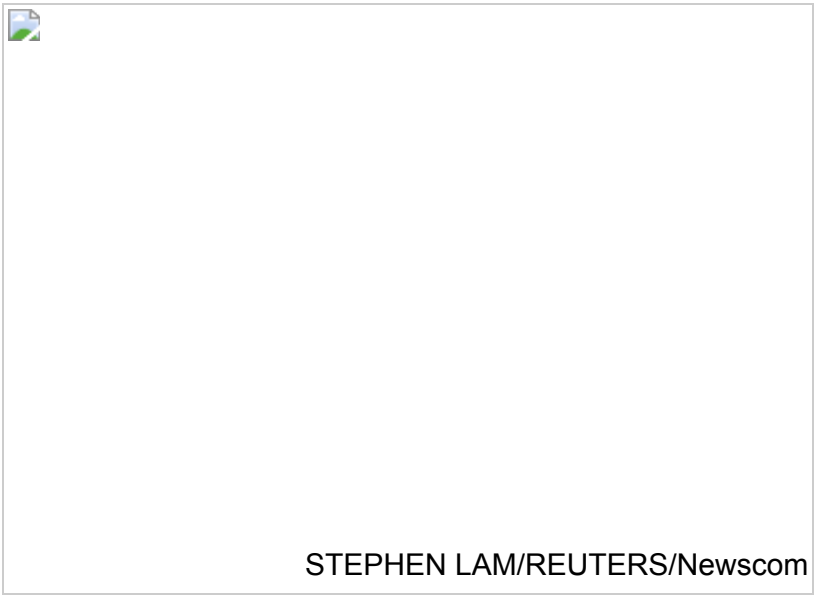
You'll Soon Be Able to Manufacture Anything You Want and The Silicon Valley Cartel Will Be Powerless to Stop It

From DIY guns to designer drugs, classic-car parts, and human livers, 3D printing promises a dynamic and uncontrollable world.

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STEPHEN LAM/REUTERS/Newscom

In the very near future, governments will lose the ability to keep guns, drones, and other forbidden goods out of the hands of their subjects. They'll also be rendered impotent to enforce trade and technology embargoes. Power is shifting from the state to individuals and small groups courtesy of additive manufacturing—aka 3D printing—technology.

Additive manufacturing is poised to revolutionize whole industries—destroying some jobs while creating new opportunities. That's according to a recent report from the prestigious RAND Corporation, and there's plenty of evidence to support the dynamic and "disruptive" view of the future that the report promises.

It's all pretty cool, if you look forward to a future that just won't fit under rulers' thumbs.

"The simplicity and low cost of [3D printing] machines, combined with the scope of their potential creations, could profoundly alter global and local economies and affect international security," write RAND's Trevor Johnston, Troy D. Smith, and J. Luke Irwin in "*Additive Manufacturing in 2040*."

To their credit, the authors see additive manufacturing not only as a "disruptive threat," but also as a "powerful enabler." They quote one industry expert who raves about the potential to "print electronics, insulators, conductors, plastic substrates all together without degradation." Likewise, a health expert tells them, "The medical field will be transformed dramatically … We will be able to print livers, or we can print pieces of arteries for heart surgery."

The authors also note that 3D printing represents a loss of control by government officials. Five years after the creation of the first 3D-printed firearm by Cody Wilson, the RAND authors see technology continuing to re-balance the power relationship between individuals and the state.

"At the domestic level, point-of-sale consumption will no longer be an opportunity for governmental control of risky goods, such as firearms and drones," they write. "State sovereignty is predicated on a monopoly of force and, at a minimum, the capacity to regulate arms. [Additive manufacturing] will further relax this control, giving private citizens greater access to lethal weapons and other tools of violence."

Not mentioned in the report, but noted in a related RAND article, is "the potential for new street drugs, custom-printed from chemicals."

Yes, this could mean—as the report foresees—more risk of crime and terrorism in the future. The authors pose scenarios in which terrorists penetrate targets unarmed and use existing 3D printers *inside* the defensive perimeter to create weapons.

OK. Maybe.

But criminals and terrorists are already pretty well supplied around the world, via black markets, state sponsors, and often their own manufacturing capability. Forget ISIS—it's the shopkeepers afraid of crime and denied the means of self-defense, or the deliberately disarmed and abused minority suffering under a hostile government, who are most likely to find the acquisition of arms easier courtesy of new technology.

Additive manufacturing also eases the availability of spare parts—especially in isolated settings and for old or unusual equipment.

That's why the United States Marine Corps has embraced the technology for fabricating replacements in the field, and fanciers of classic cars see 3D printing as a great alternative to hunting for rare parts and paying through the nose for the privilege.

"When a product fails and certain replacement parts are unavailable or scarce, 3D printing offers a means for a quick and efficient repair," noted a paper presented at the 2015 Product Lifetime and the Environment Conference.

And the innovations that keep weapons functioning in the field and vintage cars cruising the roads will just as easily benefit an airline forbidden to make purchases on the world market. Subject to international sanctions, Iran's domestic airline "had become infamous for its crashes as the aging fleet struggled to fly using only 'smuggled or improvised parts,'" notes the RAND report. But the company is gaining the ability to make what it needs.

This "might reduce the number of accidents," sniffs the RAND report, yet "that benefit comes at the cost of weakening the effectiveness of sanctions, which represent a basic tool for managing geopolitical challenges." But many observers might think that it's a *positive* development when end users can create critical replacement parts on the fly, even if it deprives squabbling politicians of the ability to hold airline passengers as hostages.

A technology that can fabricate replacement parts at the point of use can create a lot more, too. Johnston, Smith, and Irwin cite estimates

that 10 years from now, additive manufacturing will be responsible for between 5 and 50 percent of goods sold, and up to 90 percent two decades out.

That scale of industrial transformation is likely to mean big changes in where and when goods are produced—potentially creating (the authors say) new dangers. They open the paper with a hypothetical attack by terrorists radicalized by high unemployment in their country because "factories that once assembled more-specialized goods have been replaced by local [3D] printers in the markets to which those goods were once exported." But that's only looking at what's lost—considering the horse-drawn carriage makers, to use an old example, without also acknowledging the automobile manufacturing jobs that came to replace them.

Later in the paper, the authors concede that "business opportunities that do not even exist yet, such as the production of human organs, could emerge" as additive manufacturing progresses," and "thus, products and perhaps whole industries could move to different locations in the figure even as the frontier itself advances."

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