

ADDITIVE MANUFACTURING

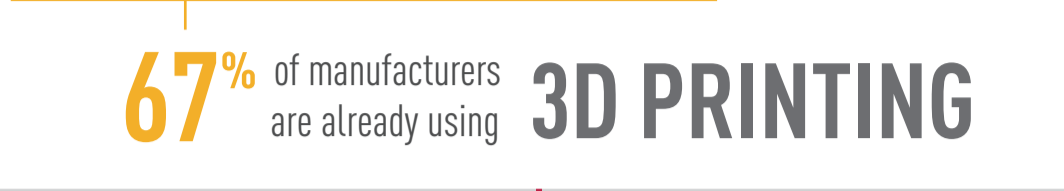
BREAKING THE MOLD OF TRADITIONAL MANUFACTURING



Additive Manufacturing is Transforming the Industry

With proven successes producing high-quality molds, tooling, manufacturing aids and more, manufacturers from all industries are now scrambling to figure how to incorporate this new technology. As with any major change, the challenges are twofold: **changing the way you think and act**, and **having the right tools to enable your success**.

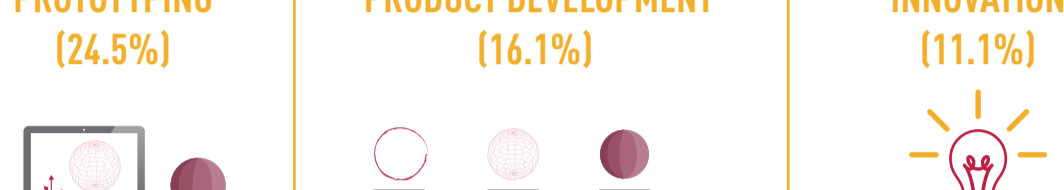
PwC estimates...



Of these

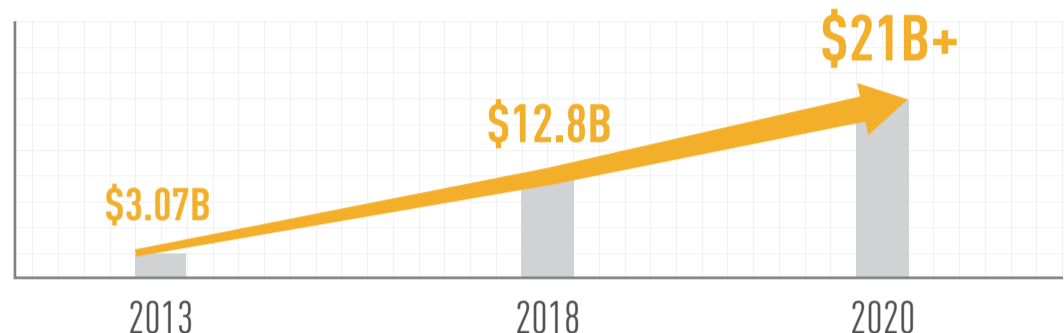


Companies are pursuing 3D printing for

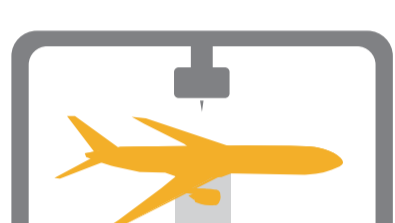


And the Outlook for Additive Manufacturing is Promising

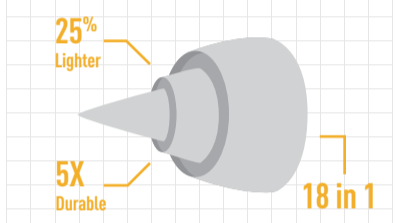
Anticipated Growth for the 3D Printing Industry



BOEING
Boeing has already installed over **200 different types** of flying production parts on **16 different aircraft**.



GE Aviation
GE Aviation created an entirely new nozzle design that consolidates **18 separate parts into 1**. The new nozzle is **25% lighter** and **5 times more durable**.



Everyone Knows Design for Manufacturing Has Its Perks

With fewer restrictions, engineers can design high-quality products that can be produced **more efficiently** and with **fewer costs**.

- **Design Freedom** – Manufacture products that you could never manufacture before
- **Model Optimization** – Starting from topological optimization becomes practical
- **Faster Manufacturing** – Faster time to market
- **Weight Reduction** – Material optimization and hollow parts with an internal lattice
- **Waste Reduction** – Reduces raw material costs
- **Costs Reduction** – Expensive tooling and tooling lead time become unnecessary



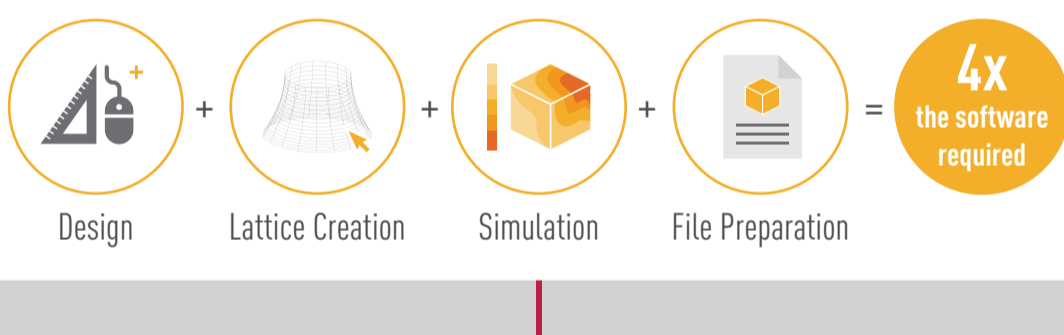
High material utilization wastes **less than 10%** of material.

But Some Companies are Getting Stuck in the Transition

The design and process flexibility afforded by 3D printing is constrained by traditional manufacturing technology and processes.

- Innovation is stifled as engineers design for traditional manufacturing methods
- Productivity drops due to trial and error printing
- Additional software is required to define internal lattices, run simulations, and prepare files for printing
- Modifying parts after topological optimization is difficult

Users may need up to **4 different types of software** to print 3D models



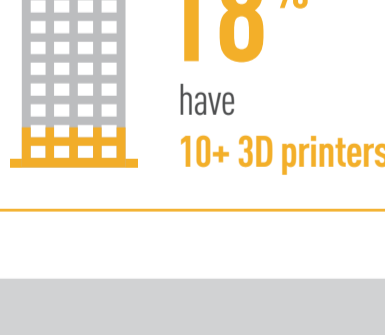
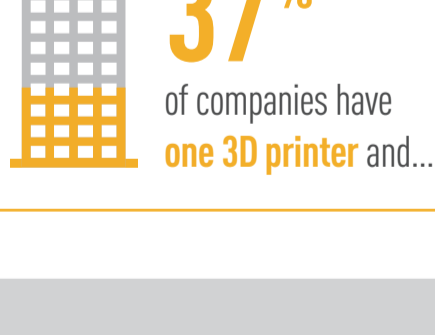
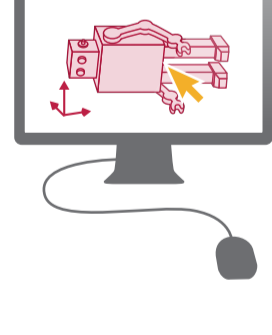
The average number of 3D printers per organization was **5.4**

Lucky for You, PTC® Has a Solution!

PTC's vision is to close the current gap between design and the 3D printer so that design, simulation, and printing form an intuitive, seamless process. Check out the new capabilities available in PTC Creo!

Design Faster

- **Connect Printers** – Define settings for multiple printers
- **Print Parts & Assemblies** – Print models created in Creo Parametric using STL (stereolithography) files as an input
- **Correct Issues Faster** – Easily modify the model in parts and assemblies mode
- **Define Finishes** – Assign materials, colors, and a glossy or matte finish to the model*



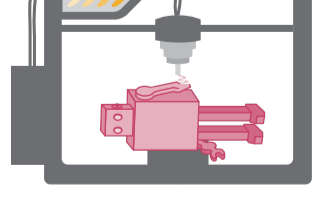
Validate Better

- **Validate Printability** – Identify thin walls and narrow gaps on real geometry to increase accuracy
- **Print Preview** – Scale, position, and show a clipped view of the model and probable support material on the tray
- **Optimize Positioning** – Automatically optimize the position of the model in the tray for printing*
- **Document Final Design** – Save the CAD data, model translation, and position in the tray as one STL file**



Print Smarter

- **Calculate Material** – Calculate the required amount of build and support materials*
- **Print Faster** – Print the equivalent of two layers of material at a time to reduce estimated build time*



Learn More About How PTC Helps You **Think Differently** and **Design Efficiently** with PTC Creo

www.PTC.com/cad/3d-design/design-for-additive-manufacturing

*Features available when using Stratasys Connex printers only.
** The quality of a printed model is set by the STL file resolution.
Sources:
- PwC Technology Forecast The Future Of 3-D printing: Moving Beyond Prototyping To Finished Products (http://www.pwc.com/en_US/us/technology-forecast/2014/3d-printing/features/assets/pwc-3d-printing-full-series.pdf)
- Gartner Survey Reveals That High Acquisition and Start-Up Costs Are Delaying Investment in 3D Printers.
- Why 3D Printing Stocks Could Have a Tremendous Runway for Growth (http://www.foo.com/investing/general/2014/09/09/why-3d-printing-stocks-could-have-a-tremendous-run.aspx)
- Wohlers Associates, Inc.
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