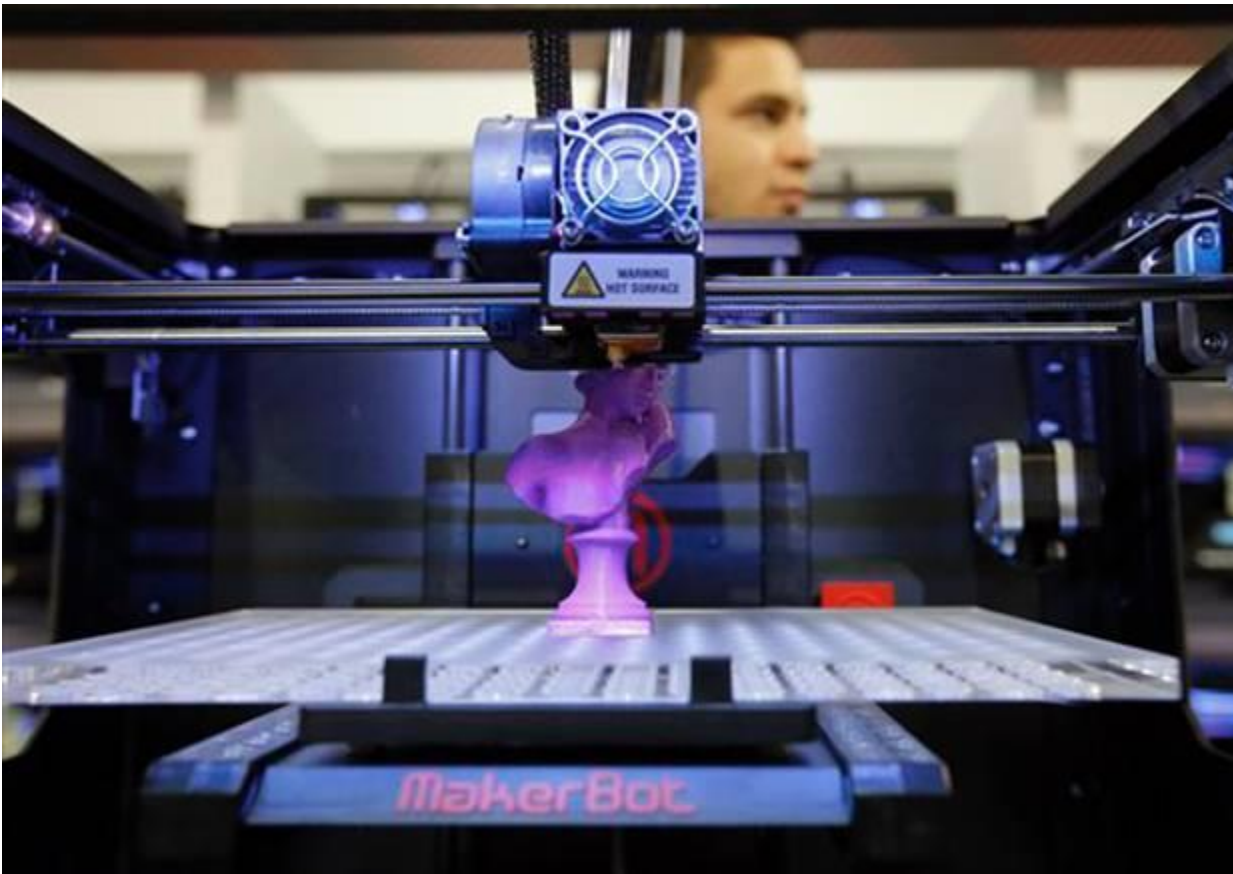


# 3D printing for dummies: How do 3D printers work?



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**You've heard the hype about 3D printing but how does it actually work? Andrew Walker explains it's like baking a sliced loaf of bread backwards**

It seems like everyone from the White House to [Amazon.com](https://www.amazon.com) is talking about 3D printing these days, but what exactly is it? Here's a quick guide to what all the hype is about...

## **What is a 3D printer?**

3D printers are a new generation of machines that can make everyday things. They're remarkable because they can produce different kinds of objects, in different materials, all from the same machine.

A 3D printer can make pretty much anything from ceramic cups to plastic toys, metal machine parts, stoneware vases, fancy chocolate cakes or even (one day soon) human body parts.

They replace traditional factory production lines with a single machine, just like home inkjet printers replaced bottles of ink, a printing press, hot metal type and a drying rack.

## **Why is it called printing?**

If you look closely (with a microscope) at a page of text from your home printer, you'll see the letters don't just stain the paper, they're actually sitting slightly on top of the surface of the page.

In theory, if you printed over that same page a few thousand times, eventually the ink would build up enough layers on top of each other to create a solid 3D model of each letter. That idea of building a physical form out of tiny layers is how the first 3D printers worked.

### **How do 3D printers work?**

You start by designing a 3D object on an ordinary home PC, connect it to a 3D printer, press 'print' and then sit back and watch. The process is a bit like making a loaf of sliced bread, but in reverse. Imagine baking each individual slice of bread and then gluing them together into a whole loaf (as opposed to making a whole loaf and then slicing it, like a baker does). That's basically what a 3D printer does.

The 3D printing process turns a whole object into thousands of tiny little slices, then makes it from the bottom-up, slice by slice. Those tiny layers stick together to form a solid object. Each layer can be very complex, meaning 3D printers can create moving parts like hinges and wheels as part of the same object. You could print a whole bike - handlebars, saddle, frame, wheels, brakes, pedals and chain - ready assembled, without using any tools. It's just a question of leaving gaps in the right places.

### **What are the opportunities?**

Have you ever broken something, only to find it's no longer sold and you can't replace it? 3D printing means you can simply print a new one. That world, where you can make almost anything at home, is very different from the one we live in today. It's a world that doesn't need lorries to deliver goods or warehouses to store them in, where nothing is ever out of stock and where there is less waste, packaging and pollution.

It's also a world where everyday items are made to measure, to your requirements. That means furniture made to fit your home, shoes made to fit your feet, door handles made to fit your hand, meals printed to your tastes at the touch of a button. Even medicines, bones, organs and skin made to treat your injuries.

You can get some of those things now if you're wealthy, but 3D printing brings affordable, bespoke manufacturing to the masses. If that sounds like pure fantasy, try googling "personalised 3D printed products" and see for yourself. After all, the notion of doing your supermarket shopping on an iPad was like something out of Star Trek 20 years ago.

### **What are the limitations?**

Although buying a 3D printer is much cheaper than setting up a factory, the cost per item you produce is higher, so the economics of 3D printing don't stack-up against traditional mass production yet. It also can't match the smooth finish of industrial machines, nor offer the variety of materials or range of sizes available through industrial processes. But, like so many household technologies, the prices will come down and 3D printer capabilities will improve over time.

### **Is it the next big thing?**

Yes, if you're a product designer or engineer, but for most people, no.

Like all new technologies, the industry hype is a few years ahead of the consumer reality. It's an emerging technology which means, like home computers or mobile phones, most people will remain sceptical about needing one until everyone has got one... and then we'll all wonder how we ever managed without them.