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3D printing: A powerful technology, but no panacea

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3D printing or additive manufacturing shows great promise but there are still significant challenges, say Deloitte's Eric Openshaw and Mark Cotteleer.

There is no shortage of hype. Corporate leaders are continually warned that additive manufacturing (more commonly known as 3D printing) will cataclysmically disrupt virtually all businesses on the planet. Futuristic visions encompass everything from custom 3D-printed cars to human organs available on demand for transplants.

The reality, however, is rather different. Companies are using additive manufacturing (AM) today to complement established methods such as injection moulding and casting. And AM is not likely to replace these methods in the near future for several reasons.

For example, AM still poses significant technical challenges in terms of costs, speed, material availability and consistency of outputs. In addition, customers have yet to place full trust in additively manufactured products. As with other technologies, even revolutionary ones, AM will continue to develop as it takes its place within the constellation of manufacturing methods.

AM will displace some technologies over time, but has not reached that stage yet. In the meantime, companies are pursuing competitive advantage with AM by combining two paths to the money: boosting product innovation and making supply chains more flexible and agile.

Product innovation

The power of AM stems from its ability to reduce or eliminate the cost of complexity. By creating whole objects one layer at a time, many products or components, including some with moving parts, can be made in one step, reducing assembly costs.

In addition, by applying the precise amount of material needed in each layer, AM also reduces waste inherent in production processes such as machining. The technology is also opening up new vistas for manufacturing design: it can accommodate a universe of geometric configurations, which mitigates the need for tooling, set-ups and changeovers.

As the cost of complexity goes down, the opportunity for more potent product innovation goes up. Although rapid prototyping is AM's most common application today, some companies are using it to customise products in ways that would be prohibitively costly with traditional production methods.

Cubify, for example, offers personalised collectables, such as a Santa Claus, reproducing the customer's head from photo images. Footwear manufacturers are starting to use AM to create running shoes that map to the user's biomechanics.

Re-engineering products to capitalise on AM capabilities can significantly reduce their cost. A lighting goods manufacturer, for example, recently redesigned a plug used in fluorescent lights.

The plug originally consisted of three components – a base, socket and cover. Using AM, it is now produced in one piece. The redesign cut material costs substantially and slashed assembly costs by nearly 70 per cent. And the plug works just as well as its predecessor.

AM can also be used to improve product quality. For example, a supplier of technologies for vehicles is using AM to make an entire aluminium diesel pump in one piece. The redesign not only reduces parts and assembly costs, it also eliminates process steps that led to leaks.

Supply chains

Product life cycles are shortening, putting a premium on speed to market. Supply chains anchored on large, centralised manufacturing operations can struggle to keep pace. AM may alter the equation. Because its initial costs can be lower than those of traditional manufacturing operations, AM can offer competitive per-unit costs at levels below the scale required by investments in traditional manufacturing approaches.

With AM, companies can establish more manufacturing locations in order to be closer to customers and markets. By using AM to iterate design more rapidly, companies can also eliminate tooling which accelerates speed to market even further.

Medical technology is an industry at the vanguard. For example, hearing aid manufacturers are switching to AM to produce the shells that fit the ear. The change allows the companies to radically reduce the back and forth between the doctor's office and manufacturer to get the fitting right. That reduction shortens the overall process by 50 to 80 per cent and significantly reduces labour costs as well.

Custom dental crowns are another case in point. Using traditional production methods, a dental technician can produce about 20 crowns a day. With AM, the number jumps to 450.

AM can also trim costs and reduce supply chain risk for products with long manufacturing lead times or that serve remote locations. The US military is a prime example. Experimenting with AM, the military discovered that it could produce field surgical kits on demand in remotely located combat hospitals. The advance allows the hospitals to reduce the cost of maintaining buffer inventories while increasing the availability of those kits. The result is lowered risks to injured soldiers on the battlefield.

So in conclusion, AM is a powerful technology, but it is no panacea. To capitalise on its potential to achieve specific business and operational outcomes, chief financial officers and business leaders need to answer these questions:

- How can products and components be redesigned using AM to reduce material and assembly costs?
- Can AM improve product performance and/or reduce production quality issues?

• What supply chain challenges, such as speed to market, can AM help surmount?
• The competition is certainly asking these questions. Thus, although AM will not change everything right way, its impact is growing and time is of the essence.

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