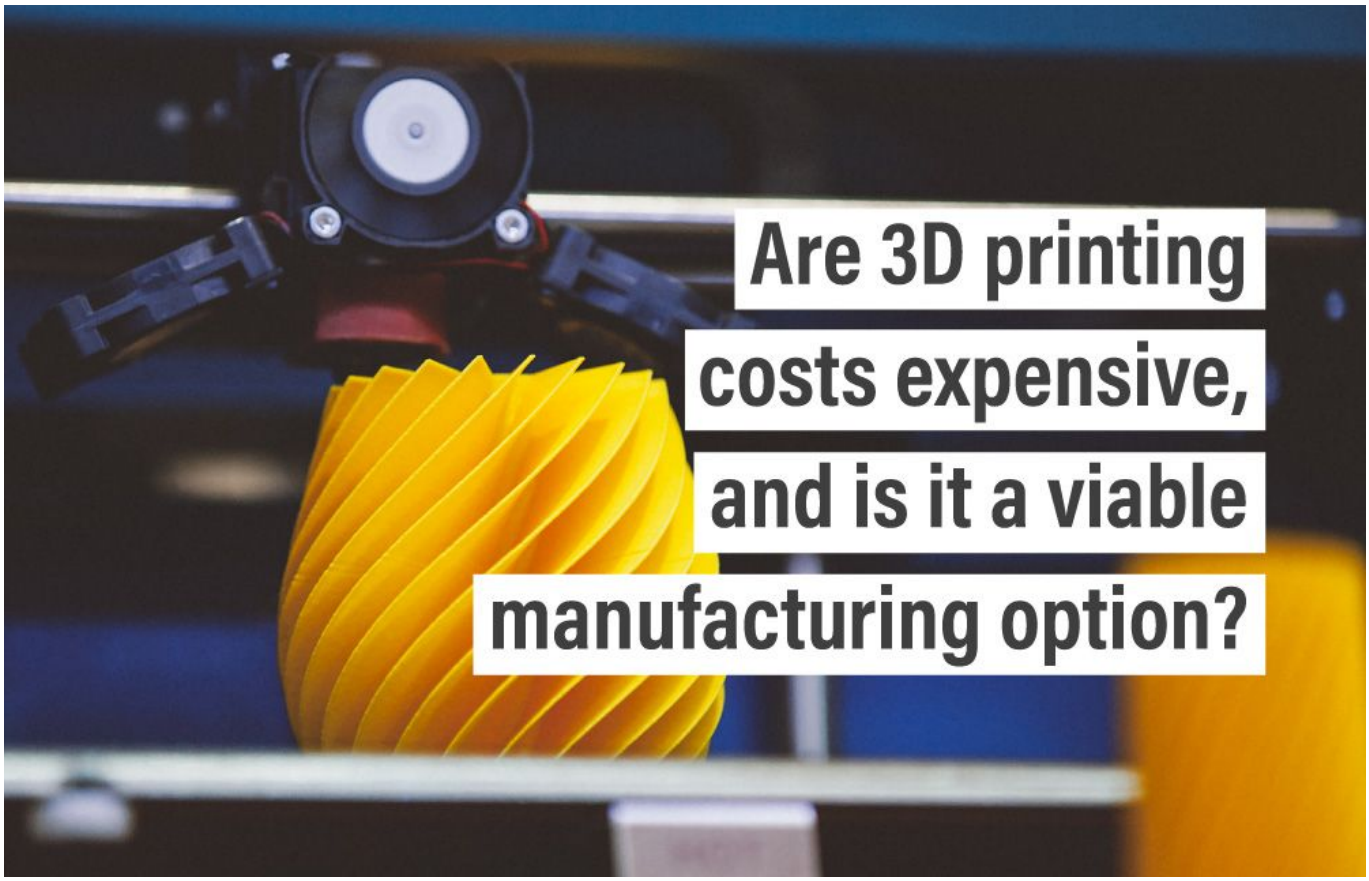
Are 3D printing costs expensive, and is it a viable manufacturing option?



Are 3D printing costs expensive, and is it a viable manufacturing option?

Reading time 20 mins

Key Points

- 3D printing is creating three-dimensional objects from a digital model or file. It is gaining popularity across diverse industries such as healthcare, aerospace, automotive, education, consumer products, architecture, and robotics.
- One of the most significant advantages of 3D printing is its versatility and ability to use a wide range of materials (e.g. plastics, metals, ceramics, and composite materials).
- Factors that affect 3D printing costs: Choice of materials, printer type, print volume, printing speed and resolution, design complexity, and post-processing (e.g. sanding or assembling different parts).
- Benefits of 3D printing: Customisation, speed, cost, flexibility, and short lead times. In addition, it generates less waste and enables the recycling and repurposing of materials, thus promoting sustainability.
- Challenges to 3D printing: Limitations on the materials that can be used and the size of the object that can be printed. Large-volume print runs can impact quality control and cost.
- The cost of 3D printing and viability as an option for full-scale product manufacturing can vary greatly.
- Service bureaus and product design agencies are an affordable option for entrepreneurs and small businesses seeking flexible and fast 3D printing services without compromising on quality.

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Get in touch

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In recent years, 3D printing has gained significant popularity as a versatile technology with the potential to revolutionise various industries. While it offers immense potential for innovation and rapid prototyping, many entrepreneurs and small businesses in the UK are concerned about 3D printing costs and whether that makes this technology a viable option for manufacturing.

At Ignitec, our investment in a multi-material 3D printing machine was costly, but it paid off, and our clients are reaping the rewards! Prototypes with the look and feel of the manufactured end-product can sometimes be built in minutes, allowing clients and our designers to test, iterate, and improve products much faster and less expensively than we could otherwise. If you're keen to explore 3D printing and the in-house manufacturing services we provide, contact us for a free and confidential consultation with an expert on our design team.

This article is a guide to everything you need to know about 3D printer technology. We'll explain the different types of 3D printing, the materials used in the process, the benefits and challenges of using it for manufacturing, and the industries adopting it. This will explain why 3D printing costs can vary significantly but also give you some options to get it done inexpensively.

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What is 3D printing, and how does it work?

3D printing, also known as additive manufacturing, creates three-dimensional objects from a digital model or file by building up successive layers of material.

One of the biggest advantages of 3D printing is its versatility and ability to use a wide range of materials. The materials that 3D printers most commonly use include:

- **Plastic:** The most commonly used plastics in 3D printing include ABS, PLA, Nylon, PETG, and TPU. These materials are popular because they are readily available, inexpensive, and easy to work with.
- **Metals** are becoming increasingly popular in 3D printing, with materials such as titanium, aluminium, and stainless steel. Metal 3D printing can be used to create complex shapes that are difficult or impossible to manufacture using traditional methods.
- Ceramic materials, such as alumina, zirconia, and porcelain, are used in applications that require high strength and resistance to heat and wear, such as medical parts and high-temperature aeronautical components.
- **Composite materials**, such as carbon fibre, fibreglass, and Kevlar, are used in 3D printing for applications that require high strength, stiffness, and resistance to impact.

Common types of 3D printing

There are several types of 3D printing, each with advantages and disadvantages. The most common types include:

- **Fused Deposition Modeling (FDM):** This is the most popular type of 3D printing. It involves melting a thermoplastic filament and extruding it through a nozzle to create the object layer by layer.
- **Stereolithography (SLA):** This method uses a laser to cure a liquid resin, layer by layer, to create a solid object.
- **Selective Laser Sintering (SLS):** This method uses a laser to sinter a powdered material, layer by layer, to create a solid object.
- **Direct Metal Laser Sintering (DMLS):** This method uses a laser to sinter metal powder, layer by layer, to create a solid metal object.
- **Digital Light Processing (DLP):** This method uses a digital light projector to project an image of each object layer onto a vat of photopolymer resin, which is then cured by a UV light.

Each method has benefits and limitations, and the choice of method depends on the specific application and the desired material properties.

Factors affecting the cost of 3D printing

1. **Choice of materials:** The type of material used significantly affects the 3D printing cost. Common materials like PLA and ABS are more affordable, while speciality materials such as metals and high-performance polymers are considerably more expensive.
2. **Printer type:** The cost of 3D printers varies widely, from affordable desktop printers for hobbyists to high-end industrial machines. The initial investment in a printer can be a substantial expense.
3. **Print Volume:** The size and complexity of the printed object will impact the cost. Larger and more intricate prints require more material and time, thus increasing the overall price.

4. **Printing Speed:** Faster print speeds often come with a higher price tag in terms of the printer's cost and operational expenses due to increased energy consumption.
5. **Post-Processing:** Depending on the desired finish, post-processing steps (e.g. sanding, painting, or assembling multiple parts) can add to the overall cost.
6. **Design Complexity:** The complexity of the 3D model affects printing time and material usage. Simplifying the design can reduce costs.
7. **Printing Resolution:** Higher-resolution prints demand more precise printers, which can be more expensive. However, lower resolutions may not achieve the desired quality.

Is 3D printing expensive in the UK?

The cost of 3D printing in the UK is relative and depends on various factors, as mentioned above. Here's a breakdown of the situation:

Affordable Entry-Level Options: There are numerous cheap desktop 3D printers in the UK market, catering to hobbyists, educators, and small businesses. These machines are reasonably priced and offer a cost-effective way to get started with 3D printing.

Material Costs: Basic 3D printing materials like PLA and ABS are generally affordable and widely accessible in the UK. However, exotic or speciality materials can be considerably more expensive.

Service Bureaus: For those who don't want to invest in a 3D printer, there are 3D printing service bureaus in the UK, such as the one we have at Ignitec. We offer printing services at competitive rates, allowing you to pay only for the prints you need without the upfront costs of a printer.

Long-Term Value: While the initial investment in a 3D printer might seem significant, it's essential to consider the long-term value. Owning a printer provides the flexibility to iterate designs and produce parts in-house, potentially saving money over time.

Industrial Applications: For industrial-grade 3D printing, especially in aerospace, automotive, and healthcare sectors, the costs can be higher due to the need for advanced printers and materials. However, the benefits in terms of customisation and rapid prototyping often justify the expense.

What are the benefits and challenges of using 3D printing for

manufacturing?

There are several benefits to using 3D printing for manufacturing, including:

- **Customisation:** Allows for customisation and personalisation of products, which can be a significant advantage for companies that need to produce products in small quantities or with unique features.
- **Speed:** Facilitates fast, on-demand manufacturing, which can be a significant advantage for companies that need to get products to market quickly.
- **Cost:** It can be cost-effective for small production runs or highly customised products, eliminating the need for expensive tooling and moulds.
- **Flexibility:** Allows for the creation of complex shapes and structures that would be difficult or impossible to manufacture using traditional methods.
- **Shorter lead times:** Reduces the need to seek suppliers overseas, thus mitigating supply chain fragility and providing additional cost-benefit advantages.
- **Sustainability:** Enables the recycling and repurposing of materials, reducing the need for virgin materials and minimising environmental impact. In addition, 3D printing uses only the exact amount of materials required to create a part or product, thus generating less waste.

3D Modelling Case Study

Ignitec's collaboration with Autonomous Robots Ltd to develop and design an autonomous underwater vehicle utilised 3D modelling to overcome the challenges presented by a project of this scope and nature. Our collaboration resulted in a groundbreaking new concept for underwater surveying made possible by our ability to validate the concept and its functionality by successfully integrating electronic components, design efficiency, and manufacturing practicalities.

However, there are also several 3D printing challenges when used for manufacturing:

- **Material limitations:** While a wide variety of materials can be used in 3D printing, some materials are unsuitable for this process. This includes flammable natural materials (e.g. paper, wood, organic textile fibres), hard natural materials that are heat resistant (e.g. stone), and certain metals (e.g. gold and silver)
- **Size limitations:** The size of the object that can be 3D printed is limited by the printer

bed size. Larger objects may need to be printed in multiple parts and then assembled, which can be time-consuming and challenging.

- **Quality control:** 3D printed parts may have surface imperfections or inconsistencies in material properties that can affect the quality and performance of the final product. Quality control measures must be implemented to ensure that each part meets the required specifications.
- **Cost:** While 3D printing can be cost-effective for small production runs or highly customised products, the price per unit can be high for larger production runs. This is due to the cost of materials, the time it takes to print each unit, and the cost of maintenance and repair of the printer.

7 industries transformed by 3D printing technology

According to Fortune Business Insights, the global 3D printing market size was valued at $18.33 billion in 2022 and is projected to grow from $22.40 billion in 2023 to $105.99 billion by 2030. The rapid rise in digitisation and faster adoption of advanced technologies – at both governmental and private sector levels – are driving factors behind the growth of the 3D printing technology market, transforming industries such as:

1. **Aerospace:** Lightweight, complex parts for aeroplanes and spacecraft that are difficult or impossible to manufacture using traditional methods.
2. **Medical and Healthcare:** 3D printing has powered medical breakthroughs in bioprinting, replication, and prosthetics – especially custom prosthetics, implants, and surgical tools tailored to the individual patient's needs.
3. **Automotive:** Lightweight, high-performance parts for race cars and other vehicles.
4. Consumer Products: Create customised and personalised products, such as jewellery, phone cases, and home decor items.
5. **Architecture:** Models and prototypes of buildings and structures, as well as custom architectural features and details.
6. **Education:** Transforms classrooms at every level – including printing educational aids (e.g. sculptures of molecules) and facilitating student design challenges.
7. **Robotics:** When used for 3D printers, robotics can move in an incredible variety of angles, creating complex shapes for custom and large-scale objects.

Final thoughts on the viability of 3D printing for UK businesses

The cost of 3D printing in the UK and its viability for manufacturing varies widely based on factors such as the type of printer, materials, and the project's complexity. For individuals and small businesses, affordable options are available for 3D printing without breaking the bank.

If you're looking for flexible 3D printing costs with a service agency that can help you bring your designs to life quickly without compromising quality, contact us. Our product manufacturing services ensure that even if 3D printing isn't a viable option for full-scale product production, we can provide end-to-end solutions to seamlessly take you from concept and 3D prototype to the consumer market with considerably less risk.

FAQ's

Is 3D printing expensive for beginners?

3D printing can be affordable for beginners. Entry-level desktop 3D printers are available at reasonable prices, making them accessible to hobbyists and beginners.

How much does a basic 3D printer cost?

Basic desktop 3D printers can range from £150 to £500 or more, depending on the brand, features, and build quality.

Are 3D printing materials expensive?

Basic 3D printing materials like PLA and ABS are generally affordable, typically costing around £20 to £30 per kilogram. Speciality materials can be more expensive.

What factors affect the cost of 3D printing?

Several factors influence 3D printing costs, including material choice, printer type, print volume, design complexity, resolution, and post-processing requirements.

Can I save money by using open-source 3D printing software?

Yes, open-source 3D printing software like Cura and PrusaSlicer can save you money on software expenses, as they are freely available.

How does the cost of 3D printing compare to traditional manufacturing methods?

3D printing can be cost-effective for prototyping and small production runs. However, for large-scale manufacturing, traditional methods may be more economical.

Are there hidden costs associated with 3D printing?

Hidden costs can include electricity, maintenance, and replacement parts for your 3D printer. It’s essential to factor these into your budget.

Can I reduce 3D printing costs by using recycled materials?

Yes, recycling materials like old filament spools or failed prints can reduce costs, but be cautious about the quality of recycled materials.

Is 3D printing cost-effective for custom parts?

3D printing is often cost-effective for producing custom parts since it doesn’t require expensive moulds or tooling.

Are there affordable 3D printing options for education?

Educational institutions can find budget-friendly 3D printers; some companies offer academic discounts or packages.

Can I get 3D-printed prototypes made without owning a printer?

Yes, 3D printing service bureaus offer printing services, allowing you to pay for individual prints without needing a printer.

Are resin 3D printers more expensive than filament-based ones?

Resin 3D printers can be more expensive than filament-based printers due to their technology and the cost of resin materials.

Does the complexity of a 3D model affect printing costs?

Yes, complex 3D models with intricate details or supports can increase printing time and material usage, raising overall costs.

How can I estimate the cost of a 3D printing project?

You can estimate 3D printing costs by considering material costs, print time, electricity usage, and any additional post-processing or finishing expenses.

Are there grants or funding options for 3D printing projects?

Some organisations offer grants or funding opportunities for innovative 3D printing projects, particularly in healthcare, education, and research.

Can 3D printing be a cost-effective solution for creating replacement parts?

Yes, 3D printing can be a cost-effective way to produce replacement parts, especially for older or hard-to-find items.

How do commercial 3D printing services compare in terms of cost?

Commercial 3D printing services vary in cost, so comparing quotes and considering factors like material quality and turnaround time is essential.

What are the cost differences between Fused Deposition Modeling (FDM) and Stereolithography (SLA) 3D printing?

FDM 3D printing is generally more affordable than SLA, but SLA can provide higher resolution and smoother surface finishes.

Can I use 3D printing to save on manufacturing tooling costs?

Yes, 3D printing can eliminate the need for expensive moulds and tooling in the production process, potentially saving significant costs.

Are there online resources for comparing 3D printing costs in the UK?

Yes, several online platforms and calculators allow you to estimate 3D printing costs by inputting various project parameters like material type, print volume, and complexity.

Is 3D printing a viable manufacturing option for mass production?

While 3D printing is excellent for prototyping and small-batch production, it may not be as cost-

effective as traditional manufacturing methods for mass production due to slower print times and material costs.

Can 3D printing be used for manufacturing custom or one-off parts?

Yes, 3D printing excels at manufacturing custom or one-off parts, making it a viable option for producing unique or highly customised products.

Is 3D printing suitable for manufacturing in aerospace and automotive industries?

Yes, the aerospace and automotive industries often use 3D printing for prototyping, creating lightweight components, and producing parts with complex geometries.

How does the cost of 3D printing compare to traditional manufacturing methods?

The cost-effectiveness of 3D printing versus traditional manufacturing depends on factors like production volume, materials, and design complexity. For small runs and customised parts, 3D printing can be competitive.

Can 3D printing replace traditional manufacturing in some cases?

3D printing can complement traditional manufacturing but may not entirely replace it. It offers unique advantages like rapid prototyping and customisation but has speed and material selection limitations.

Are there industries where 3D printing is the preferred manufacturing method?

Industries like healthcare, dental, jewellery, and aerospace favour 3D printing for its precision, customisation, and ability to create intricate parts.

Is 3D printing a sustainable manufacturing option?

3D printing can be sustainable when used efficiently. It reduces material waste, energy consumption, and transportation costs, making it environmentally friendly.

What materials are suitable for 3D printing in manufacturing?

Various materials, including plastics, metals, ceramics, and composites, are suitable for 3D printing in manufacturing. Material choice depends on the specific requirements of the product.

Can 3D printing be used for production at scale with the right equipment?

Yes, with industrial-grade 3D printers and optimised processes, 3D printing can be used for production at scale. Some companies use large-scale 3D printers for manufacturing.

Does 3D printing offer advantages in terms of design flexibility?

Yes, 3D printing provides design flexibility, allowing for complex geometries and integrating multiple components into a single printed part, which can be challenging with traditional manufacturing methods.

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