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COVER STORY

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MEGA BRANDS' DIGITAL BUILDING BLOCKS

Using 3-D CAD and digital sculpting technology, Mega Bloks' designers can quickly model and test toy designs, facilitating an "around-the-clock" development cycle.

A Dragon's Universe figure prototype modeled in FreeForm. Dragon's Universe is a popular Mega Bloks brand.



HOLIDAY SEASON IS A MAKE IT OR break it time for most retail goods manufacturers, particularly for toy makers who log the bulk of their sales in the critical fourth quarter. Preparation for the big selling season is a year-round event. Manufacturers shop toy designs to retail partners like Wal-Mart and Target early in the year to secure shelf space and then it's an all-out scramble to engineer and produce products only to circle back and begin work on fresh designs in advance of subsequent seasons.

"You can't afford to miss out on the holiday season — if you are not there, your toy is dead," says Christian Lemire, design manager for boys products at Mega Bloks, a division of Mega Brands, which markets a broad line of interlocking, plastic construction toys featuring popular TV characters like Dora the Explorer and Thomas the Tank Engine. "If you're late, the penalty is they won't take your product next season, and you're not only competing with other toy manufacturers for shelf space, but with other products as well."

Accelerated demand for new toy models and this mounting competition over shelf space has changed the game around toy design. No longer do toy makers like Mega Bloks have the luxury of taking 20, sometimes even 30 weeks to bring a product from the early concept stage through production. In order to meet aggressive delivery schedules and have a continuous stream of new models in the pipeline, companies like Mega Bloks are transforming their product development processes from a reliance on 2-D drawings and sculpting physical prototypes to new digital sculpting methods and 3-D CAD tools. The changes are meant to facilitate time-to-market and support what has morphed into an "around-the-clock" development cycle. "When we started (in the 1980s), you had to have 10 SKUs (stock keeping units) a year; now in the one category of boys toys, there are over 300 SKUs every year," Lemire explains. "Kids

Mega Bloks taps SolidWorks to model geometric structures like toy boats and vehicles.

want to have something new every three months, and there is no option for being late."

'Digital Play Dough'

While the toy industry certainly isn't the only segment facing time-to-market pressures, it does confront some unique challenges since the organic shapes and intricate detail required in toy design don't always translate readily to parametric 3-D CAD tools. Automotive manufacturers and companies building large discrete pieces of machinery long ago began a transition to digital prototyping as a way to catch design errors early on in the process before any physical prototypes were built, thus reducing costs and vastly accelerating time-to-market.

"A lot of toy companies are still sculpting in wax and clay," says Joan Lockhart, vice president of marketing for SensAble Technologies, which markets haptics devices and 3-D touch-enabled modeling systems. "Traditional CAD products are defined by tangents, angles and curves ... and it was too hard to apply them to toy design. Our kind of CAD makes it possible for them to transition to a digital workflow."

The kind of CAD she's talking about is FreeForm, which acts like "digital play dough," allowing designers and sculptors to pull, carve and shape

on-screen elements to create organic shapes that mimic what can be done in real clay or wax. Companies like Mega Bloks have integrated FreeForm into their design processes, creating 3-D organic models that can be stylized and textured for prototyping, used to evaluate the manufacturability of products and to replace manual mold processes. Being able to model what previously couldn't be modeled easily in a traditional CAD package gives companies like Mega Bloks all the benefits that digital prototyping brings to bear: From near 50 percent reductions in the development cycle to reducing the number of errors as designs are handed off between engineering and manufacturing as well as to mold makers, many of which are located overseas.

Transition to Digital Prototyping

Mega Bloks eased its way into the digital world, first through use of 2-D drafting tools with AutoCAD then adding SolidWorks to give engineers the ability to create and model toy prototypes in 3D. While the 2-D and 3-D tools helped automate the design of all the geometric



Traditional CAD tools don't lend themselves to the detailed texture and design work required by some of the more organic shapes like those employed in the Halo collection.

forms — things like blocks, rockets, vehicles and other elements with rigid shapes — the tools were not cut out for doing all of the detailed texture and design work required by more of the organic shapes and intricate add-on parts. For that aspect of development, Mega Bloks relied on a team of sculptors who would work in wood resin to physically carve out figurine designs based on drawings. The physical prototypes, which take a few weeks to create for each unit, would then have to pass muster with the design and engineering team before they were cleared to be molded, and any design changes would send the sculptor back to the drawing board to physically create a new version.

Given that design changes are a common occurrence, this protracted manual process was no longer efficient. Sculptors frequently had to start fresh with clay designs, pulled in a different direction for myriad reasons, among them, the need to deliver greater detail, mandates for changes from licensees, in addition to consistency issues related to trying to ensure that the figurines shared a common look and feel. Sometimes, the price point on a product dictated that it be sent back to development to be redesigned to be smaller or to use less materials. “There are a bunch of ways we have to redo the job and when everything was going well, the process could take up to 20 weeks for a simple project and 30 weeks for something more complicated” says Catherine Giroux, senior sculptor/designer at Mega. “We just couldn't live with that anymore.”

While SolidWorks CAD helped automate the design process for 80 percent of the parts, creating the organic shapes the manual way was still laborious and time consuming. Mega Bloks then found FreeForm, software that worked the way sculptors were used to working, finally giving them a tool so they could participate in the digital design process, Lemire says. “We are a block company so all our parts have to fit into a grid of a block and fitting system,” he explains. “We can now

start the design in 3-D (CAD) then use FreeForm to produce something organic within the rigid construction system. That makes it possible to give kids a nice construction system that has the intricate details they're used to having in action figures.”

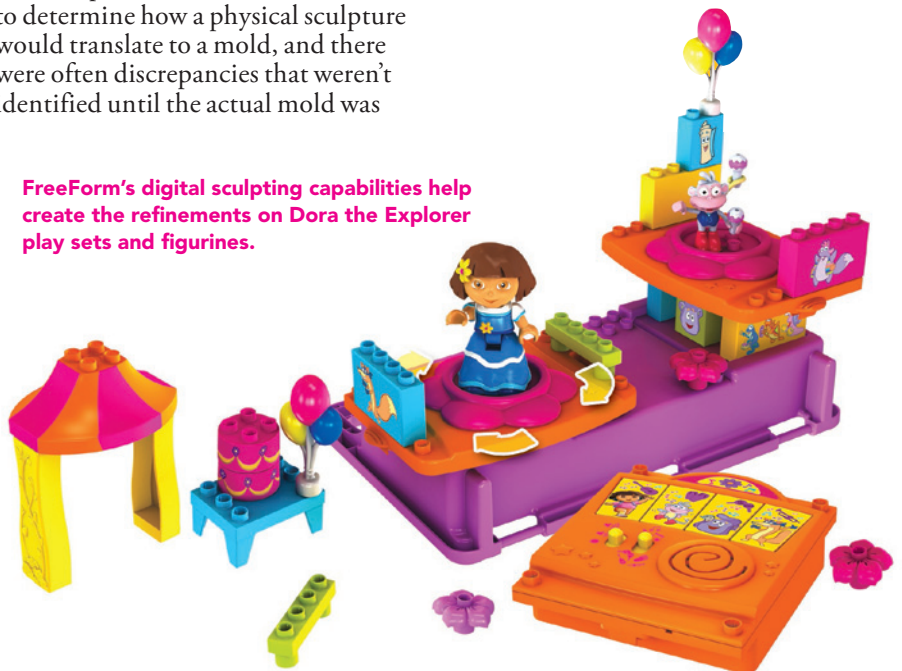
Today, sculptors take a 3-D SolidWorks model of a boat, for example, and import it into FreeForm. Using FreeForm's array of sculpting features, designers can add wood texture or create accessory parts like ropes, anchors and sails. Once they're satisfied with the design, they send it off to engineering for validation and once approved, the same STL FreeForm file can be shipped off to mold makers for the next stage of the process. This streamlined workflow addresses many of the bottlenecks of the old process. For one thing, the trial-and-error process of evolving physical wax or clay prototypes took much longer in the workshop. For another, it was difficult to determine how a physical sculpture would translate to a mold, and there were often discrepancies that weren't identified until the actual mold was

cast, Giroux says.

“Most of the time, we now use 3-D files to directly create the mold, and there are fewer surprises,” she explains. “When we finish our work, the engineers can see onscreen any molding issues; before it was more guesswork and not as precise.”

In addition to minimizing miscommunication and design miscues during the molding process, FreeForm has also sped up the design of organic shapes while fostering reuse. Over time, Mega Bloks has built up a library of FreeForm shapes and parts, essentially creating a vault of nearly 1,000 clay files representing all variations of feet, hats, heads and other common accessories. Sculptors like Giroux are thus able to mix and match elements in their new designs, vastly reducing the development time since they don't always have to start from scratch. “We've become much more efficient as we've learned the product and gained experience,” Giroux explains.

FreeForm's digital sculpting capabilities help create the refinements on Dora the Explorer play sets and figurines.

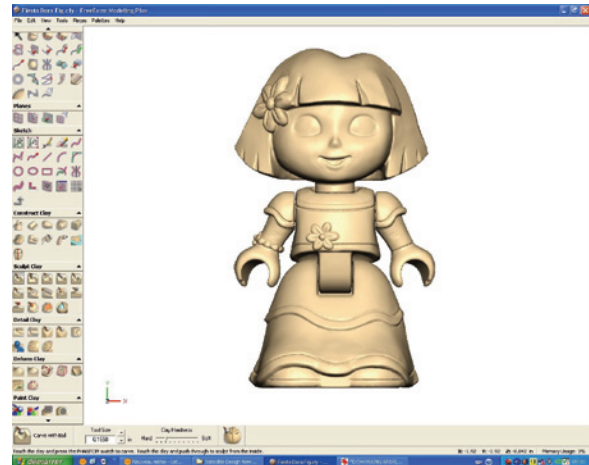


“With our expertise, we can now work with rough sketches and it’s faster while allowing the designer to work on something else.” Today, Mega Bloks doesn’t take longer than 15 weeks to produce any one product and concept-to-delivery times are even less for many of its offerings, she says.

Changing Workflows

While the combination of 3-D CAD and FreeForm has significantly transformed and streamlined Mega Bloks’ design workflows, it did require more than simply learning a new design tool. In order to take advantage of the benefits of creating molds directly from a FreeForm STL file, Mega Bloks had to work with its overseas partners to ensure they not only had the digital sculpting software, but they know how to work with files. Another critical factor was to examine the entire design process and make workflow changes in addition to incorporating the new tools.

“Sometimes when you use a new tool, you try to copy the old way you work and that is not the best way of doing things,” Lemire says. For example, in the old manual process, sculptors might take a month or longer to create a physical model of a figurine or organic shape, which gave designers a window in which they could view their work and make comments as it evolved. Not so with the use of FreeForm and digital sculpting. Now sculptors work so quickly, designers have to make a conscious effort to wade in early in the design process to comment on any problems or necessary changes in order to reap the real efficiencies of the digital tool, he says. “When a sculptor takes a month, you have a lot of time to talk to them about stuff like making eyes bigger or stretching a neck,” Lemire explains. “In FreeForm, much of this can be done in an hour so you really have to work differently to use the time more efficiently.”



FreeForm allows Mega designers to digitally sculpt figurines, bringing far more accuracy and consistency to the process.

Given that sculptors can work so much more quickly, Mega Bloks saw an opportunity to explore more variations of designs. Before, sculptors took their time to incorporate everything into one, maybe two well-thought out variations on a design. With FreeForm, sculptors are now encouraged to explore multiple variations and put more working prototypes in front of children for evaluation since it’s not as onerous to start from scratch if a design is panned.

This ability for experimentation helps Mega Bloks achieve its ultimate goal: Producing toys that are on every kid’s holiday wish list. “It’s not enough to be there on time,” Lemire says. “We want to make sure we’re putting the right stuff out there for the right kids at the right moment.”

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