Ultimaker guide


# 5 ways to stop wasting money on production processes

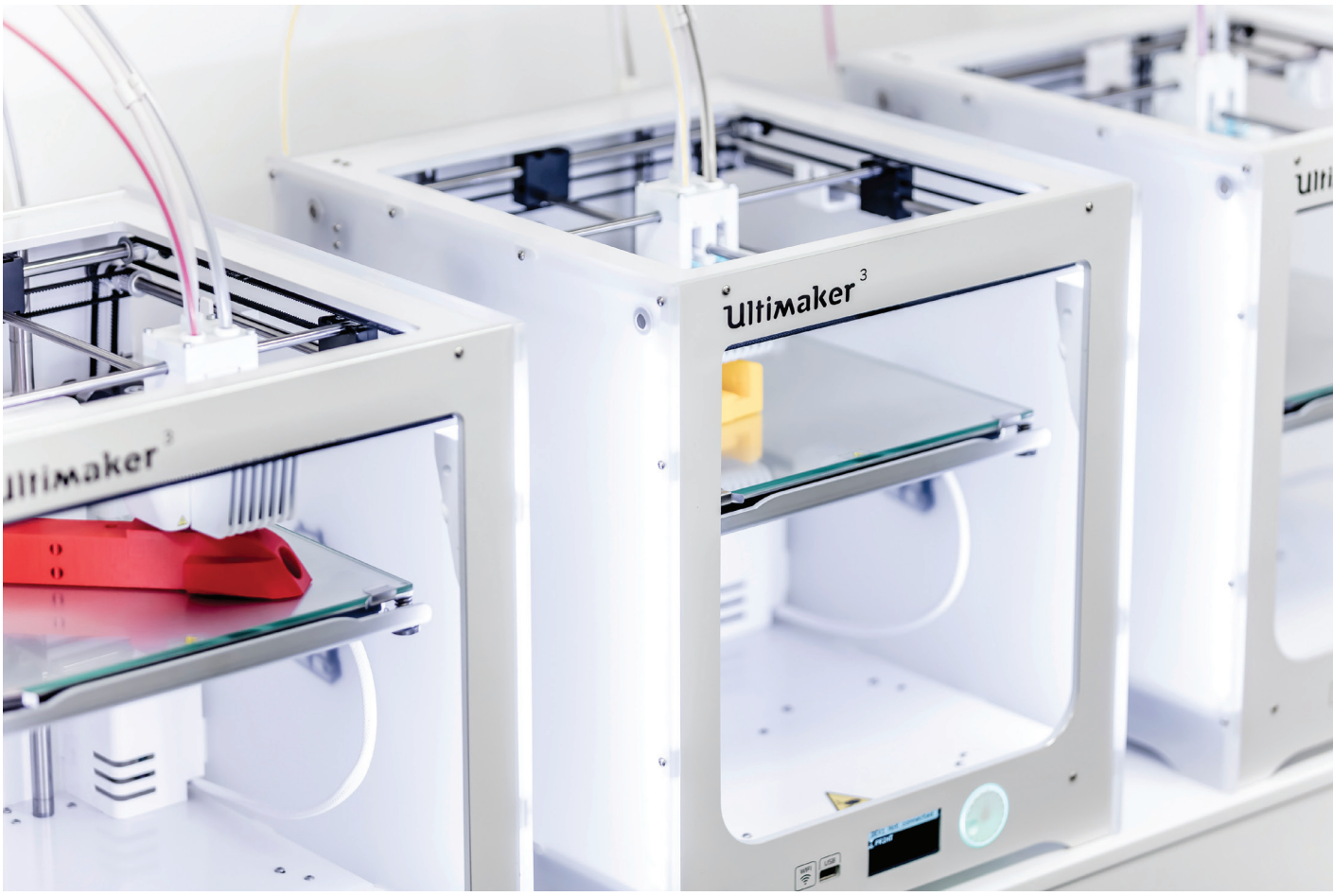


Ultimaker

# Introduction

## This guide will introduce five ways that easy-to-implement technology can help your business cut production costs and drive innovation.

FFF 3D printing – a digital technique that creates physical objects by adding layer after layer of material – is having a revolutionary effect on how production processes work. From automotive engineering to the beauty industry, well-known brands all over the world have gained a competitive edge by using 3D printing to reinvent processes, shrink production budgets, and accelerate product time to market.



# 1. Print tooling in-house

## 3D printed manufacturing aids help to elevate workfloor quality and effectiveness, and reduce costs.

Factories and workshops rely on manufacturing aids every day. Jigs, fixtures, and quality gauges facilitate fast machine setups, allow fewer deviations during assembly and fitting, hold parts securely, and streamline production line routines.

But manufacturing aids are often highly customized items. Outsourcing production to a third party results in lead times, added costs, weight, and storage considerations with each iteration, with a manufacturing process that is controlled entirely by the supplier. Any issues with a design will require the cycle to start again, and will impact product delivery.

3D printing gives greater flexibility to production tooling, removing common constraints, such as lead times, shipping, and other associated factors. As each item is produced locally, the manufacturing process is entirely under your control.

3D printed polymers offer a range of different properties, such as high toughness, high strength, flexibility, chemical resistance, and more. Materials are relatively inexpensive, allowing more extensive design iteration. If tooling changes are required, or the workfloor has suggestions of how to improve tool ergonomics, a design can be revised, 3D printed, and deployed in a matter of hours. If a part doesn't meet the right requirements for the application in practice, it can be reprinted with a stiffer or tougher engineering material. And if more parts are needed, a design can be reprinted as many times as you need.

**Streamlined production. Reduced costs.**

- Get ahead of the competition inexpensively – less than 1% of global manufacturing currently takes advantage of 3D printing technology
- Low production costs enable a greater range of applications than conventional production methods allow, with no compromises on ROI
- Items are easy to customize, refine, and adapt at minimal cost
- Tool development time shrinks from months to a matter of days
- Assembly line yield and production efficiency is improved in a cost-efficient way

Ford Motor Company were able to implement more than 50 3D printed tools for high volume production of the All-New Focus, with considerable cost savings per tool compared to conventional methods. The alignment tool pictured ensures that emblems and decals are consistent for each vehicle that rolls off the assembly line.

3D printed manufacturing aids are used by Volkswagen Autoeuropa to maximize production efficiency. An example of this is their wheel protector jig, which prevents scratches and damage to wheel rims and simultaneously aligns an operator's pneumatic impact gun to speed up the fitting processes and reduce wasted money from scrap costs.

| Wheel protector jig | External supplier | Ultimaker 3D printers |
|---|---|---|
| Cost per item | €800 ($900) | 21 ($24) |
| Development time | 56 days | 10 days |

Performing maintenance on complex and customized aircraft can be a huge challenge. By adopting 3D printing, The Royal Netherlands Air Force are able to affordably create tools in a matter of hours that fit specific applications. 3D printed parts cost approximately $10 to produce, whereas traditional methods can cost over $1,000 for the same part.


3D printed manufacturing aids make it easier, faster, and cheaper for world-leading beauty company L'Oréal to verify that product packaging is consistent. This gauge ensures that labels are positioned correctly on each item, so that there are no deviations when products hit the shelves.

## 2. Validate designs faster

Keep your products relevant to rapidly changing consumer trends. 3D printed prototypes are cheap to produce and reduce the steps of conventional processes, allowing you to verify your design before investing further.

In-house 3D printing speeds up prototyping cycles so that your products reach the market faster. Dimensionally accurate and functional 3D printed prototypes are inexpensive to produce, and can be shared with clients and customers to test form, fit, and function. A refined 3D printed prototype can also give other internal stakeholders a head start on marketing communications and sales strategies – before the first production item is manufactured.

Polymers such as nylon or polypropylene can be 3D printed, so in some cases you can test prototypes with the same material properties as the final product. Items intended for production with expensive materials, such as precious metals, can first be produced as an inexpensive 3D prototype in order to verify their physical characteristics. 3D printing can also be used for mold making, or for other considerations that are external to a product itself, such as packaging prototypes.

**Faster prototyping. Better end products.**

- Be confident of a product concept before investing in any expensive production tooling
- Prove a concept works before producing it with more expensive materials, such as metal
- Prototype with the same materials as production items, like nylon or polypropylene

British manufacturing company Sylatech use 3D printing to verify that pre-production items are dimensionally accurate and function as intended. When the design requirements are satisfied, these items are then used to manufacture precision metal parts through investment casting.

| Yacht propellor | Conventional tooling | Ultimaker 3D printers |
|---|---|---|
| Project cost | £17,100 ($22,500) | £660 ($860) |
| Project development time | 4 weeks | 5 days |

*Image courtesy of L'Oréal*

Before adopting 3D printing, L'Oréal could spend **as long as 18 months on product development** for packaging prototypes. Now, designs can be validated in a matter of days.

Ukrainian pastry chef Dinara Kasko produces highly unique and artistic desserts, and uses 3D printed concepts to verify her designs. Printed items are then used to create silicone molds that are filled with ingredients to make the final dessert. The iterative freedom that 3D printed prototypes allow has also been instrumental in developing her own line of branded dessert molds.

## 3. Create customized end-use parts

### Custom 3D printed parts can be manufactured at low cost, so if you think you can improve existing products, you can.

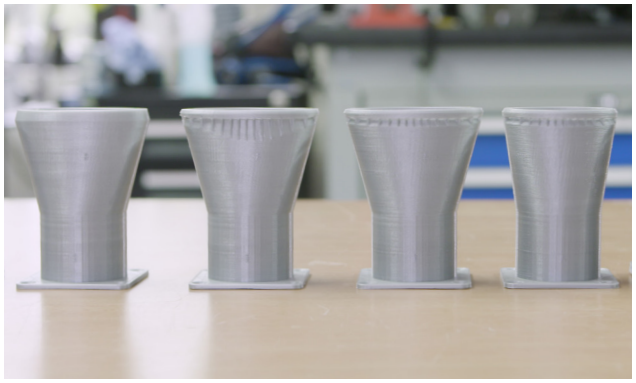
Have you ever needed to repair off-the-shelf products or machinery made up of parts that are expensive to replace, or that are discontinued? 3D printing enables quick, high-quality parts that can be deployed as functional objects.

Conventional methods, like injection molding, must follow restrictive design-for-manufacturing rules. With 3D printing these rules change drastically, allowing more exotic and efficient geometries, which can also leverage generative design, which improves structural performance, saves material use, and shortens the design-to-manufacturing cycle.

The range of available 3D printing materials is expanding every day, so whether you need reinforced, ESD-safe, chemical-resistant, or other types of engineering-grade materials, it's very likely that your application is covered.

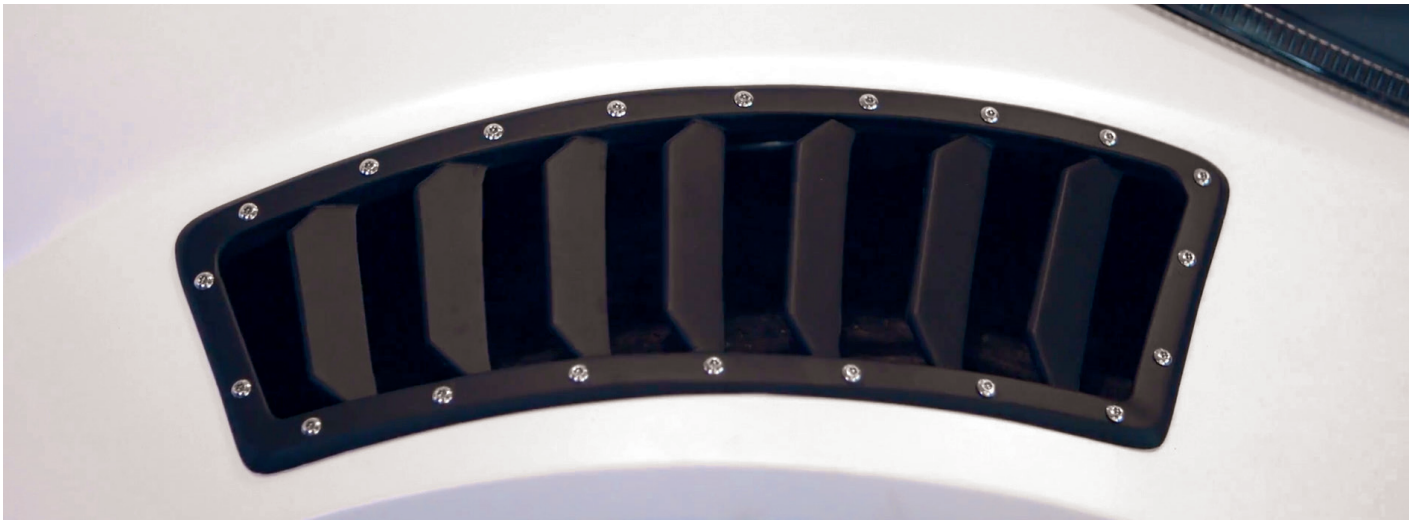
**Flexible manufacturing. Bespoke solutions.**

- Create complex parts quickly and cheaply
- Remove the limitations of outsourcing and design for manufacturing
- Benefit from an iterative design approach

If you've seen snow in any recent film or television production, 3D printing has likely played a part. Snow Business, based in the UK, is the world's biggest supplier of winter special effects to the film and television industry. The diffusion nozzle is a critical part of their snow machines. After years of R&D development, this nozzle has a liquid and airflow geometry so complex that it can only be made by 3D printing. An iterative design approach has enabled their R&D team to produce realistic-looking snow effects, with functional 3D printed parts deployed and used on set.

| 3D printed nozzle | SLS service | Ultimaker 3D printers |
|---|---|---|
| Cost per iteration | £125 ($160) | £2.50 ($3.20) |
| Lead time | 7 days | 7 hours |



Before 3D printing, aftermarket car part manufacturer Tucci Hot Rods would fabricate custom aluminum or plastic parts using laser cutting and CNC milling techniques, or create custom pieces by hand, which was expensive, time consuming. They also had no guarantee that a part would fulfill its purpose until it was manufactured and tested. 3D printed parts reduce the design-to-manufacture cycle, have the right properties to deploy as an end-use part effectively, and are more cost-effective to produce compared to conventional methods.

## 4. Accessible, scalable manufacturing

Manufacturing is an industry that operates with razor-thin margins. In the past this has often led to outsourcing overseas where labor rates are cheaper. 3D printing reduces the need for this.

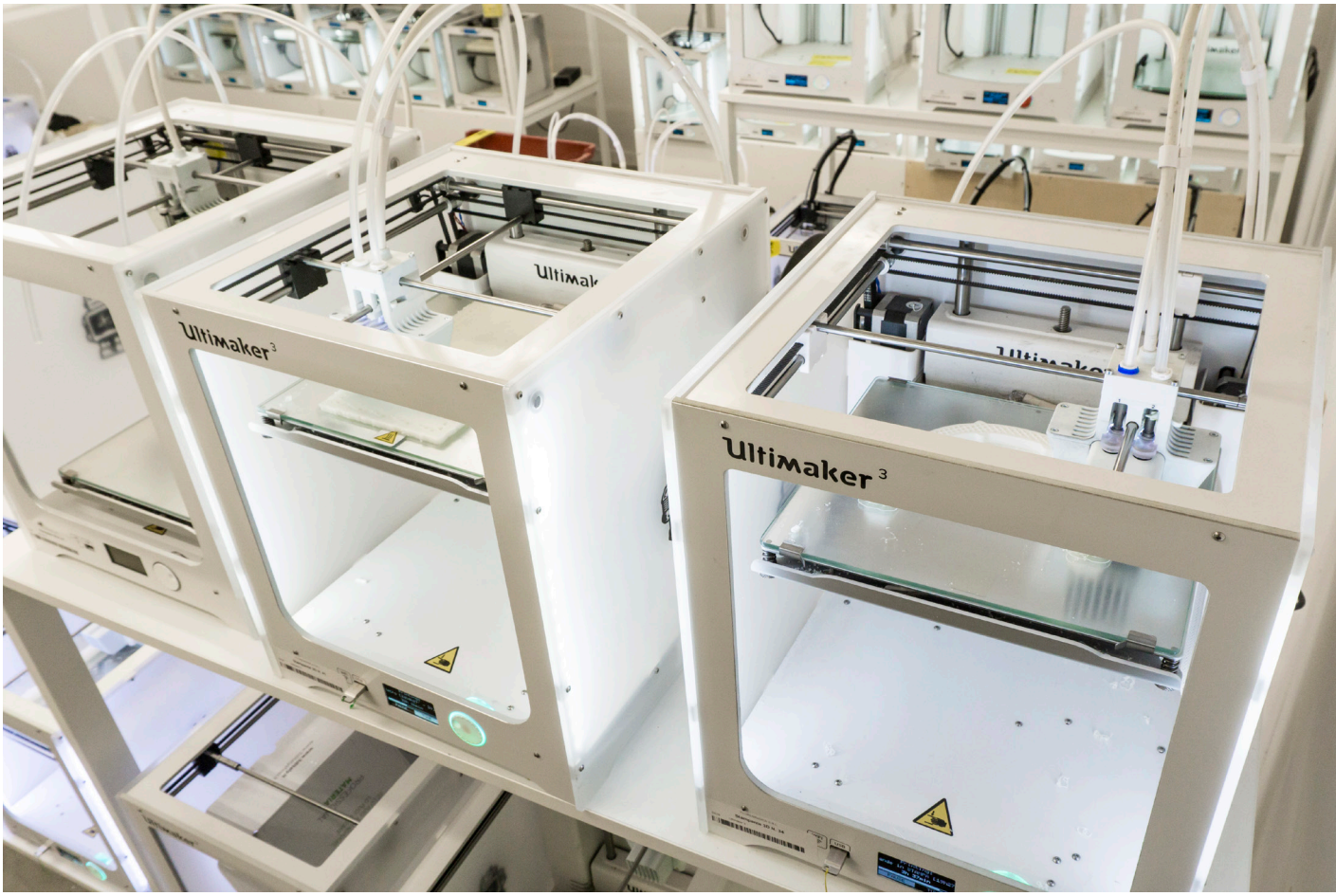
3D printing is the most versatile of all manufacturing processes, and can produce a greater range of shapes than any other technology. Without the need for fixed tooling or other subtractive manufacturing constraints, 3D printing deposits material only where it is needed. This results in less waste and fewer transportation costs.

Conventional manufacturing equipment relies on specialized calibration and trained staff to operate. Desktop 3D printers make manufacturing accessible to anyone. Ultimaker 3D printers are designed to be easy and safe to use, and common configuration and maintenance operations are automated, so you don't have to be technically proficient to use them. 3D printers manufactured by Ultimaker have undergone strict testing to be compliant with international standards for safe unattended use, so you are safe to leave them to do their job, while you do yours.

Software built into each network-enabled Ultimaker 3D printer makes it possible to set up and operate a short-run production facility right inside your warehouse. Using this software, grouped 3D printers can coordinate with each other and process a queue of jobs in order to manufacture items in parallel, to efficiently meet demand. Key analytics, such as print time, material use, and more are securely logged and made available, so that you can keep track of processes, and forecast supplies effectively. All of this can be controlled by one person from a single interface, such as a laptop, smartphone, or tablet. With a fully featured app and cloud connectivity, you are also able to start jobs, track the progress of your print jobs, and receive status notifications outside of your local network.

**Scale-up for less**

- 3D printers can produce a variety of different shapes without the need to change tooling
- Transportation and waste disposal costs are less compared to subtractive methods
- The ease-of-use of Ultimaker 3D printers enables you to spend less on skilled labor
- Ultimaker 3D printers are compliant with international standards for safe unattended use
- Network-enabled Ultimaker 3D printers are an automated and scalable production solution




Italian fashion brand Florenradica has leveraged the versatility of 3D printing to produce varied items for a range of fashion houses. To meet the fast-paced, rapidly changing demands of the fashion industry, they have scaled their 3D printing operation using a group of 50+ Ultimaker 3D printers, which work together in parallel for maximum efficiency. Other forms of manufacturing equipment need a trained operator per machine, or require tooling changes for different production items.

# 5. Simplify model making

## Free up time to develop your concepts by letting the 3D printer do the hard work for you, one, or twenty times – whatever you need.

Model making is an essential step in architecture, product design, and other creative industries. These industries already rely on CAD modeling to convey ideas, so converting this data into something that can be 3D printed is a simple process. 3D printing models removes time-consuming and labor-intensive characteristics of conventional model making, doesn't require skilled labor, and creates less waste than conventional methods, like foam or woodworking.

Architects are rapidly adopting 3D printing to create intricate prototypes, and no longer need to compromise on model detail or accuracy, all while saving time and costs in the process. From small models to huge context models, precise, detailed prototypes can be accurately produced by a 3D printer in a matter of hours, and then duplicated when needed.

Clients can look at, touch, and feel concepts to get a clearer idea of the spatial relations of a design – more than they would by simply looking at CAD designs on a screen. And if ideas need to be communicated rapidly across a large distance, CAD data can be shared and printed at each location.

**Clearer concepts. Meaningful innovation.**

- Clearly and accurately communicate an idea with a model produced directly from your CAD data
- Create complex geometries that are normally difficult to make by hand, with detail at large or small scales
- Shrink development processes from months to just days
- Duplicate models as and when needed

Make architects in London used to contract out their model making. A third-party supplier would build feasibility study models from timber at a cost of approximately £20,000 ($26,500) and up to six weeks to complete. Using 3D printing, hundreds of **individual structures can be produced in two days at a cost of £2,000 ($2,650) for labor and materials, and a build time of two weeks.** An iterative design approach also adds value, allowing Make to better communicate and refine their ideas to partners and stakeholders.

London-based MATT architects uses 3D printing concept models to communicate complicated ideas to their clients. Previously they used hand-made paper or cardboard models, which was a labor-intensive process that took time to produce, and limited the range of ideas that could be conveyed. Now they can have high-detail concepts in a matter of hours.

| Cityscape models | Conventional model making | Ultimaker 3D printers |
|---|---|---|
| Cost per model | £400 ($520) | £15 ($20) |
| Iterations per model | 1-2 | 3-4 |

**Don’t let the hurdles of manufacturing slow down your good ideas.**
At Ultimaker, we understand the need to keep workflows and production budgets under control, so we have built an integrated solution of 3D printing hardware, software, and materials to reduce the hurdles of manufacturing. Every day, over 300,000 designers and engineers around the world rely on our solution to improve their processes through local digital manufacturing, so that they can spend time on what matters most – innovating.

## Explore more 3D printing knowledge

You can learn more from industry leaders and experts,
and compare the specs of our 3D printers on the Ultimaker website.

Read more 3D printing knowledge

Take the next steps with 3D printing


**About Ultimaker**

Since 2011, Ultimaker has built an open and easy-to-use solution of 3D printers, software, and materials that enable professional designers and engineers to innovate every day. Today, Ultimaker is the market leader in desktop 3D printing. From offices in the Netherlands, New York, Boston, and Singapore – plus production facilities in Europe and the US – its global team of over 400 employees work together to accelerate the world's transition to local, digital manufacturing.