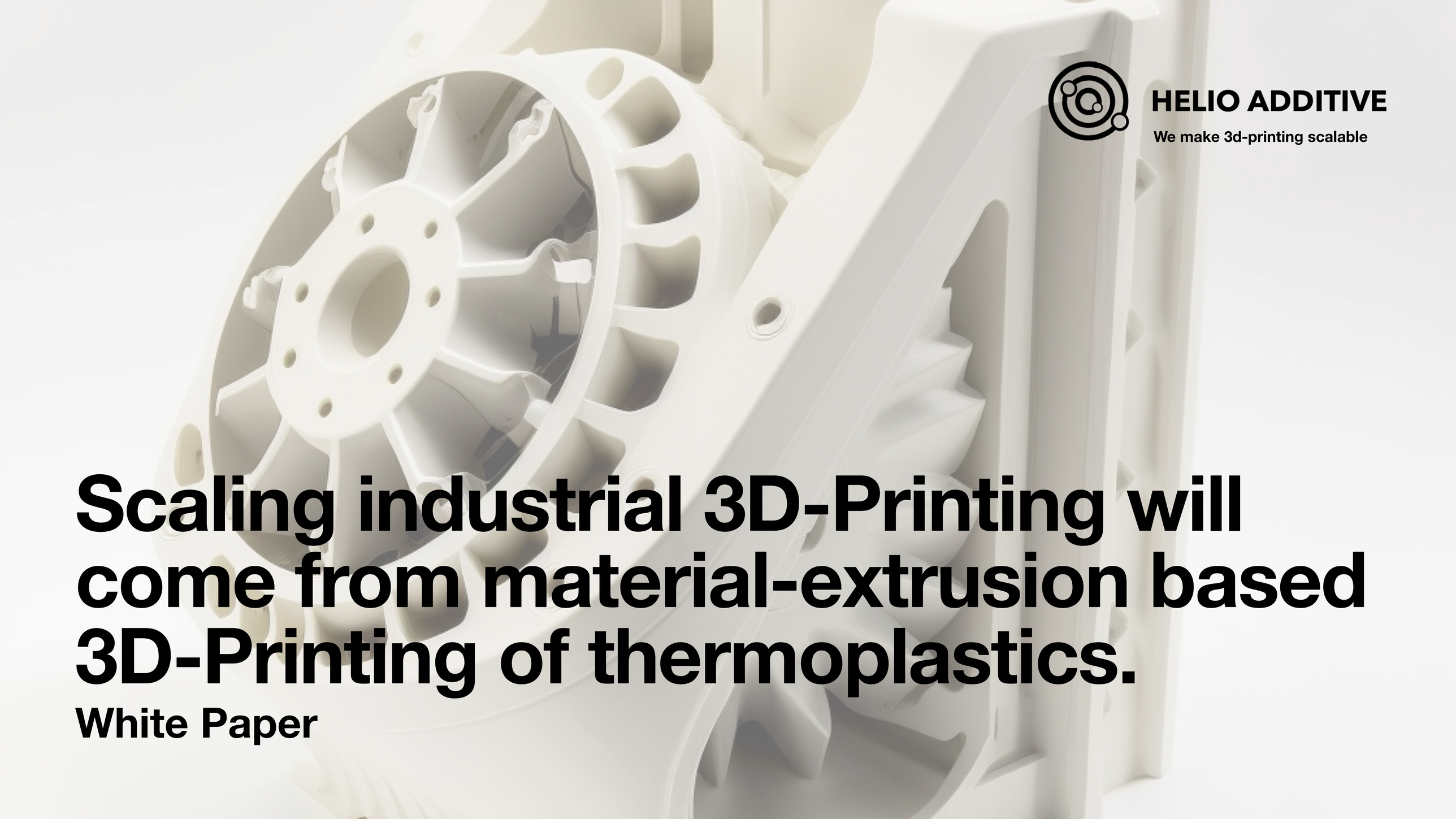

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We make 3d-printing scalable

Scaling industrial 3D-Printing will come from material-extrusion based 3D-Printing of thermoplastics.

White Paper

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‘Slicing’ the 3d-printing market doesn’t have to be complex.

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A factory of the future.

- The factory of the future will heavily rely on 3D printing technology.
- Comprehending the current market and predicting its future trends is challenging due to:
  - Multiple printing technologies.
  - Various material types.
  - Numerous applications that are all blended together.
- Despite its complexity, understanding 3D printing technology does not have to be challenging.

Of 10m 3d-printers in the wild, over 90% are material-extrusion based.

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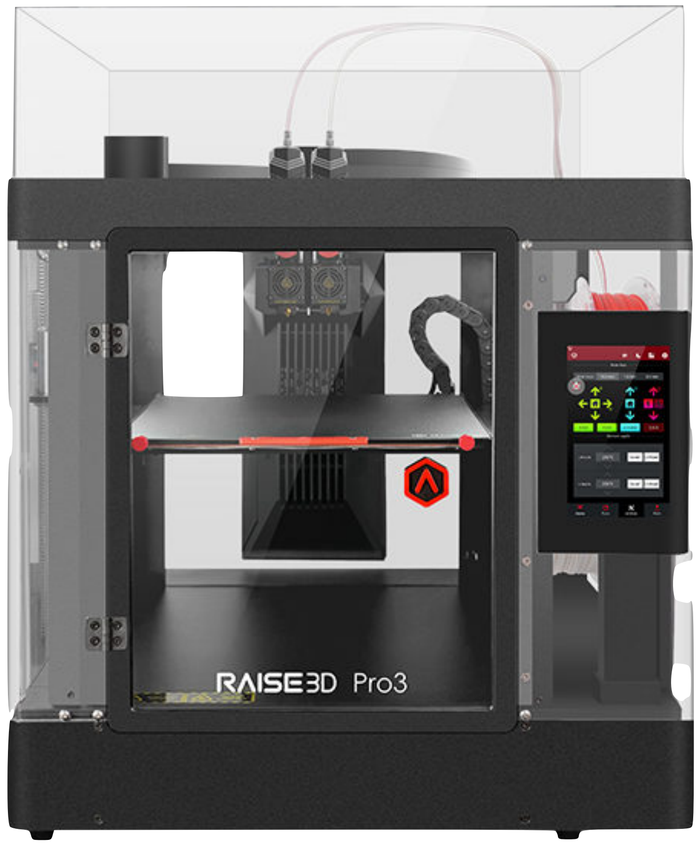

Raise3D Pro 3

- There are over 200,000 industrial 3D printers available from companies such as Stratasys, Raise3D, and BigRep.
- Industrial and consumer 3D printers have similar capabilities, making it challenging to distinguish between them.
- Stratasys, the largest printer manufacturer by sales, and Creality, the largest printer manufacturer by units sold, are both material-extrusion-based printer companies that use thermoplastics.

3d-printing price performance is growing exponentially.

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	Cost (averages) for equivalent functionality	Scale
3D printing	$40,000 (2007) to $100 (2014)	400x in 7 years
Industrial robots	$500,000 (2008) to $22,000 (2013)	23x in 5 years
Drones	$100,000 (2007) to $700 (2013)	142x in 6 years
Solar	$30 per kWh (1984) to $0.16 per kWh (2014)	200x in 20 years
Sensors (3D LIDAR sensor)	$20,000 (2009) to $79 (2014)	250x in 5 years
Biotech (DNA sequencing of one whole human DNA profile)	$10 million (2007) to $1,000 (2014)	10,000x in 7 years
Neurotech (BCI devices)	$4,000 (2006) to $90 (2011)	44x in 5 years
Medicine (full body scan)	$10,000 (2000) to $500 (2014)	20x in 14 years

Declining costs
/
Increasing capabilities

- 3D printing had a 400x increase in price performance between 2007 and 2014.
- The trend of advancements in 3D printing has continued with high-speed printing and other developments.
- The increase in performance was triggered by patent expiry, better software, better materials such as thermoplastics (PC, ABS, TPU), and the use of new sensors.

From Exponential Organisations, Malone, Ismail & Van Geest

The 3d-printing market size is growing fast at ~25% per year.

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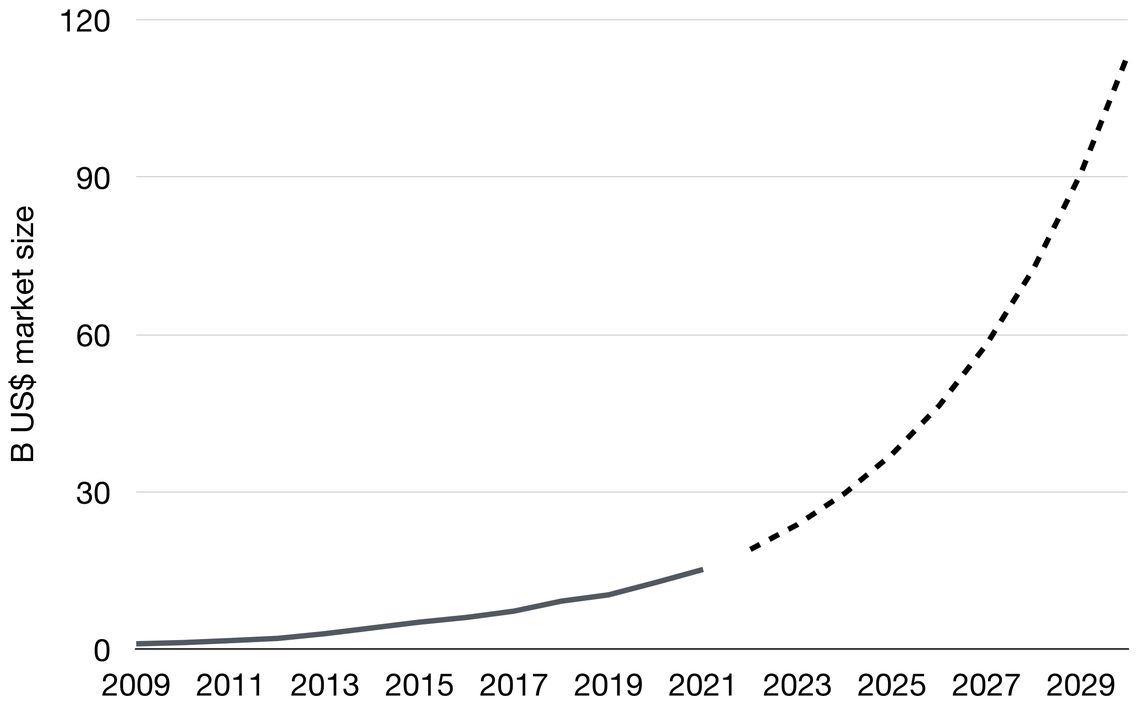

- Average market growth rate for the 3D printing industry was around 25% between 2009 to 2021.
- If the growth rate continues, the industry is projected to surpass $100 billion by 2030.
- It is possible that the industry is currently at the beginning of the exponential curve of growth.

Data aggregated from different market studies. Forecast is an continued extrapolation with constant growth rates.

3d-printing will have a major impact on the future of manufacturing.

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Another factory of the future.

- According to a study conducted by TU Delft, 3D printing can reduce energy consumption by up to 27% compared to traditional manufacturing methods.
- 3D printing can enable communities affected by climate change to access local manufacturing, allowing them to maintain their infrastructure.
- 3D printing's ability to create new geometries opens up opportunities for manufacturing entirely new types of objects, such as mechanical meta materials.

3D-printing is still young, and growth will accelerate.

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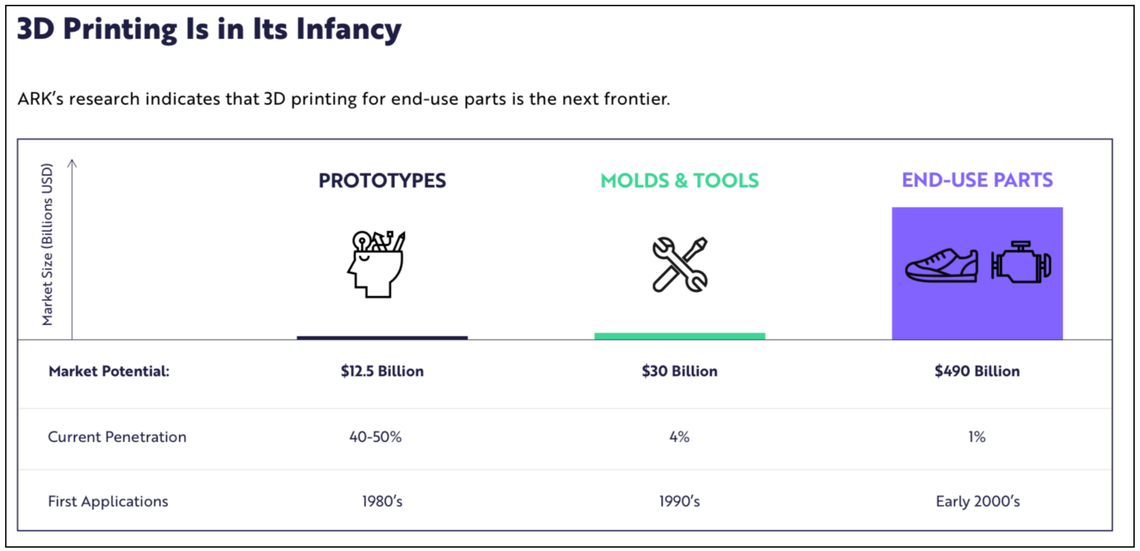

Ark Invest 2021 'Big Ideas' industry presentation

- The market penetration for 3D printing is still relatively low, indicating a significant opportunity for growth in the industry.
- In 2021 and 2022, there has been a marked increase in 3D printing projects focused on producing end-use parts. This is likely due to the disruptions in the global supply chain and an increased demand for localized manufacturing.
- 3D printing has emerged as a viable solution to meet the demand for on-demand production and supply chain resiliency.

End Use Parts Market is the future of 3d-printing.

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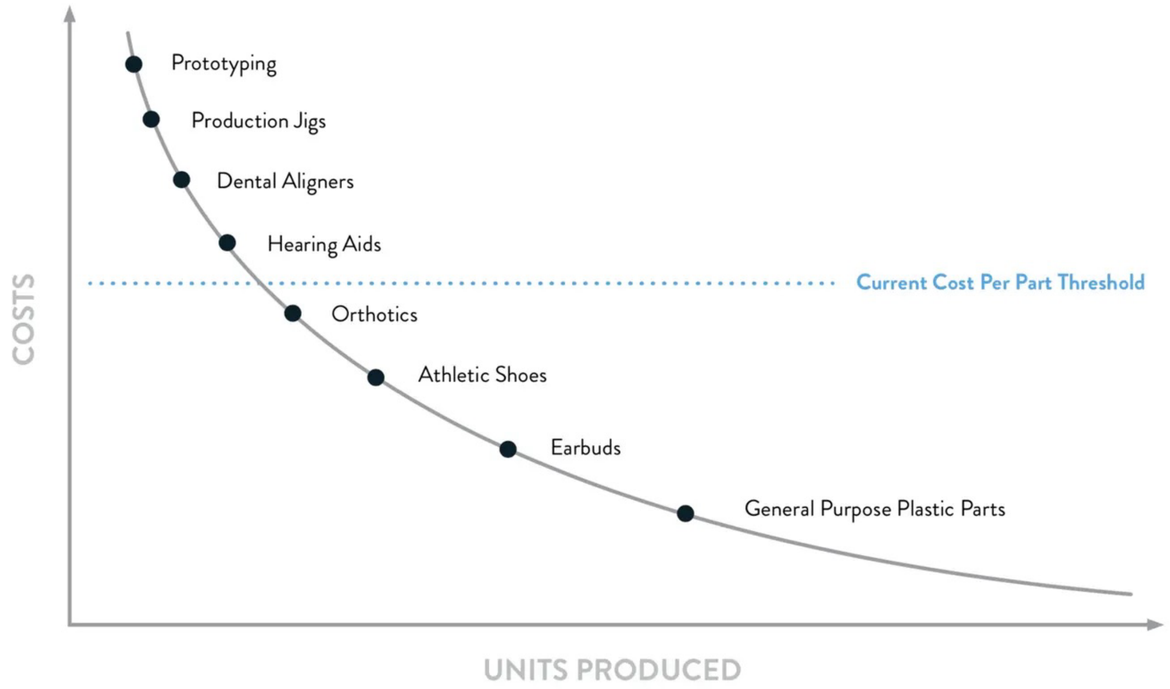

Formlabs visualisation of the cost curve. Values are indicative only.

- There's a growing need for 3d-printed end use parts with engineering thermoplastics (ABS, PC, PA etc…).
- An important challenge for the 3d-printing industry is to reduce the cost versus injection holding (increase price performance).
- We've been approached by companies asking us to set up micro-factories in industries such as automotive using thermoplastics.

Right-to-Repair laws are driving opportunities for polymer 3d-printing.

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Appliances

Plastic spare parts for broken home appliances

- Each year, Europeans produce more than 6.5 million tons of electrical waste. About half of that junk is due to broken household appliances, and the EU recycles only about 40% of it, leaving behind huge amounts of potentially hazardous material.
- New ‘right of repair’ laws in the EU make it a requirement by law that manufacturers provide spare parts too consumers, tying up hundreds of millions in inventory.
- Companies like Ouroboros solve this problem by allowing consumers to access spare parts locally, manufactured just in time, using microfabs at a fraction of the working capital.

Conceptual company ‘Ouroboros’ tackles the electrical waste market with 3d-printing of spare parts.

- The European Union has taken steps to protect consumers from forced obsolescence, ensuring that products are designed to last longer and be more easily repairable.
- As a result, the market for spare parts, particularly those that can be produced using 3D printing, is growing rapidly.
- These spare parts and replacement components are often made from engineering thermoplastics such as PC and ABS, which are well-suited for 3D printing applications.

Material-extrusion based 3d-printing with thermoplastics brings scale.

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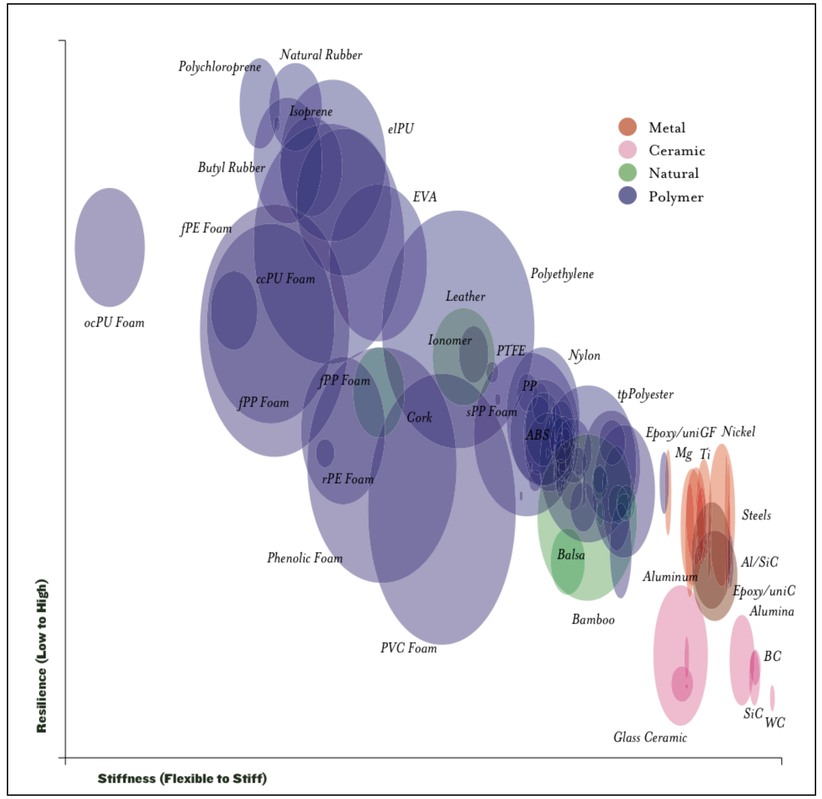

Ashby & Johnson, materials & design

- Brittle PLA is often used as a starting point for those interested in material extrusion-based 3D printing due to its relatively low cost and ease of use.
- While more difficult to print than PLA, engineering plastics offer higher performance and allow for a wider range of real-world applications.
- Many of the products that consumers use in their daily lives, such as cars, appliances, and electronics, are composed of engineering thermoplastics.

Material-extrusion based 3d-printing works at a wide range of sizes.

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- 3d-printed parts often have to be larger than what other 3d-printing processes can easily handle.
- From bridges to door panels, material-extrusion based 3d-printing offers a variety of scales.
- These parts also require the mechanical performance that engineering thermoplastics can provide.

Big Area Additive Manufacturing (BAAM)

Consumer 3d-printing is an exciting wild card for industry growth.

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Bambulab X1 Carbon

- The latest generation of material-extrusion-based 3D printers designed for consumers offers push-button performance, making it easier than ever for individuals to create high-quality prints at home.
- This technological innovation in desktop 3D printing is expected to drive adoption and spur further advancements in the field.
- BambuLab, which is a leading manufacturer of these consumer-grade 3D printers, is a primary example of this trend.

Helio Additive’s software solves process complexity to increase price performance.

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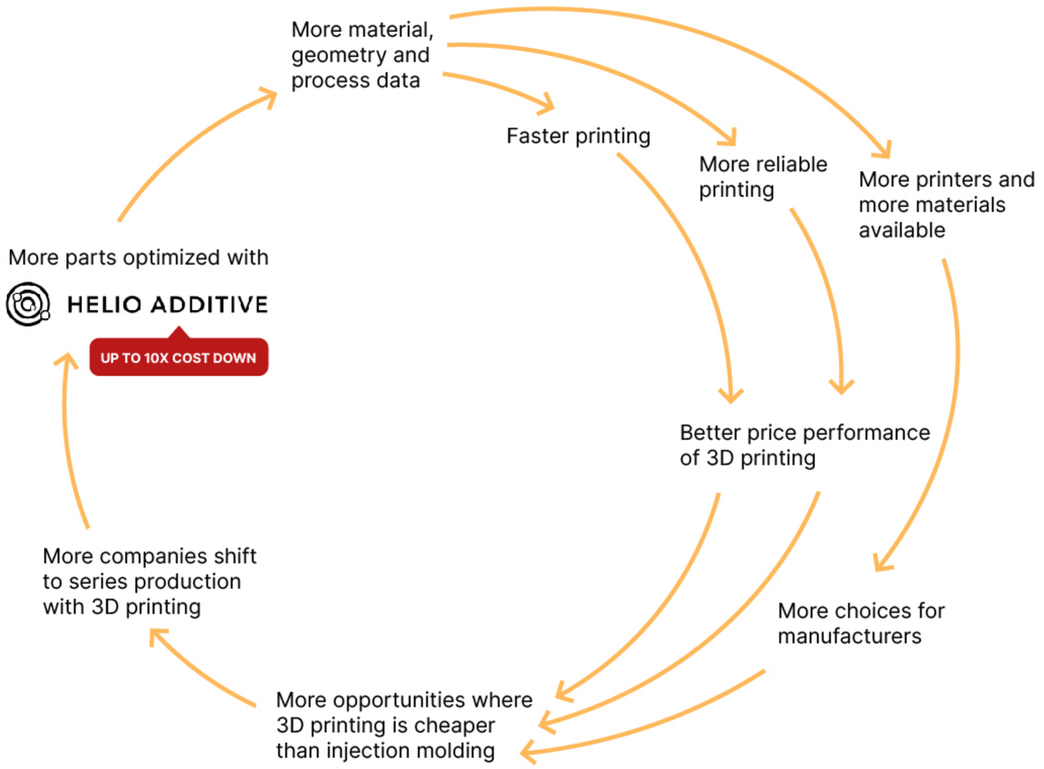

Helio Additive helping drive industry growth.

- Helio Additive's primary objective is to develop technology that makes 3d-printing scalable.
- To achieve this goal, the company has focused on owning and understanding the underlying physics of the 3D printing process.
- The company's alpha product, Dragon, uses a voxel-level physics model to predict the 3D printing process and enable more informed printing parameter decisions, which can significantly reduce costs.

Partner with Helio Additive and make your 3d-printing scalable.

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Dragon I dashboard

- We want you to be part of our journey to revolutionise 3D printing. Join us as our foundation customer or technology partner. Here's how you can engage with us:
  - Visit our website at www.helioadditive.com to learn more about our products and services.
  - Reach out to us at info@helioadditive.com to discuss how we can collaborate and address your specific needs.
  - Be part of the next generation of 3D printing and experience the benefits of our innovative technology.