be created, but also for broken existing toys to be repaired.

Customers Love Customization

Kids love to be able to put a unique twist on toys and really make them their own. A 3-D printer's ability to print quickly, and in small numbers, allows for even more customization, so even consumers without their own 3-D printer can design their own products and then purchase their

A 3-D printed monster creation, from Monstermatic

own individual creations.

Monstermatic is a highly interactive monster-creation platform that fully integrates 3-D printing inside a mobile game. This character-creation platform allows users to swap the parts of 10 monsters in order to customize their own creature. The interface allows users to interact with the monster directly in the app, and then simply hit a button to order a 3-D printed figure of their customized monster to bring him to life in the physical world.

Clayton Mitchell, founder of Mico Studio, the company behind Monstermatic, knows that gamers tend to spend hours and a lot of thought and energy building a digital avatar in the digital space. He says that until now, the hero could never leave the digital realm in which it was created.

"This whole 3-D printing thing is really about accessibility and customization," he says. "Being able to send something straight from your smartphone to the actual 3-D printing is pretty amazing.

"[Customization] offers an incredible freedom to the users to be able to actually change their color, add whatever they want on the character, and I think it really deepens the connection with the user and his avatar, whatever it is, if it's in the digital or physical world," says Mitchell.

Spin Master's Knight agrees, pointing out that "mass customization," as opposed to mass production, is something that bigger toy companies should really focus on.

"All these choices before, the toy companies have always had to filter them down to the ones that they think will be the most popular or they have tested to be the most popular. That kind of mass customization, whether you print them at home or you go into a store, is one of the very exciting things for toy companies right now to look into," he says.

Overall, the overwhelming consensus is that 3-D printing is not a fleeting fad that will quickly fade, but a wave of the future that is here to stay. It will only continue to get stronger—a Moore's Law of sorts—as the years go by. Although the new technology or processes may seem intimidating, 3-D printing can provide powerful innovation to all aspects of toy designing, manufacturing, and retail, perhaps changing the way we think about the toy industry as a whole, forever. ∎