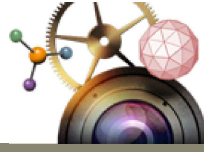


## Babbage

Science and technology



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# Divining reality from the hype

Aug 27th 2014, 15:13 by N.V. | LOS ANGELES



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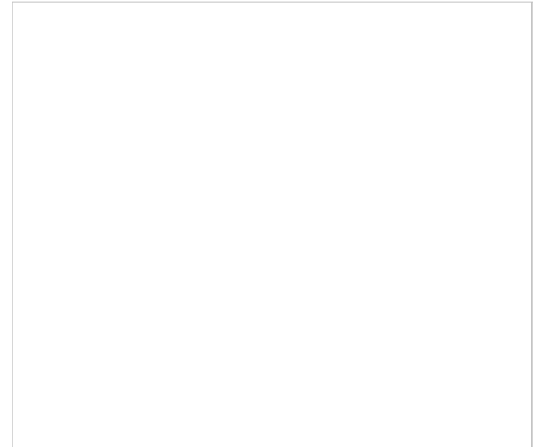
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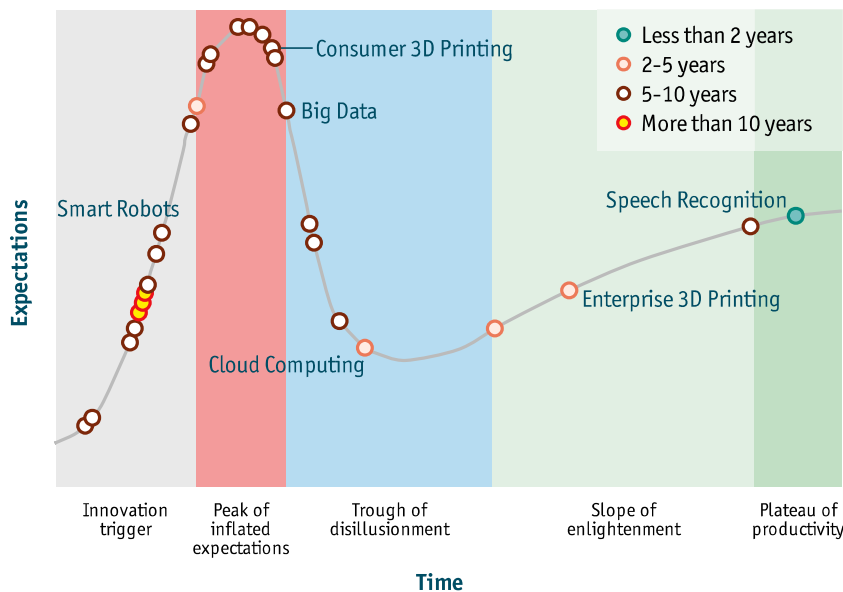
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## The emerging technologies hype cycle, 2014\*



## 3D Bioprinting Systems

Our article [Printing a bit of me](#) appeared in The Economist on March 8th 2014

Sources: Gartner; The Economist

\*Selected technologies

OVER the past few decades it has become clear that innovation—more than inputs of capital and labour—is what drives a modern economy. In the developed world, the application of technological know-how and scientific discoveries by companies, institutions and government establishments accounts for over half of all economic growth. Because of its seminal influence on wealth-creation in general and employment in particular, the manner in which innovation functions—especially, the way it comes and goes in Darwinian bursts of activity—has emerged as a vital branch of scholarship.

What researchers have learned is that waves of industrial activity, first identified by the Russian economist Nikolai Kondratieff in 1925, have a character all of their own. Typically, a long upswing in a cycle starts when a new set of technologies begins to emerge—eg, steam, rail and steel in the mid-19th century; electricity, chemicals and the internal-combustion engine in the early 20th century. This upsurge in innovation stimulates investment and invigorates the economy, as successful participants enjoy fat profits, set standards, kill off weaker rivals and establish themselves as the dominant suppliers.

Over the years, the boom peters out, as the technologies mature and returns to investors slide. After a period of slower growth comes the inevitable decline. This is followed

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eventually by a wave of fresh innovation, which destroys the old way of doing things and creates conditions for a fresh upswing—a process Joseph Schumpeter, an Austrian economist, labelled “creative destruction”.

Back in the late 1990s, Babbage noticed that the waves of innovation had begun to speed up (see “[Catch the wave](#)”, February 18th 1999). The industrial waves Kondratieff observed in the 1920s came every 50-60 years or so. By the late 1990s, fresh ones were arriving twice as often. Fifteen years on, their frequency appears to have doubled yet again. Waves of new innovations now seem to be rolling in every 10 to 15 years.

It is not hard to see why. Rather than leave things to chance, all the big industrial countries nowadays have legions of engineers and scientists scanning the literature for ideas that portend blockbuster innovations capable of carving out new markets. Meanwhile, social networking has made it easier than ever for money and talent to join forces in order to hustle the innovation process along. In addition, today's far broader channels of communication ensure that any new way of doing things becomes instantly known to everyone interested.

Sometimes too well-known. Indeed, the hyperbole surrounding many fledgling technologies, especially those in their early stages of development, can prove a costly distraction for the unwary. Firms on the fringe of some new development may have difficulty filtering the message from the hubbub, allowing expectations to lose touch with reality. Believing some emerging technology (say, 3D printing) is about to transform their industry, they may make aggressive investments that will prove disastrous if the technology's impact turns out to be less than anticipated.

To help companies manage such expectations, Gartner, an information-technology consultancy based in Connecticut, has built a set of decision-making tools based on its so-called “hype cycle”. For the past 20 years, the consultancy has produced an annual update of various hype cycles that provide snapshots of the progress certain technologies have made over the previous year; where on the innovation cycle they currently reside; and how long (if ever) they will take to reach maturity. This year's collection (published on August 11th) assesses the prospects of some 2,000 technologies, grouped into 119 aggregated areas of interest. The graphic above illustrates many of the points on this year's curve, each categorised by the time until a technology's projected maturity in the market.

Each hype cycle shows how expectations change during five key phases of a technology's life cycle. The first phase (“Innovation Trigger”) happens when the news media begin to notice a promising new technology. Even though no usable product may exist and the technology's commercial viability is still a long way from being proved, media interest begins to gather steam.

At the top of the cycle (“Peak of Inflated Expectations”), the early publicity prompts a number of success stories, while scores of failures receive less attention. During this second phase, some large early adopters get involved, spurring further headlines.

In the third phase (“Trough of Disillusionment”), interest wanes as trials fail to deliver results and press coverage turns negative. A shake-out drives weaker participants to the wall, while survivors with better products consolidate and gain support from early adopters, along with additional funding from venture capitalists.

With the fourth phase (“Slope of Enlightenment”), more enterprises approve pilot schemes, as they become acquainted with the technology's proven benefits and best practices. Meanwhile, second- and third-generation products begin to appear, providing the needed confidence for mainstream adopters to think about committing themselves.

Finally, the fifth phase (“Plateau of Productivity”) is where mainstream adoption takes off. Firms providing the technology are now seen as credible suppliers. Their products gain broad market appeal, as the technology's value becomes recognised by the industry as a whole.

But the shake-out along the way is considerable. A good example is the chart for emerging



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technologies—Gartner's longest-running and most comprehensive annual hype cycle. This provides a close-up of those technologies that possess both broad industrial relevance and the promise of at least a high, or even transformational, impact on firms affected. Of the 45 emerging technologies in this year's snapshot, 17 are the subject of rising expectations, ten are at the peak, 11 are sliding into the trough, six have begun to climb up the slope towards viability, and just one (speech recognition) has made it to the plateau of mainstream acceptance. Only the fittest seem to survive all the hyperbole.

Perhaps the most cautionary hype cycle of all, though, is the one for personal 3D printers. Here, Gartner identifies two themes. The first is that the enterprise market and the consumer market for 3D printers are driven by entirely different uses and requirements. As such, they bear little resemblance to one another. For instance, there are 40 or so established manufacturers selling enterprise-class 3D printers to business for \$100,000 and up. By contrast, more than 200 start-ups are hoping to crack the consumer market with 3D printers priced as low as several hundred dollars.

The second point is that 3D printing is not one technology, but a combination of seven different ones. "Hype around home use obfuscates the reality that 3D printing involves a complex ecosystem of software, hardware and materials, whose use is not as simple as 'hitting print' on a paper printer," notes Pete Basiliere, research vice-president at Gartner.

The hype cycle for 3D printing shows some of the technologies involved are maturing faster than others, and could be widely available within a few years. For instance, the use of 3D printing for making prototypes—a mainstay of the industry since its inception—is enjoying increasing acceptance in business. But prototyping is unlikely to be of much interest to home users. Besides, despite the broad awareness and media buzz, even the prices of personal 3D printers that are being banded around are still too high for typical do-it-yourself consumers. Overall, says Mr Basiliere, consumer 3D printing is five to ten years away from mainstream adoption.

Babbage thinks even that may be optimistic. Several months ago, he wondered aloud whether 3D printers would ever make it into the home, if the only things they could fabricate were small trinkets and gew-gaws out of soft or brittle plastics (see "[Making the cut](#)", June 2nd 2014). He felt that, to have any practical value, personal 3D printers should be able to make load-bearing components—to repair things around the home like lawnmowers, washing machines, children's bicycles and old cars. To do that would mean being able to print with powdered metals.

But, while industrial metal printers that use selective laser sintering do an excellent job, they cost \$125,000 or more. Their price would have to come down by two orders of magnitude to have any chance of making it into the home.

Consumer 3D printing is still at its hype cycle's peak of expectations. Whether it survives the coming slide into the trough of disillusionment, with the inevitable shake-out of suppliers, is still too early to say. Babbage hopes it does, but that the survivors focus more on reducing the cost of making things that are genuinely useful rather than merely ornamental.

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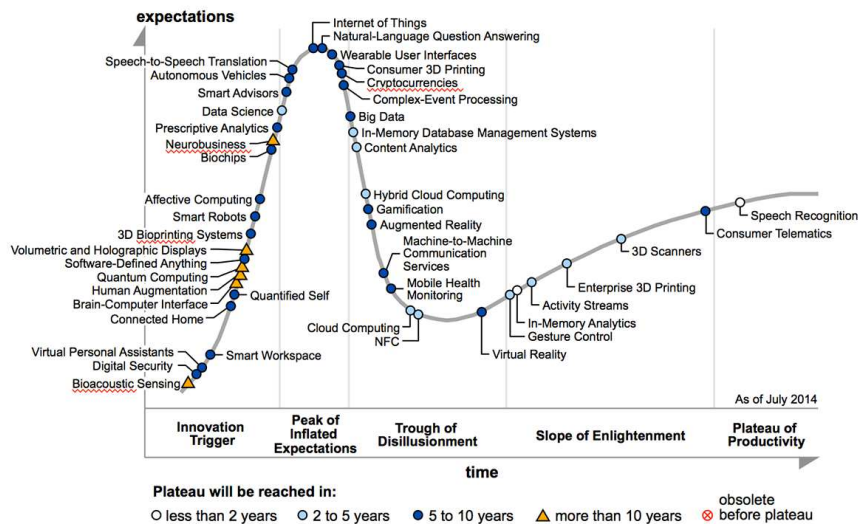
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The 2014 Gartner hype cycle chart, with all technologies identified

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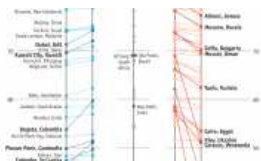


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**Sherbrooke** Aug 29th, 21:26

What is exactly "data science" and "big data"? Statistics? Statistics and data mining? I strongly doubt that this whole thing will plateau in 2 to 5 years - a time only enough to spit out a Ph.D.

Don't get me wrong, the area is not in its infancy, but with the current state of things its nowhere near a plateau.

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Reply

**CanadaAW** Aug 29th, 15:02

One thing for which I WOULD use home 3D printing (depending on how far the costs fall) would be to replicate and produce thousands and thousands of pieces of plastic, snap-together, interlocking blocks... very similar to what that company from that country located on the northern edge of Germany does. :-) I won't say the name in order to avoid being sued. :-)

Of course, I'd first make a few dozen copies of the pieces to ensure that the printer is creating each piece within 0.01 tolerance (or however you measure tolerance). Actually, I would ask the salesperson to do this as a demo, in order to convince me that buying the printer (and supplies) would be worth it.

Recommend 2 Report Permalink

Reply

**Lijoy Kurian** Aug 29th, 13:01

Great Article. Over the years, I have seen this happen again and again, albeit on a smaller scale. It starts with buzz around a technology. You see the technology being talked up in the media, and managers start using the buzz words, and selling it as the panacea for all ills. When a company is in that mode, it seems like problems will be solved just by the power of hype. In my experience, not much emphasis is put on execution. So after spending lot of money and wasting lot of time, we end up with a very bad product. This is because the teams/managers are not trained enough to realize what are the potential benefits and pitfalls of the technology.

I am seeing the same thing happening with Big Data and Data Science. I for one think that there is huge potential for solving problems with Data Science and Big Data Technologies. But the teams are ill equipped to execute.

Recommend 2 Report Permalink

Reply

**nkab** Aug 28th, 17:13

Very informative article. I suppose technology innovation and its addressable market as delineated in this article presuppose that that concern themselves mainly with the industrialized and developed economies. There's nothing wrong with this assumption statistically and empirically, but Gartner's five phases (five key phases of a technology's life cycle) for a given technology cannot be plotted or identified with time or time lapsed globally or universally, except perhaps for broad brush global mega-trending, IMO.

IMO, there exist significant deviations or subsets of Gartner's Five phases to run through that are not only technology and market specific but also the state of the economic/ industrial development and even geographically unique.

A case in point is an August 24, 2014 news item that they have built and delivered for use 10 (identical) houses in 24 hours by 3D printing in Shanghai recently. That's a feat that fits neither the scenario of enterprise 3D printing nor of the consumer 3D printing as elaborated in the article.

Recommend 2 Report Permalink

Reply

**Shavak** Aug 28th, 11:49

The previous wave of innovation (software, media, cloud computing) seems to have run out of steam before the next one has truly emerged to replace it - genetics, customised manufacturing, 3Dprinting, alternative energy and so on. If this cycle keeps on getting squeezed (once it gets going), are we

doomed to see such periods where growth stalls due to lack of innovation, as viewed by the Austrian School? We can innovate only so fast.

Or, perhaps, the cycle has not been squeezed as much as thought. Genetics, alternative energy have been around for some time now, but they are far from mature, though they have the potential to cause our economies to grow for decades to come. Look at the possibilities for extended, productive lifespans, with very experienced and knowledgeable workers in every field, the sustainably massive increase in per capita energy consumption, the potential terraforming of the earth to eliminate excessive CO2 and provide food aplently for all and so on. May be Kondratieff was closer to the mark than has been possible to show, because innovation is so difficult to measure or for other good reasons. Great Depression - 1930s, Great Recession - centred around 2010, shall we say, so the Kondratieff cycle may exist with a 60-80 year duration, after all?

Recommend 3

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Reply

**Sherbrooke** in reply to Shavak Aug 29th, 21:30

Define "cloud computing": is this the "thin client" implementation of services many companies sell as cloud computing (i.e. when Apple says "now your files are in a cloud", it really means "your files are accessible on a designated server available via thin client") - or is this the approach when applications are deployed on a grid and a software development toolset is re-gearred completely to include standard parallelization, communiation and duplication of data? First one is just a fad, second one is picking up steam real fast - in fact, we switched a number of internal systems to the "cloud" some time ago, and I suppose that more will follow.

Recommend 1

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Reply

**RollyOn** Aug 28th, 10:33

Good article, there's a lot here that I take as read but doesn't seem to be people's general concept. e.g. the idea that first to market has an advantage. Actually I think that is not always true, often better to come to market later in the cycle.

In a similar vein though I put the concept many have that the initial innovative idea is all important in terms of business success. Certainly that's a simplification that the media enjoys making. In fact most business successes derive from a variety of business competencies and e.g. continual innovation and adaptability on a path. New Businesses by no means emerge fully fledged just from an 'idea'.

On 3d printing, I agree with your load bearing hypothesis. Many components now are made cheaply, consistently and efficiently in mass production. Maybe we can't find all components we now might want but it will be as easy to have them delivered as printed and in terms of r&d and innovation much can be done on computer. 3d printing will find a market in the home for tinkerers but I don't see it as a mass market technology, the excitement of making your first pink plastic widget will soon fade. Not that dissimilar to self printing books. Perhaps the local repair shop might benefit from a metal 3d printer but in our throw away and replace economy that model is already cost ineffective.

Recommend 2

Report Permalink

Reply

**RollyOn** in reply to RollyOn Aug 28th, 10:46

Economists might beneficially ponder the relationship between "Darwinian bursts of innovation" with inflation and the money supply. Specifically the significance thereof of continually boosting the money supply regardless of cycle, expecting growth and not allowing that an apparent productivity gap may in fact be a sign of the need for a correction.

Recommend 2

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Reply

**edwardong** Aug 28th, 01:58

3D printing will likely have the greatest impact on:

i. Reducing distribution and servicing costs for capital goods. E.g. cars, airplanes, ships, oil rigs.

For example, car service outlets. Instead of keeping scores of uncommon parts, a car maker could just keep the e-blueprints for printing the part on the cloud.



This would:

- save inventory holding costs
- save inventory obsolescence costs
- save on tooling costs
- enable faster customer service (no parts outages)
- save on transport costs of inventory (e.g. urgent air flown parts)
- cut franchise costs as more small businesses can set up service centres even in remote areas due to lower inventory costs
- enable a larger distribution network, thus increasing sales volume

In combination with current shared platform technology it would also:

- bring down the break-even volumes of a model, since the platform cuts the manufacturing cost, but 3D printing cuts the distribution and servicing costs.

One could also make the same argument for fridges, washing machines, etc. but these goods tend to be more disposable, and the manpower cost of servicing them may overwhelm any savings on the parts.

ii. Custom designed jewelry and home/office furnishing. E.g. different designs of ear-rings, rings, cuff links, charm bracelets, brooches, spectacle frames, Swatch watch backs, towel rails, door handles, etc.

- Similar savings in inventory, franchising, customer service and models, as above.

- In addition, in this case, there are zero manufacturing costs. if a particular design does not sell, so what? The only cost was of the designer designing it, as it was never manufactured.

- Customers can also be allowed to add their own motifs, crests, insignia quite easily. Take a couple of photos, translate it into a 3D design and presto.

Recommend 4 Report Permalink

Reply

**Medicine4theDead** Aug 27th, 23:06

The Economist forgot to mention educational technologies like MOOCs. Or maybe that is because the Economist is an educational publisher.

Recommend 6 Report Permalink

Reply

**Sherbrooke** in reply to Medicine4theDead Aug 29th, 21:33

Can I see any indication that MOOC's have any significant impact? I.e. "US colleges greatly reduced cost because of MOOC's, but enrollment still falls" or "US student debt hits record low because everyone does free MOOCs"?

Oh, wait, it's the other way round...

Recommend 1 Report Permalink

Reply

**the.ronin** Aug 27th, 19:14

You mean tell me all this hooplah about "analytics" is just hype??? Say it aint so, Joe!

Recommend 6 Report Permalink

Reply

**bampbs** Aug 27th, 18:50

Only the future sifts the reality from the hype.

Recommend 9 Report Permalink

Reply

**Connect The Dots** in reply to bampbs Aug 27th, 22:32

No reality is seen everyday in the present..it is a matter of paying attention:

For instance I do not see 3D printers making any impact.

I see teenagers txtng 500 times a day inane comments.

And young people video gaming all weekend without sleep fueled by energy drinks.

And see the price of natural gas and petrol falling due to fracking.

===

If you live in the present and carefully observe the changes, you can easily see the future.

Recommend

6

Report

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Reply

**Nathan W** Aug 27th, 18:47

Cloud computing: Given monopolization in markets and lack of trust of corporations (well justified), I hardly think that people will trust companies not to take advantage of cloud computing with all their personal files.

Perhaps there are some interesting uses in specific areas of business or collaboration. Again, I think most companies will strive to keep this internal, although access through Amazon servers, for example, can certainly be useful if you don't want to spend a lot upfront.

When you can store TB after TB for not really all that much, why trust an external server to now screw you with inflated charges once enough customers lock in?

Moreover, while IT networks don't face high per TB costs in data transmission, costs are fairly high for consumers.

Surely the cloud will prove useful. But in the age of NSA reads anything it can technically get its hands on, I think people and business will prefer to lock up their data and files rather than leave them in the cloud. Perhaps the Swedish cloud will offer more promise? But there's interception, etc.

Oh, I must be guilty. I don't want poorly trained and unaccountable contractors to have easy access to any and everything they may wish to touch. I'll keep my data at home, to the extent possible, thank you very much.

So probably the dot is in the right place, for the very same reasons that the "Big Data" dot is also in the right place, imo.

Recommend

4

Report

Permalink

Reply

**Sherbrooke** in reply to Nathan W Aug 29th, 21:35

Can you please explain to me the difference between "keeping the files in a cloud" and "keeping the files on an FTP server"?

Recommend

1

Report

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Reply

**Nathan W** Aug 27th, 18:41

I think many people would be interested in having many nearby outlets which could easily produce replacement parts using 3D printing technologies. Probably IP rights will make it impractical for licensing purposes for many things. But if I can call up the local parts shop and ask for knob A115 on product SKU 23412342134t and pick it up that afternoon or delivered the next day, that would be supercool. I need four knobs to fit something back together. I'm only willing to pay ... a few dollars for them. Is there a market some years down the road? As it is, probably the best bet is to a hardware store, find the closest equivalent, and use too much glue to make up for the fact that the part wont quite fit.

Is 3D really going to add that much additional value? I think the consumer market will be filled by outsourcers. I could make sushi at home with the right tools, but the sushi people get it just right. I think it will be about the same for "consumer" 3D printing.

Recommend

9

Report

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Reply

**Sherbrooke** in reply to Nathan W Aug 29th, 21:36

Industrial 3D already added tremendous value. See how most cars in the 70es and 80es were angular and how they are all smooth now? That's in part because the molds could be 3D-printed -



machined based on software inputs.

Recommend 1

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**environmentalist** Aug 27th, 18:27

Speech recognition has yet to fully deliver. Granted, it has made great strides since it was first hyped in the 80s, but even today pressing a button on the phone is preferable to the "say your option" automated response systems out there.

Recommend 8

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**Connect The Dots** Aug 27th, 16:02

Underpromise but Overdeliver.

The biggest technological breakthrough in the past 10 years in America was not smart phones, social media, web based commerce, or LED technology.

The biggest breakthrough is stealthy yet it has impacted every single citizen even if they do not use the internet.

It affects lighting, heating and cooling, transportation, energy, the economy, and world peace.

===

The big technology breakthrough is FRACKING.

It ended the War on Terror, ended two wars, and enabled the withdrawal of Western forces from the catastrophic Mideast.

And boosted the economy, created jobs and lifted the economy finally out of the Great Recession.

Smart phones with mobile internet Facebook can't touch that.

===

Energy Independence has lead to Political Independence...pretty good for a single, new technology breakthrough with a stupid name.

Fracking has brought peace and ended war!

Have a Fracking Good Time!

Recommend 12

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Reply

**Connect The Dots** in reply to Connect The Dots Aug 27th, 16:16

True Superheroes have a secret identity, are underestimated by doubters, and are never fully appreciated by the masses after saving the world.

Fracking Superman.

Recommend 7

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Reply

**Medicine4theDead** in reply to Connect The Dots Aug 27th, 23:08

Now it is the war on drinking water and earth stability. Dots win again. Lex Fracking Luther

Recommend 6

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Expand 1 more reply

**shibakoen** Aug 27th, 16:01

Has anyone ever Piketty-ized (Pikettized) the hype-cycle? You know, actually grab data and try to plot where products or industries lie based on actual quantifiable data? What data points would you use? Revenues? Profit margins?

Recommend 10

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Reply

**willstewart** Aug 27th, 15:50

I think that you will find that sales of the sort of replacement parts you suggest have shrunk not because there is no need but because the need is not sufficient - parts are more reliable and the cost of getting them fitted is high. The logistic problem of supply is largely fixed anyway (ask Amazon) and not a sufficient reason for 3D printing.

So to make 'home 3D' fly we need something new. Gewgewes like individual iPhone cases might work - but really individual things like made-to-measure earpieces (which are already made) might be more promising. Made-to-fit personal wear might work, as might special sports gear. None of this needs metal.

Recommend9ReportPermalink

Reply

Artemio Cruz in reply to willstewart Aug 27th, 16:55

But you can easily see, at least for a while, how a local store, which could afford the machines and materials, could provide the service: you bring the plans, it prints the parts.

Recommend10ReportPermalink

Reply

willstewart in reply to Artemio Cruz Aug 27th, 17:17

But this is available now, albeit online (as for iPhone cases in fact) at very moderate prices. I suppose a local store could deliver today rather than tomorrow-from-Amazon but the investment would be a lot just for this.

And in fact producing the design is not so simple - a 3D copy machine might be a better local product (probably still with send-away-to-make).

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