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# Why 3D printing is disrupting manufacturing by turning traditional process on its head

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"3D printing is really a category within what I call additive manufacturing, or layer manufacturing," says Hayden Osborn, a tool engineer at Boeing. "You're adding material layer by layer, rather than whittling material down." This, he explains, requires people to think about 3D printing in a totally different way: a disruptive and wholly new kind of manufacturing. Osborn sat down with us to explain the nuances of the various additive-manufacturing processes and offer his take on the future of the technology.

For Osborn, the struggle is not so much with the technology as with getting people to look at challenges from a completely different angle. "It takes a different way of thinking about things. You're making something from scratch, so there are no preconceived boundaries," he explains. "There's this misconception that you just press print and it goes."

### Rethinking manufacturing from the ground up

The capabilities of additive manufacturing, of which 3D printing is part, completely turn the design process on its head from start to finish. "Up until this point, everything [in manufacturing] has been subtractive," he explains. "You start with a giant chunk of material and take away everything you don't want. That means you're confined to industry standards, stock sizes, and off-the-shelf materials. Up until now, that's dictated the design process."

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Now, instead of creating separate pieces that need to get assembled or welded together, additive manufacturing can create parts that involve ball bearings or turbines and do it in one step. "Now there are different constraints you don't see in traditional manufacturing," says Osborn, pointing out a steel piece printed in the shape of a chess rook.

"You couldn't create this any other way," he explains, noting the detail and precision additive manufacturing is capable of, if you design appropriately for the technology.'

"You can use that to your advantage. You can create the shapes you think of in your mind that stretch the boundaries of traditional forms. But it's hard to get out of the habit of thinking of those stock material sizes," he notes. You can sense his frustrations from an uphill battle against the this-is-the-way-we've-always-done-it mentality. "This technology allows you to picture shapes in a more creative way."

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## Finding your allies

Where Osborn works, he discovered another team working with additive manufacturing. “I try to go down there as often as I can and learn as much as I can from them. A lot happens with water cooler conversations,” he says. Once Osborn found like-minded colleagues, the friendships only strengthened, and he’s now collaborating in ways that advance both teams’ efforts. “They were producing tools through their lab using a metallic process. For me, it always made sense to do it the way we did it, but I hadn’t considered their way before.”

“That’s the fun part for me,” says Osborn. “We’re on the crest of the wave.” As he explains, a lot of the standard processes for additive manufacturing are coming from early adopters who work closely with suppliers who make the machines. “We’ve learned a lot of lessons and some of the policies we’re creating can translate to other industries now that standards are available.”

## Bringing the technology into the realm of normal

“People are tangible creatures,” Osborn says, talking about the various ways the technology is already being used across industries. With additive manufacturing, “x-rays can show a 3D representation.” To Osborn, the just-hit-print mindset is limiting. “A 3D printer doesn’t necessarily have to make an entire object. It can make pieces of a larger object. Or make prototypes for medical devices. Or print custom pasta shapes. Or art sculpture pieces. [Or a kidney.](#)”

The options are clearly varied, and thinking about why you’d need custom pasta, Osborn offered up the idea that advertisers could make logo-shaped foods for a special event, rather than having to special order them through someone else. As we talk about the [3D printer in space](#), there’s a sense of more self-reliance when you have access to a machine with these capabilities. “If they needed a paper clip, they would have had to order it,” Osborn uses as an example. “And NASA would have had to launch it on a rocket. If they need one now, they can make it.” And while the idea of a printer in space is new and much of the technology relies on gravity, Osborn has hope: “There’s a creative way around that, but it’s not where we’re at right now.”

Instead, he says we’ll start seeing a lot of “customizing for consumers. There’s a company right now that uses [Microsoft Kinect to make 3D-printed figurines](#). We’ll see a lot of customization like that.” Osborn also notes that people will be able to make personal accessories without going to the store, or to customize makeup. “If you want to make money as a manufacturer, you can’t make something one at a time,” he says, explaining that additive manufacturing has an advantage for one-off jobs.

## Riding on the crest of the wave

“In two to three years, additive manufacturing will really explode,” believes Osborn. “Initial problems, bugs, the weird things that happen when you print: we’re ironing them out.” But, he admits, it won’t be easy. “There are hurdles to overcome. It’s going to take demand on the industrial level to really throw money at it to be influential, to be able to use more exotic materials, bigger machines.”

It enables creative thinkers who can’t necessarily build something physically out of cardboard or don’t have the fabrication skills that allow them to make objects. But now they have no deterrents to being creative.

“3D printing in general is in its infancy stages,” says Osborn. But as it grows, a huge benefit is that the machines don’t care how complex a design is. “It takes the computer file and slices it into layers and prints one layer at a time.” Designers can create objects that do not require any assembly, or manufacture parts that you couldn’t possibly assemble yourself. “You’re able to have more precision, high quality, and it’s repeatable,” emphasizes Osborn. “It enables creative thinkers who can’t necessarily build something physically out of cardboard or don’t have the fabrication skills that allow them to make objects. But now they have no deterrents to being creative.” For many materials the printer has, the “don’t

they have no deterrents to being creative. For many materials the printers use, we don't know the mechanical properties of it," he adds. And while this doesn't matter for a custom phone case, it does matter for industries that have regulations. "You have to prove that it's not going to break apart. There are a lot of variables, and we have to come up with ways to prove to quality teams that it's not going to harm someone while they're using it."

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